Non-technical summary ESIA for Medusa submarine cable system: main trunk (and selected Phase 1 landings)

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1 Introduction

The objective of this document is the presentation of Environmental and Social Impact Assessment following the standards of the European Investment Bank (EIB) for the Medusa submarine cable system project. This project consists in the installation of a fiber optic submarine cable across the Mediterranean Sea promoted by Medusa Submarine Cable System S.L.

The installation of the cable will be executed by Alcatel Submarine Networks (ASN) and is expected to occur between 2024 (Western Mediterranean) and 2025 (Eastern Mediterranean).

Medusa subsea system will consist on a main cable going from Lisbon, in Portugal, to Port Said, in Egypt. Additional landings are planned in Zahara de los Atunes, Torreguadiaro and Barcelona (Spain), Marseille (France), Tetouan and Nador (Morocco), Bizerte (Tunisia), Mazara del Vallo (Sicily, Italy), Yeroskipou (Cyprus) and optionally Collo and Algiers (Algeria), Heraklion (Crete, Greece) and several landings in Libya and Turkey. Therefore, up to 12 different countries may be involved in the project.

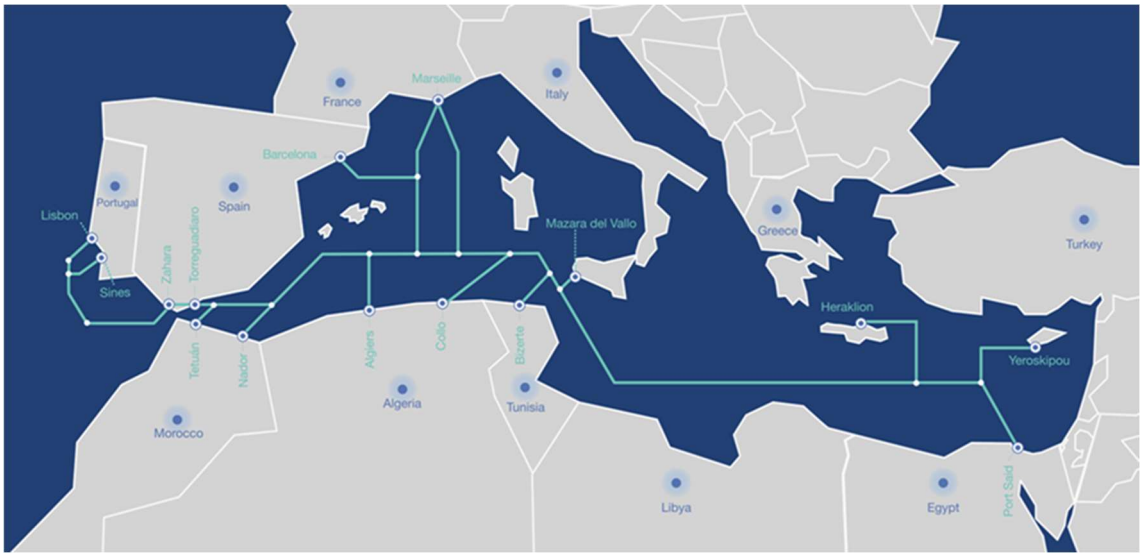

Figure 1. Schematic route of the Medusa subsea system across the Mediterranean Sea.

The present document analyzes only the main trunk of the cable between Lisbon and Port Said, as well as landings of the Atlantic Sea and Western Mediterranean basin: Lisbon, Zahara, Torreguadiaro, Barcelona, Marseille and Mazara.

Each of these landings is subjected to permitting process, which has already been started in Portugal, Spain and France. Therefore, at the current stage of the project, more detailed information exists for those landings belonging to these countries.

2 Project Description

The installation of a submarine fiber optic cable is composed by a terrestrial and a marine segment. The terrestrial segment is that between the Cable Landing Station (CLS) where the electronic equipment for the treatment of the optical signal is installed, to the Beach Manhole (BMH), which is an infrastructure located next to the beach, where the transition between the marine cable and terrestrial cable occurs. The marine segment is the one going from the BMH up to open sea waters.

The present document is focused on the marine segments of Medusa subsea system.

Fiber optic cables have a diameter varying in the range of 17-53 mm, depending on the thickness of insulated sheath and other protection layers. The simplest cable is the Lightweight cable (LW), used up to 8000 m of depth. Then the protection and the diameter increase in the Lightweight protected cable (LWP), generally used between 1500 and 3000 m, in the Single Armored cable (SA), normally used between 0 and 2000 m, and the Doble Armored cable (DA), which may be used at any depth between 0 and 500 m, but is generally used up to 200 m. SA and DA cables are that used for shallower water, as they present external layers of steel armor to increase the protection against abrasion, fishing hook penetration, etc.

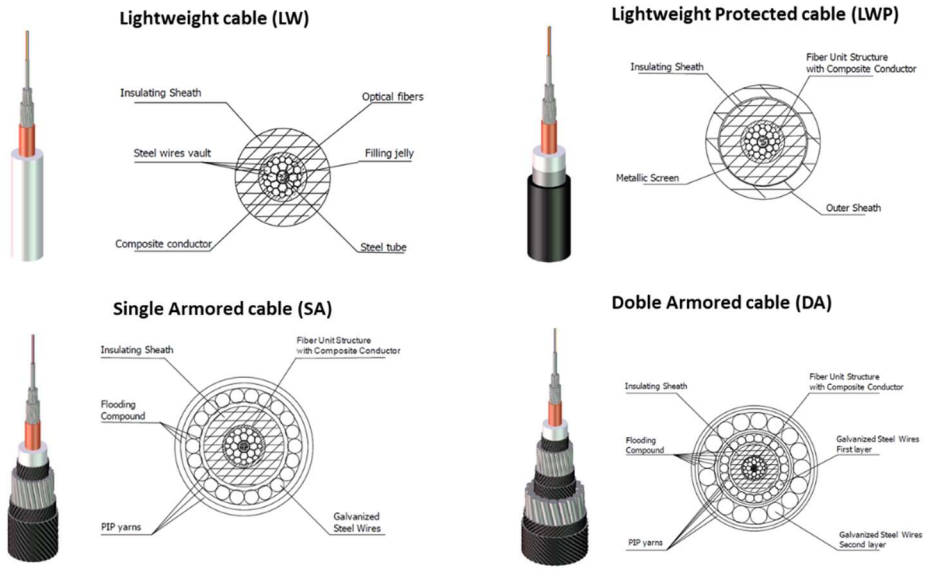

Figure 2. Different types of fiber optic cables. Source: ASN.

A submarine cable project requires the installation of some infrastructures in landing areas, such as BMH and border pipe. The first one is located above water mark, generally behind the beach. The second one can be buried on the beach or below low water level and has the aim to tie up

the marine cable. Marine cables are connected between border pipe and BMH through beach ducts that represent a higher protection for the cable itself in the beach area.

Figure 3. Example of BMH (left) and border pipe (right) infrastructures. Source: AFR-IX Telecom.

