Tunisia-Italy Power Interconnector Project

Environmental and Social Impact Assessment (ESIA)

Executive summary – Part 1

Draft for Consultations

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STRUCTURE OF ESIA

ABBREVIATIONS AND ACRONYMS

AAO	Association des Amis des Oiseaux
AC/DC	Alternating Current/Direct Current
ADB	Asian Development Bank
AFI	Industrial Property Agency (Agence Foncière Industrielle)
ANPE	Agence Nationale de Protection de l'Environnement (National Agency for Environmental Protection)
APAL	Agence de Protection et d'Aménagement du Littoral (Coastal Zone Protection Agency)
ASPEN	Association pour la Sauvegarde de Patrimoine Environnemental et Naturel du Cap-Bon
CAPEX	Capital Expenditure
CBA	Cost-Benefit Analysis
CEF	Connecting Europe Facility (for Energy)
CRDA	Commissariat for Agricultural Development (Commissariat Régional de Développement agricole)
CTF	Clean Technology Fund
CVRA	Climate Vulnerability and Risk Assessment
DFI	Development Finance Institution
EC	European Commission
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ENTSO-E	European Network of Transmission System Operators
EHSGs	World Bank Group Environmental, Health and Safety Guidelines
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESCP	Environmental and Social Commitment Plan
ESMP	Environmental and Social Management Plan
ESF	World Bank's Environmental and Social Framework
ESS	World Bank's Environmental and Social Standards
EU	European Union
GCF	Green Climate Fund
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GTC	Grid Transmission Capacity
HVAC	High Voltage Alternate Current
HVDC	High Voltage Direct Current
HDD	Horizontal Directional Drilling
IFC	International Finance Corporation
IPPC	Intergovernmental Panel on Climate Change
JRC	Joint Research center
JV	Joint Venture
MED-TSO	Mediterranean Association of Transmission System Operators
MISE	Ministry of Economic Development (Ministero dello Sviluppo Economico – Italy)
NGO	Non-Governmental-Organization
NIF	Neighborhood Investment Facility (CTF)
NTC	Net-Transfer Capacity

OHL	Overhead Line
OPEX	Operating Expenditure
PCI	Project of Common Interest
PNIEC	Italian Integrated National Energy and Climate Plan (Italy)
PS	Performance Standards
RAP	Resettlement Action Plan
RoW	Right-of-Way
RES	Renewable Energy Source
SAC	Special Area of Conservation
SCI	Site of Community Importance
SEP	Stakeholder Engagement Plan
SEW	Socio-Economic Welfare
SoW	Scope of Work
SSP	Shared Socioeconomic Pathways (SSP)
STEG	Société Tunisienne de l'Electricité et du Gaz
TA	Technical Assistance
T&D	Transmission and Distribution
TEN-E	Trans-European Network Regulations
TERNA	Rete Elettrica Nazionale SpA - private Italian transmission system owner-operator
ToR	Terms of Reference
TYNDP	Ten Year National Development Plan
TSO	Transmission System Operator
TUNITA	Tunisia-Italy Power Interconnector Project
WB	World Bank

1. INTRODUCTION

1.1 Foreword

This document presents the Executive Sumary of the ESIA presented for the Tunisia-Italy Power Interconnector Project (TUNITA).
The ESIA is presently in draft form: supplemental data and additional assessments will be added based on public consultations and supplementary analyses that will be carried out during the month of February, 2023.

For convenience of consultation, the ESIA has been structured into 13 separate sections, as listed hereafter:

- Section 1 – Document guide – *Contains an introduction to the project and a short description of the scope of work of the ESIA*
- Section 2 – Regulatory and legislative framework – *Describes the framework of the project in terms of national and international regulations and legislation*
- Section 3 – Project definition – *Describes in detail the project components and life cycle, with particular focus on construction and operation phases*
- Section 4 - Environmental baseline – Terrestrial domain – *Describes the current conditions of environment on the project affected territory in Tunisia*
- Section 5 - Environmental baseline – Marine domain - *Describes the current conditions of environment for the marine areas affected by the project*
- Section 6 – Socioeconomic baseline - *Describes the current social and economical conditions of the project affected territory in Tunisia*
- Section 7 – Public Consultation and Information Disclosure – *Illustrates the public consultations that were carried out in Tunisia for project disclosure*
- Section 8 – Risks and potential impacts assessment – Terrestrial domain – *Impact assessment is the center of the ESIA, determining the expected effects of the project on environment and society. In this section environmental and socio-economic impacts are evaluated for the terrestrial domain*
- Section 9 – Risks and potential impacts assessment – Marine domain – *Presents environmental impacts on the marine domain*
- Section 10 – Synopsis of impact assessment – *The scope of this section is to summarize the prevalent positive and negative impacts potentially induced by the project during its life cycle*
- Section 11 – Environmental and Social Management Plan (ESMP) – *The ESMP derives directly from the impact assessment and directs effective and responsible implementation and management of environmental and social impacts mitigation and enhancement measures*
- Section 12 – Climate Change Report – *The scope of this report is to analyze potential project risks generated by climate change and evaluate its adaptation to climate change*
- ANNEX A – IBAT Assessment Report – *Illustrates the result of biodiversity analyses by IBAT tool*

1.2 Project objectives

The Tunisia-Italy Power Interconnector Project (TUNITA) entails the realization of a new bidirectional HVDC (High Voltage Direct Current) submarine electricity interconnection between Tunisia (Cap Bon) and Italy (Sicily), with a transmission capacity of 600 MW.
The project location is shown in the following figure.

Figure 1.1: Project Location map

The project is promoted by a joint company under Tunisian law (50% - 50%), named ELMED Etudes Sarl, composed by TERNA (Italian Electricity Transmission System Operator) and STEG (the Tunisian energy utility and Electricity Transmission System Operator).

The overall objective of the project is to increase the interconnection capacity, and thus the security and sustainability of supply, of the Euro-Mediterranean system by creating a link between the European and Northern African energy systems. The interconnection will ensure an operating voltage of ± 500 kV and a Net Transfer Capacity (NTC) of 600 MW.

1.3 Project components and funding boundaries

The overall Tunisia-Italy Power Interconnector Project consists of the components presented in the following Table and Figure.

The **World Bank-financed "project**" includes:

- the marine project components from the landfall in Kelibia to the limit of the Tunisian EEZ and
- the terrestrial components in Tunisia.

The "**Associated Facilities**" of the World Bank-financed Project (not included in the WB funding) comprise:

- the marine project components in the Italian EEZ and
- the terrestrial components in Italy.