The installation of a submarine fiber optic cable consists of a preliminary phase for the study of the theoretical route, which allows to minimize the environmental and social impacts of the project and a pre-installation geophysical and geotechnical survey, which permits to analyze in detail the route and the potential for burial of the substrate and redefine it if necessary. Before starting installation works, permits must be obtained for each of the landing sites.

Installation works consists of marine operations that are done by the cable ship, laying operation in shallow areas done by auxiliary vessels, and terrestrial operations for the installation of beach infrastructures.

Marine works consists on the clearance of the route from obstacles that may be present, laying and burial of the cable in detrital areas below 1000 m, surface laying of the cable in rocky areas as well as at depth higher than 1000 m and post-laying inspection through ROV.

Terrestrial works consists on the installation of BMH, border pipe and conduct at the beach area. At the end of the cable burial phase, the initial conditions are restored in the beach area.

Shallow water works consist of an operation coordinated between cable ship and beach team, with the participation of support boats and divers. These works permit to lay and bury the cable in areas where the shallow depth of the water does not allow the presence of the cable ship and to land the cable at the beach. The cable is connected to border pipe and BMH after these operations.

3 Legal and Administrative Framework

Main rules about submarine cable laying are included in the Law of Sea Convention (UNCLOS), which is an international agreement that defines the rights and responsibilities of the nations in

the use of the ocean, establishing rules and guidelines for all uses of the oceans and their resources.

All states have the freedom to lay submarine cables in the high seas. In the economic exclusive zone (EEZ), all States enjoy the freedom of laying of submarine cables. In the continental shelf, all the states are entitled to lay cables, but coastal states have the right to take reasonable measures for the prevention, reduction and monitoring of pollution. The delineation of the cable route on the continental shelf is subjected to the consent of the coastal state, which has the right to establish conditions for cables entering its territorial sea. Considering this fact, national legislation of each of the countries involved should be considered for cable landings.

In the case of countries belonging to the European Union, most of the national laws significant for the present document are ratifications of EU Directives. In particular, it has to be noticed that the main EU Directive to be considered for ESIA assessment is the EIA Directive (Directive 2014/52/EU, amending the Directive 2011/92/EU). Neither submarine nor terrestrial fiber optic network projects are explicitly mentioned in Annex I and Annex II of this directive, so that Medusa project in European countries is not strictly subjected to ESIA assessment. However, the promoter must present information about environmental and social aspects that can be affected by the project as part of the permitting process for all the cable landings on the European side, based on national legislations.

A list of international texts and protocols ratified by the different countries is presented in the main ESIA document.

The present ESIA follows the standards established by EIB in the EIB Environmental and Social Standards (version of 2 February 2022).

Finally, conventions established by the International Labor Organization (ILO) are taken into account during the implementation of the Medusa subsea system project.

4 Analysis of Project Alternatives

Alternative 0 is the no execution of the project. This alternative is for sure the most favorable in terms of environmental impact, as it does not change the environmental baseline conditions of the area of study. However, taking into account the possibility of planning a submarine fiber optic cable system compatible with the protection of the environment, the use of the territory, the observance of human rights and of community health and safe, etc., the alternative 0 is not considered to be the best possible option. Indeed, it will not imply any internet capacity improvement, which is considered fundamental for the future in particular for North Africa countries.

In the case of a submarine cable project, the evaluation of the most convenient alternative from an environmental and socio-economical point of view is a key factor in order to guarantee the success of the project. In addition, the application of well-known industry standard mitigation measures is also taken into account at the time of planning the cable system route, in order to minimize the cable footprint and guarantee the cable integrity.

Considering the main determinants for the planning and optimization of the cable route, a first approximated route was planned in 2020, after a Desktop study. Up to the moment, the route has been continuously updated on the base of emerging critical points in several sectors of the route. Twenty-two versions of the cable route have been studied in the past 2.5 years, gathering environmental and engineering criteria as well as the viability of Medusa landings, which is related to the commercial interest for internet connection, the “End of Life” state of current strategic cables, the current limitation of fiber/capacity and the instability of some existing cables.

The route considered in the present ESIA represents the most adapted alternative route planned on the base of all available data. However, as a normal practice in the field of submarine cables, it has to be taken into account that the route may be subjected to further moderate changes on the base of detailed geophysical and geotechnical information that are acquired during pre-installation surveys and that have the aim to provide precise indications for the engineering of the cable, which will ensure the safest route for the life time of the cable (25 years). In addition, possible modifications of routes may be asked by authorities in charge of releasing laying permits for the landings. These modifications cannot be envisaged at the present stage of the project, as, when already started, the permitting process for the landing points is still in progress.

5 Environmental and Social Baseline

The study of the environmental and social baseline of the project has been done for the main trunk of the cable, as well as for those branches and landings indicated in Section 1: Lisbon, Zahara, Torreguadiaro, Barcelona, Marseille and Mazara. The study has considered baseline conditions of the physical and biological environment (environmental baseline) and of the human environment (social baseline).

In the following paragraphs a summary of the baseline conditions acting as environmental and social determinants for the project are reported.

5.1 Physical Aspects

5.1.1 Geomorphology and Seabed Sediments

The seabed morphology of the area of study is quite complex and represents an obstacle at the time of defining the optimal cable route.

The placement of submarine cables should avoid as far as possible the crossing of submarine canyons, as well as the laying along their axis, as they are characterized by strong slopes and are subjected to movements of large masses of sediments that can negatively affect the stability of the cables.

Unfortunately, several submarine canyons are located in many areas of the Medusa system, that is at the continental margin of (i) the East Atlantic Ocean, (ii) the NW Mediterranean Sea and (iii) the Alboran rift. The landings where the presence of submarine canyons is significant and might have some interferences with Medusa system are Lisbon, Torreguadiaro, Barcelona and Marseille.

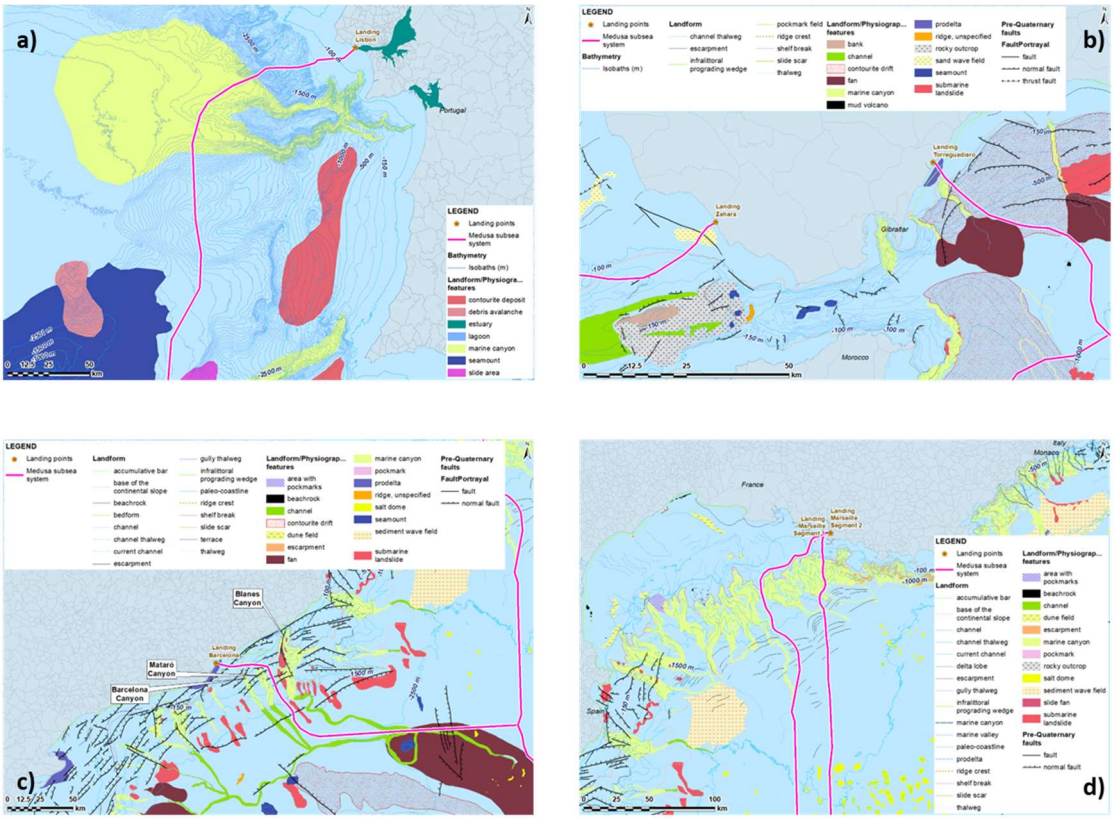

Figure 4. Seafloor geology and presence of submarine canyons in some landing sites: a) Lisbon; b) Torreguadiaro; c) Barcelona; d) Marseille.

Concerning the typology of seabed materials, rocky zones are the most problematic zones for cable laying. Some zone of rock and boulders are present offshore, in particular near the Gibraltar Strait and in the Alboran Sea. The landing where rocky zone may be present is Torreguadiaro.

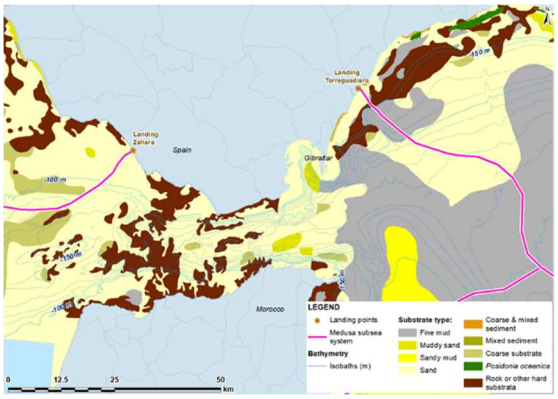

Figure 5. Rocky zones at Torreguadiaro.

5.2 Biological Aspects

5.2.1 Vegetation

According to information available up to the moment, coastal vegetation has annual character and low ecological value in most of the landings. At Zahara landing, the beach area is characterized by a low-altitude dune system, where it grows an indigenous vegetation with a higher ecological value: it is composed by species such as *Ammophila arenaria*, *Pancratium maritimum*, *Eryngium maritimum*, *Medicago marina*, *Lotus creticus* and species of the genus Trifolium. However, protected species have not been found in the zone.

Figure 6. Dune system at Zahara landing. Species like *Ammophila arenaria* and *Pancratium maritimum* can be seen. Source: AFR-IX Telecom-Tecnoambiente, 2021.

5.2.2 Fauna

Cetaceans in the Mediterranean Sea can belong to local population or be part of migrating population. The Mediterranean Sea residents are *Tursiops truncates* (common bottlenose dolphin), *Delphinus delphis* (short-beaked common dolphin), *Stenella coerueoalba* (striped dolphin), *Grampus griseus* (Risso's dolphin), *Globicephala melas* (long-finned pilot whale), *Balaenoptera physalus* (fin whale), *Ziphius cavirostris* (Cuvier's beaked whale) and *Physeter macrocephalus* (sperm whale). Moreover, 12 other species of dolphins and whales have been observed in the basin, but they are considered vagrants or visitors. For example, in the Strait of Gibraltar there is a subpopulation of *Orcinus orca* (killer whale) (IUCN, 2012).

Cetaceans, both resident and visiting, are mainly concentrated in the Western Mediterranean Sea. Here, a protection area has been established in Spanish EEZ for marine mammals, that is the Cetacean Migration Corridor. Medusa cable will cross this area at Barcelona branch.

With respect to chelonians, the Mediterranean Sea usually hosts three of the seven living species of sea turtles, that is loggerhead (*Caretta caretta*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*).

According to information available up to the moment, no sea turtle nests have been found at the selected landing beaches. However, more information needs to be acquired in the frame of PiPs.

Concerning birds, the most critical point is Zahara landing, because of the presence of Kentish plover (*Charadrius alexandrines*) that reproduces in dune area between April and August and has two periods of nesting, the first between April and early May and the second one between end-May and early June.

5.2.3 Marine Habitats

With respect to marine habitats, one of the most known critical points for Medusa subsea system is Marseille landing, where a *Posidonia oceanica* meadow is present. The following map represents marine habitats present in shallow water near Marseille landing. A plain meadow of *Posidonia oceanica* forming a strip parallel to the coast is present in the zone. Then, at the level of the Vieille Chapelle beach (landing site) the meadow is narrowest, more discontinuous and also dominated by dead matte of Posidonia.

In the context of permitting process for Marseille landing, a marine biocenoses survey has been conducted in the zone between 0 and 90 m during spring 2021. The range depth where *Posidonia oceanica* has been found is 5-28 m. The seabed habitat survey has showed that the route of

Medusa cable will have a reduced influence on *Posidonia oceanica*, by crossing mainly dead matte zones.

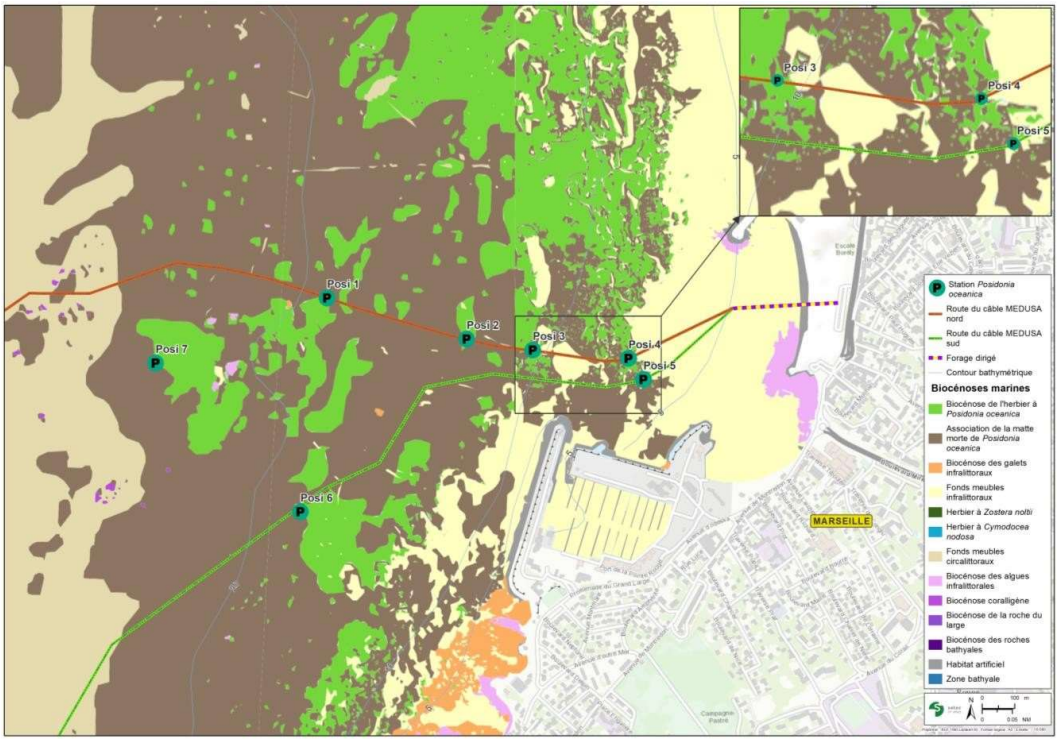

Figure 7. Seabed marine habitats map near Marseille landing. Medusa cable to be taken into account is the red one. Green: Posidonia meadow; Brown: dead matte of Posidonia. Source: AFR-IX, 2021.

The presence of phanerogam seagrasses is also noted at Mazara landing. In these cases, additional information will be collected in the frame of PiPs.

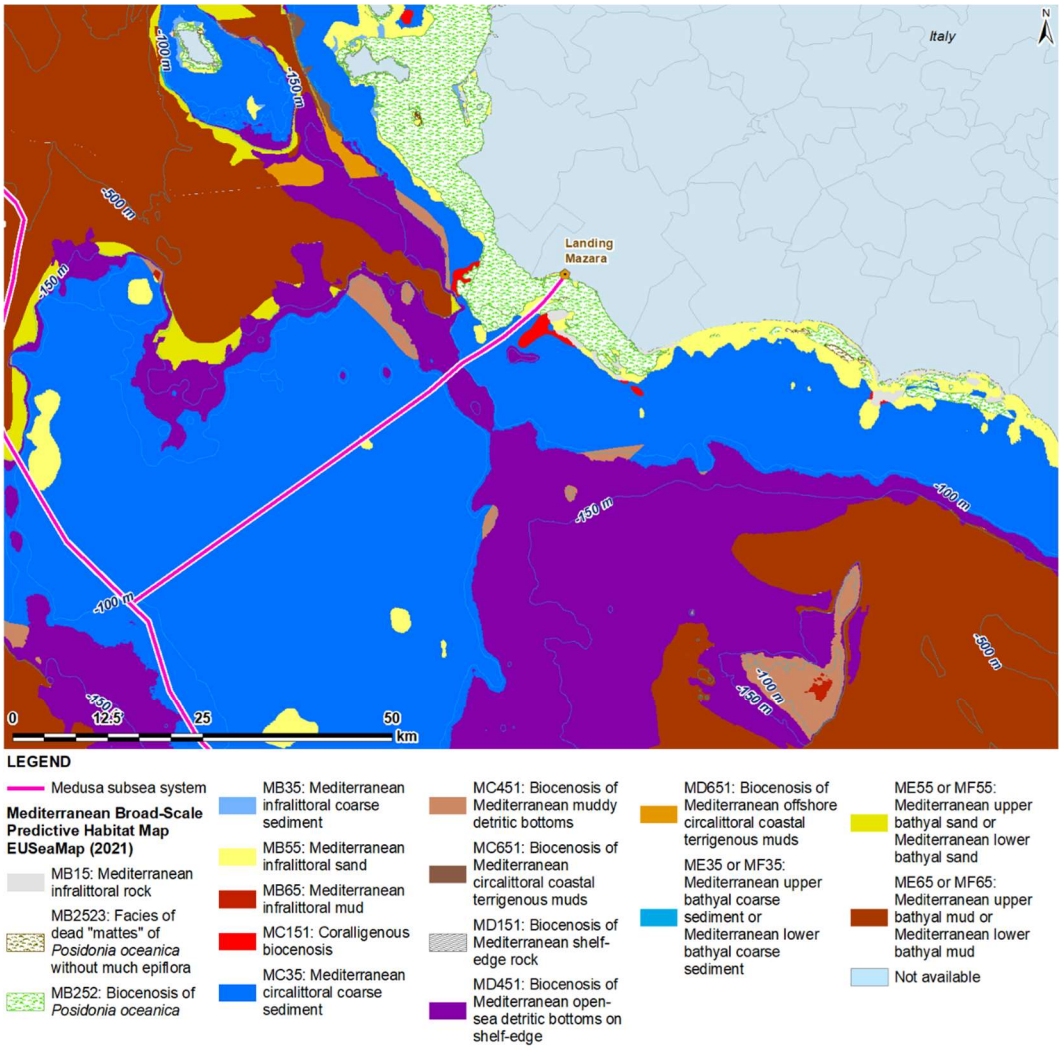

Figure 8. Presence of *Posidonia oceanica* at Mazara (EUSeaMap 2021, habitat types (EUNIS 2019)). Source: Elaborated with data from EMODnet Seabed Habitats.

Another issue for Medusa subsea system is the presence of the habitat “Reef” in Torreguadiaro zone. This habitat consists of all those compact hard substrates that emerge on the seabed in the sublittoral (submerged) or littoral (intertidal) zone, whether of biogenic or geological origin. Data from the Ecocartography of the province of Cadiz shows that the route of the cable would interfere with this habitat, associated with the infralittoral sciaphilous algae community of calm regime with gorgonian facies. Actually, sonar data from Tecnoambiente show that the rocky areas that emerge in this strip indicated by the Ecocartography of Cadiz are much more limited. Following these data, the route in Torreguadiaro landing has been planned in order to minimize/avoid the crossing of rocky areas. Anyway, pre-installation geophysical and geotechnical survey will allow to analyze in the detail the distribution of “Reef” habitat; results from this survey will be used to do a micro-

routing of Medusa subsea system with the aim of avoiding or minimizing the crossing of the habitat "Reef".

Another sensitive habitat that can be found in general on the cable route is that characterized by the presence of communities dominated by pennatulacean individuals. These communities are widely distributed in the Mediterranean and can be found in circalittoral soft bottoms and deep bottoms, sometimes associated with structures produced by gas escape. The most common species are *Pennatula rubra* and *Funiculina quadrangularis*. Although a direct interaction is to be expected for some individuals when laying the cable, the sensitivity of the biocenosis can be described as low to medium, given the small diameter of the cable and its immediate stability on these bottoms. The functionalities of the habitat will not be questioned.

Among deep-sea habitats that might be found there are coral gardens, which can be found up to 800 m deep, mainly on rocky bottoms, but also on soft bottoms. As defined by OSPAR, this habitat is characteristic of deep water and does not include inshore or shelf habitats with pennatulaceans and octocoral communities. This habitat is usually associated to rocky bottoms, and for this its presence should be limited along the cable route.

Finally, other sensitive deep-sea habitats are those of submarine canyons, dominated by sessile fauna, generally cnidarians (anemones and sea pens) as well as polycheates, and those of seamounts. Both of them are considered hot spots of biodiversity and are avoided as far as possible when planning submarine cables routes, as they represent also a high risk for the stability of the cable (high slopes). With respect to these habitats, adjacent muddy-bottoms are considered poor in terms of biodiversity.

5.2.4 Protected Areas

Medusa subsea system will cross the following protected areas along its route:

- The Special Protection Area (SPA) "Cabo Raso" (PTZPE0061), near Lisbon landing. This is a Nature 2000 site, established under the Birds Directive: the area is indeed significative for marine migratory bird species.
- The Specially Protected Area of Mediterranean Importance (SPAMI) "Cetacean Migration Corridor" in NW Spanish waters: the zone is of primary importance for the presence of cetaceans.
- The Spaces of Community Interest (SCI) and Special Area of Conservation (SAC) "Calanques et îles Marseillaises-Cap Canaille et Massif du Grand Caunet" (FR9301602), near Marseille landing. This is a Nature 2000 site established under the Habitats Directive: it is indeed significant for the presence of *Posidonia oceanica*,

coraligenous and karstic caves. Deep-water corals are also present in the proximity of Cassidaigne canyon.

- The “Calanques” national park near Marseille landing. This area coincides partially with Nature 2000 site indicated above. This national park has the aim of protecting several habitats such as submarine canyons, *Posidonia oceanica* meadows, coralligenous, submarine caves, etc.
- The Special Protection Area (SPA) “Oiseaux marins sud golfe du Lion” (FR9112038), along Segment 1 of Marseille branch. This is a Nature 2000 site, established under the Birds Directive: the area is significative in particular for the presence of the storm petrel and the little gull.

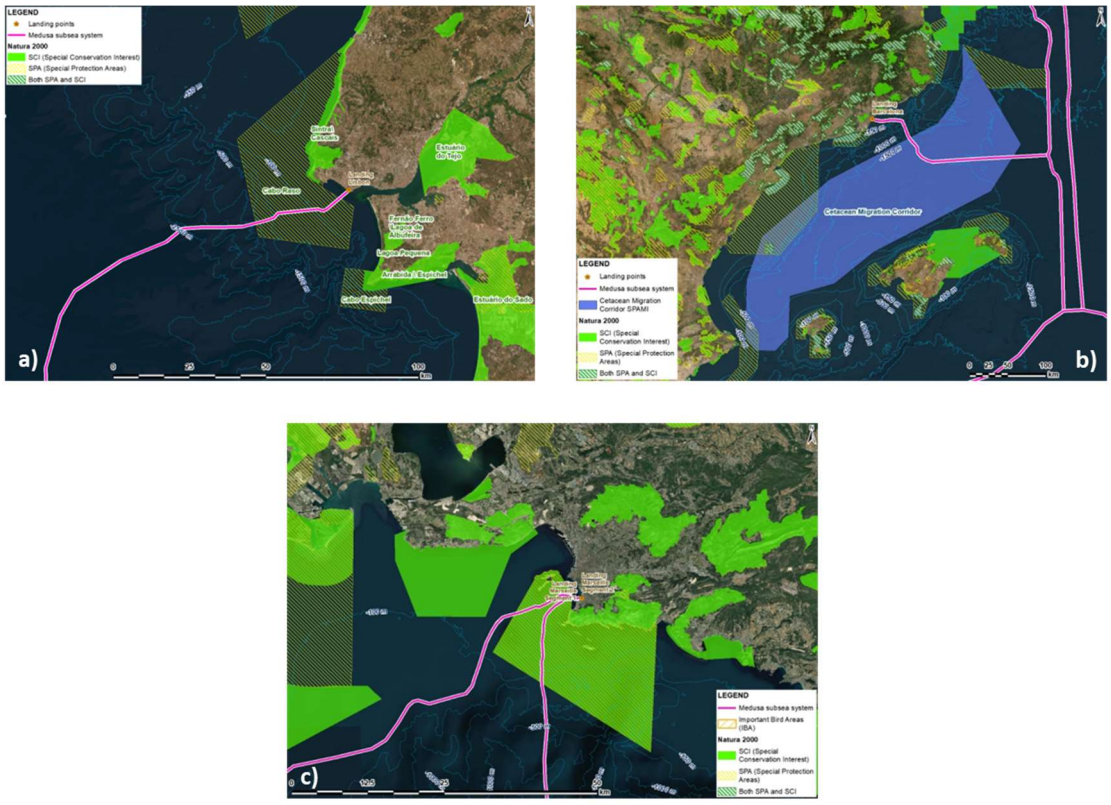

Figure 9. Protected areas crossed by Medusa subsea system: a) SPA “Cabo Raso” near Lisbon landing; b) SPAMI “Cetacean Migration Corridor” along Barcelona branch and SPA “Oiseaux marins sud golfe du Lion” along segment 1 of Marseille branch; c) SCI) and SAC “Calanques et îles Marseillaises-Cap Canaille et Massif du Grand Caunet” at Marseille landing.

5.3 Socio-economic Aspects

5.3.1 Fishing

Once installed at the seabed, Medusa subsea system can be affected by trawl fishing, as trawling gears can hook the cable, causing damage or cable break.

At the Mediterranean Sea, trawl fishing is conducted from depths of 50 m up to depths of 1000 m, while in the Atlantic Sea trawling can be conducted from 100 m to 1000 m.

Considering the main trunk of Medusa submarine system, the area characterized by higher trawl fishing activities is the platform between Sicily and North Africa. Other important fishing areas next to the trunk of the cable are those in the middle of the Alboran Sea.

In addition, the distribution of other fishing arts needs to be considered too, in relation to interference of installation works on fisheries.

In the following paragraphs information about the most sensitive landing sites for fishing is summarized.

With respect to the landings, one of the most significant issues for fishing is the presence of Cabo Plata *almadraba* close to the landing site in Zahara. It is a specific fixed gear for the capture of bluefin tuna (*Thunnus thynnus*) that is usually set in clean places on the coast, where tuna end up on their way to the Mediterranean Sea. Time window for this fishing art is from the second half of April to the second half of June, when it begins to be dismounted, to finish definitively at the beginning of July. The species caught are those belonging to the tuna family. The planned route of Medusa system does not cross the *almadraba* of Cabo Plata. In any case, its presence must be taken into account when scheduling the works at Zahara landing: in order to avoid interferences, the bluefin tuna migration season to the Mediterranean (April-June) should be avoided. It must also be considered that the assembly and installation operations of the trap nets of the *almadraba* normally start about two months before, in February.

At Torreguadiaro landing, fishing activities are quite significant from the coast up to the bottom of the continental slope. The crossing of two fishing grounds is recognized, as well as of a bivalve production area.

Concerning Barcelona landing zone, Medusa system will cross two fishing grounds and a mollusk production area, where currently echinoderms, gastropods and squirts and other tunicates can be caught (Source: BOE-A-2022-13833). The most used fishing modalities are small gear and purse seine fishing, 40% and 24% respectively. Trawling and surface longline are also conducted.

In Barcelona landing zone fishing activities are quite significant from the coast up to the top of the continental slope.

In the case of Marseille landing, the interference with fishing activities is more limited as fishing is common at the east and the west of the Medusa zone, but not in correspondence of the route of Marseille branches.

With respect to Mazara landing, from this locality to the east, the coastal zone of Southern Sicily is characterized by high fishing vessel density. Bottom trawling is the most important fishing activity along the Italian sector of the Strait of Sicily. Medusa subsea system route has been planned to avoid as far as possible this significant fishing area. Therefore, direct interference with the fishing area is limited and is seen just in the first 20 km from the coast.

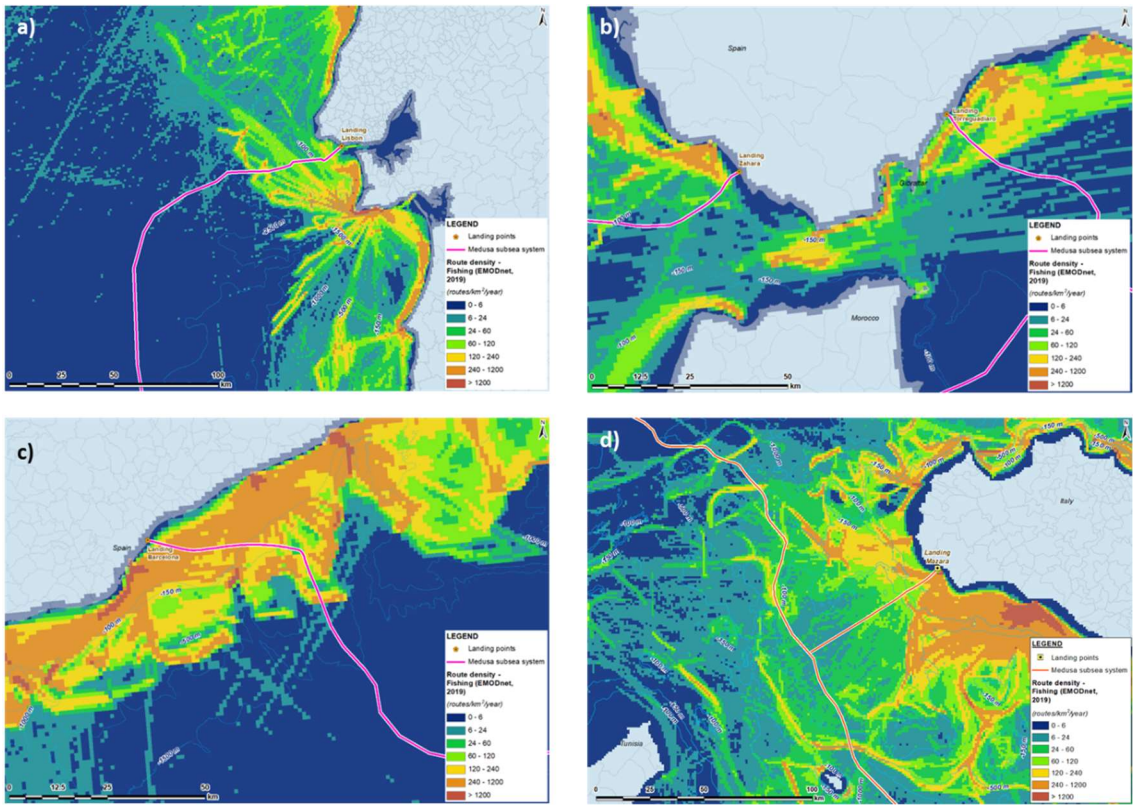

Figure 10. Route density of fishing vessels in areas along the cable route where fishing is significant: a) Lisbon landing; b) Zahara and Torreguadiaro landings; c) Barcelona landing; d) Mazara landing.

5.3.2 Infrastructures

In the marine environment, infrastructures that can be found at the sea bottom are firstly other submarine cables (telecommunication and power cables), which are abundant in the area of study. Points of intersection between in-use and old submarine cables will be investigated during

pre-laying surveys and crossing are usually agreed with the cable owners. Rules advised by the International Cable Protection Committee (ICPC) have been taken into account during the planning of Medusa route.

Other submarine infrastructures that can interfere with Medusa system are out-of-service and in-use pipelines for the distribution of gas or crude oil. In the study area are recognized in particular the following: pipeline between Morocco and Spain; pipeline between Spain and Algeria; pipelines between Algeria and Italy; pipeline between Libya and Italy. Then, the EastMed natural gas pipeline is planned in the Eastern Mediterranean, directly connecting offshore resources of Israel to mainland Greece, via Cyprus and Crete.

Among these, the pipeline Tanger-Cordoba between Morocco and Spain is the one that may have more interference with the project, as it lands at the same beach of Medusa subsea system in Tarifa Municipality, Spain. Medusa cable will land at the NW of the pipeline, avoiding the crossing with this infrastructure at sea, as well as on the beach. Then, the tunnel of the land gas pipeline between Zahara and La Línea de la Concepción, at the Mediterranean side of Cadiz province, will be used for running the terrestrial fiber optic system between Zahara and Torreguadiaro, with the aim of avoiding crossing the Gibraltar Strait by sea.

The gas pipeline connecting Italy with Algeria is landing near the SE limit of Capo Feto, several kilometers at the west of Mazara landing site. The Medusa route is planned in order to avoid the intersection with the gas pipeline nearshore. However, the crossing will be inevitable offshore.

Artificial reefs are other submarine infrastructures that can be present at landing sites. This happen in the case of Torreguadiaro landing, where Medusa cable will cross an area where artificial reefs could be found for approximately 1.5 km of its route. Data collected from the pre-installation survey will help to identify the location of artificial reefs (here and in other landings if present) and to the micro-routing of the cable in order to avoid interference with these infrastructures.

5.3.3 Heritage

The Medusa cable route has been planned taking into account public databases on shipwrecks and other heritage features present at the sea, as well as in beach zones, and avoiding the interference on these elements. However, more specific archaeological studies are usually required by authorities, before granting permits for landing the cable in territorial waters. These studies start from deepest bibliographic research of available information on heritage and archaeological significant zones next to a landing site and are then usually followed by field survey, both at the beach and in shallow waters (boreholes and video survey) in order to identify

the possible presence of archaeological remains. Geophysical data obtained from pre-installation survey are also usually interpretated by an archaeologist up to a certain depth.

No direct interference on heritage has been identified up to the moment. However, considering the different stage of permitting process in the landings, detailed information on heritage in the study area is still lacking in most of the landing sites.

5.3.4 Marine Traffic

With reference to maritime traffic, the Mediterrenean Sea is a very busy region in the world, hosting more than 20% of seaborne trade, 10% of world container throughput and over 200 million passengers (UN Environment 2017). Crude oil shipments (from Black Sea and Egypt or from the Persian Gulf) and container ships dominate the major traffic routes.

According to the following map taken from Emodnet human activities portal for total marine traffic in 2019, it can be seen how vessels in general are concentrated in coastal zones. Moreover, it is clearly visible the route of vessels moving between Eastern and Western Mediterranean Sea, crossing at the Strait of Sicily and then at the Gibraltar Strait, where the route density reaches the highest values. In the Atlantic Ocean, main routes circumnavigate the southern and eastern coast of Iberian Peninsula, connecting then to the rest of Europe.

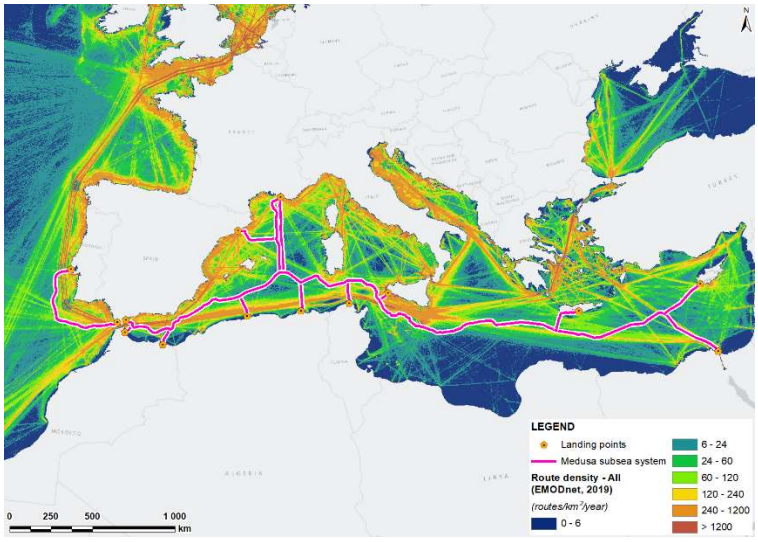

Figure 11. Density route map in the study area in 2019. Source: Elaborated with data from EMODnet Human Activities.

6 Impact Assessment and Mitigation Measures

6.1 Environmental and Social Impacts

6.1.1 Negative Impacts

The following table shows the significant negative environmental and social impacts that have been highlighted during the impact assessment for the installation and the operational phase. All the other negative impacts on different factors have been evaluated, but they are considered compatible with the baseline conditions; in this case, the application of preventive measures is not necessary, although some measures are always applied as best practices for the project or because they are imposed by the legislation.

Environmental and Social Factors	Location	Significance of the Assessed Impact	Significance of the Residual Impact
During installation			
Beach geomorphology and soil alteration	Zahara landing	Serious	Compatible
Coastal vegetation	Zahara landing	Moderate	Compatible
Marine mammals	General	Moderate	Compatible
Chelonians	General	Moderate	Compatible
Birds	Zahara landing	Moderate	Compatible
Phanerogam seagrasses	Marseille landing, Mazara landing	Serious	Compatible
Other Sensitive Marine Habitats	Zones where they are present	Serious	Compatible
Protected areas	Cetacean Migration Corridor	Moderate	Compatible
	Nature 2000 site and national park at Marseille landing	Serious	Compatible

Human health and safety	General	Moderate	Compatible
Fishing	General	Moderate	Compatible
Marine infrastructures	General	Moderate	Compatible
Terrestrial infrastructures	General	Moderate	Compatible
Heritage	General	Moderate	Compatible
Chemical quality of seawater	General	Moderate	Compatible
Terrestrial noise quality	General	Moderate	Compatible
During operation			
Phanerogam seagrasses	General	Moderate	Compatible

Table 1. Summary of significant negative impacts during installation and operational phases for Medusa subsea system.

6.1.2 Positive Impacts

Some positive impacts have also been identified: during installation works employment opportunities may be available during the phases of the terrestrial infrastructure installation for local businesses and, as a result, residents. During operational phase of Medusa project positive impacts will be generated on quality of life and education, employment and internet use. Indeed, the implementation of the project will provide a high-speed internet connection that will significantly improve internet access conditions with potential positive consequences in particular for North Africa countries: internet access for schools, internet access for higher education and research, implementation of a digital administration and improvements in the health sector with the widespread of telemedicine. These impacts will improve the quality of life and education. Finally, the operation of the stations and technical centers will be an opportunity to recruit a workforce (for guarding, cleaning activities, etc.). The creation of new ICT-related jobs du high-speed internet will also occur. These jobs will not only reduce the number of unemployed but will also provide stable incomes for these employees.

Environmental and Social Factors	Location	Significance of the Assessed Impact
During installation		
Employment	All the landing sites	Compatible
During operation		
Quality of life and education	General	Important
Employment	General	Moderate
Internet use	General	Important

Table 2. Summary of positive impacts during installation and operational phases for Medusa subsea system.

6.2 Mitigation Measures

Prior to the definition of specific measures, the main determining factors considered for the selection of the preliminary route for Medusa system are detailed. The consideration of these factors as a preventive measure in the preliminary phase of the project limits significantly the effects on the study area:

- Avoid the crossing of Natural Protected Areas as far as possible;
- Avoid the crossing of phanerogam seagrasses as far as possible;
- Minimize the crossing of rocky bottoms;
- Avoid the crossing of submarine canyons and seamounts, which are considered hotspots of biodiversity;
- Avoid areas with authorized fishing gears in the seabed.

The following table summarizes main mitigation measures to be applied to minimize significant impacts that have been detected during the environmental and social impact assessment.

Environmental and Social Factors	Location	Main Mitigation Measures
	During installation	

Beach geomorphology and soil alteration	Zahara landing	Use of PHD instead of opening a trench trough backhoe at the beach
Coastal vegetation	Zahara landing	Use of PHD instead of opening a trench trough backhoe at the beach
Marine mammals	General	Train the crew about cetacean sightings Prepare an action protocol and good navigation practices Comply with MARPOL regulations (all the ships)
Chelonians	General	Train the crew about chelonian sightings Prepare an action protocol and good navigation practices Comply with MARPOL regulations (all the ships)
Birds	Zahara landing	Avoid reproduction and nesting season of *Charadrius alexandrines* (from April to August)
Phanerogam seagrasses	Marseille landing and potentially other landings where phanerogam seagrasses are present	Carry out a survey of the benthic biocenoses Install an anti-MES (Suspended Matter) barrier around the area concerned by the burial operation (out of the phanerogam) Avoid burial of the cable in correspondence of *Posidonia oceanica* meadow Fix the cables within the Posidonia meadow to the bottom at regular intervals by anchors
Other Sensitive Marine Habitats	Zones where they are present	Conduct geophysical and geotechnical background recognition campaigns up to 1000 m of depth to optimize the cable route with respect to sensitive habitats.
Protected areas	Cetacean Migration Corridor	Enroll MMO Measure the noise generated during the installation

		Collect cetacean observation data in a database
	Nature 2000 site and national park at Marseille landing	Prefer crossing of dead matte with respect to *Posidonia oceanica* meadows Carry out a survey of the benthic biocenoses Install an anti-MES (Suspended Matter) barrier around the area concerned by the burial operation (out of the phanerogam) Avoid burial of the cable in correspondence of *Posidonia oceanica* meadow Fix the cables within the Posidonia meadow to the bottom at regular intervals by anchors Avoid crossing of submarine caves and coraligenous
Human health and safety	General	Implement a H&S plan Train workers about safe methods of working with optical fiber For beach works: limit the general access to working areas and mark all open trenches and excavated areas For marine works: display the day signals and lights of a hampered vessel
Fishing	General	Give a Notice to Mariners before starting the installation Discuss economic compensation with fishing association
Marine infrastructures	General	Pre-installation survey to identify them Respect ICPC guidelines in case of other submarine cables Obtain crossing agreements with cable owners Avoid crossing of artificial reefs

Terrestrial infrastructures	General	Use of georadar and detailed visual inspection prior to installation works Include constructive adaptations in executive projects if necessary
Heritage	General	Carry out archaeological survey before starting installation works Follow indications given by authorities in the frame of PiPs
Chemical quality of seawater	General	Comply with MARPOL regulations Drawn up an Emergency Plan for cable ship
Terrestrial noise quality	General	Avoid bath seasons Avoid reproduction and nesting season of *Charadrius alexandrines* in the case of Zahara landing
During operation		
Phanerogam seagrasses	General	Fix the cable as close as possible to the rhizomes at regular intervals by adapted anchors within the Posidonia meadow

Table 3. Summary of the main measures to be applied during installation and operational phases.

7 Environmental and Social Management Plan

The environmental and social management plan will be implemented during the installation and operational phases of the project. In the context of the ESIA document according to EIB standards, a set of guidelines and actions/indicators has been provided with the aim of addressing potential environmental and social impacts associated with the installation and operating of the subsea submarine cable systems.

In order to mitigate/manage impacts at a general level, the following enhancement commitments have been indicated in the environmental and social plan at the current stage of the project:

- an appropriately qualified Environmental and Social Supervisor should be appointed to oversee the management of environmental and social issues of the project activities.
- prior to the commencement of the installation, environmental and social authorization must be available, following also the requirements of the different countries interested by Medusa subsea system landings.
- a notification about location and time of the project activities must be given to relevant authorities.
- the director of Medusa project, as well as the Environmental and Social Supervisor, should also ensure that environmental and social exigencies are part of the contract with the contractors appointed to install the cable.

Concerning the mitigation and management of specific impacts, the proposed enhancement commitments generally coincide with mitigation measures proposed at chapter 6.2. The responsibility of these commitments generally rests with the director of Medusa project, the Environmental Supervisor and the Social Supervisor. Concerning commitments during the installation phase, some responsibilities fall also on the pre-installation survey supervisor and the responsible of cable installation. With respect to operational phase, in case of repair works to be conducted when the cable is damaged/broken, a further responsible is the manager of cable repair.

8 Stakeholders Engagement Plan

The Stakeholder Engagement Plan (SEP) aims to describe a method to engage and disclose that is both technically sound and culturally suitable. This SEP aims to enhance and facilitate decision-making and establish a channel for communication that actively involves, fosters quickly, and ensures that all project stakeholders have a common understanding. It also ensures that all groups have enough opportunities to express their opinions and concerns, which may have an impact on project decisions. The SEP is an effective tool for coordinating communications among the project promoter, project funders, project beneficiaries, and project affected parties.

The Key specific objectives of the SEP can be summarized as follows:

- Understand the stakeholder engagement requirements of the legislation of each of the countries involved in the project.
- Provide guidance for stakeholder engagement such that it meets the standards of European International Bank.
- Identify key stakeholders that are affected, and/or able to influence the Proposed Project and its activities.

- Identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultations;
- Guide the promoter to build mutually respectful, beneficial and lasting relationships with stakeholders.
- Develop a stakeholders engagement process that provides stakeholders with an opportunity to influence project planning and design.
- Establish formal grievance/resolution mechanisms.
- Define roles and responsibilities for the implementation of the SEP.
- Define reporting and monitoring measures to ensure the effectiveness of the SEP and periodical reviews of the SEP based on findings.
- Assist the promoter with securing and maintaining a social license to operate throughout the life of the Proposed Project.

Concerning the identification of stakeholders, they can be divided into different categories such as institutional authorities, decentralized local authorities and their representatives, funding partner, Non-governmental organizations (NGOs), physical persons and legal entities affected by the project and media.

In the case of institutional authorities and decentralized local authorities, these vary depending on the country and the landing considered. They will be certainly contacted during permitting process. The funding partner is the European Investment Bank (EIB). With respect to physical persons and legal entities affected by the project local population and local business are considered. In this last case the most important entities are supposed to be local fishing associations, whose activity may be affected in particular during installation works.

The following table shows the general proposal for the consultation methodology and communication methods. These may be subjected to some variations depending on the landing site involved.

Nº	Phase and process	Consultation activity	Stakeholder	Means of communication
A1	Preparation of final stakeholder database	The preliminary database compiled during desktop activity will be update at the time of field investigations	Institutional, decentralized authorities, NGO, Media	Individual contact meeting with decentralized administrations and concerned structures
A2	Preparation of the Environmental and Social Impact Assessment	Face-to-face and consultations for additional data collection for the social baseline	Institutional, decentralized authorities, NGO, physical persons affected by the project	Individual contact meeting with decentralized administrations and concerned structures
A3	Preparation of the Environmental Impact Assessment or environmental documentation for permitting	- Submission of the environmental documentation for permitting in European countries - Public inquiry as required by the law on impact studies and permitting process - Public meetings to present the EIA to be scheduled as public meetings or open houses	Commission in charge of public inquiry, Institutional, decentralized authorities, NGO, physical persons affected by the project, Media	Public meetings, Media Advertisement of planning of public inquiry in local media
A4	Installation	Vulgarisation of Grievance Redressal Mechanism (GRM)	Institutional, decentralized authorities, NGO, physical persons affected by the project, Media	Public meetings, Media Advertisement of GRM in local media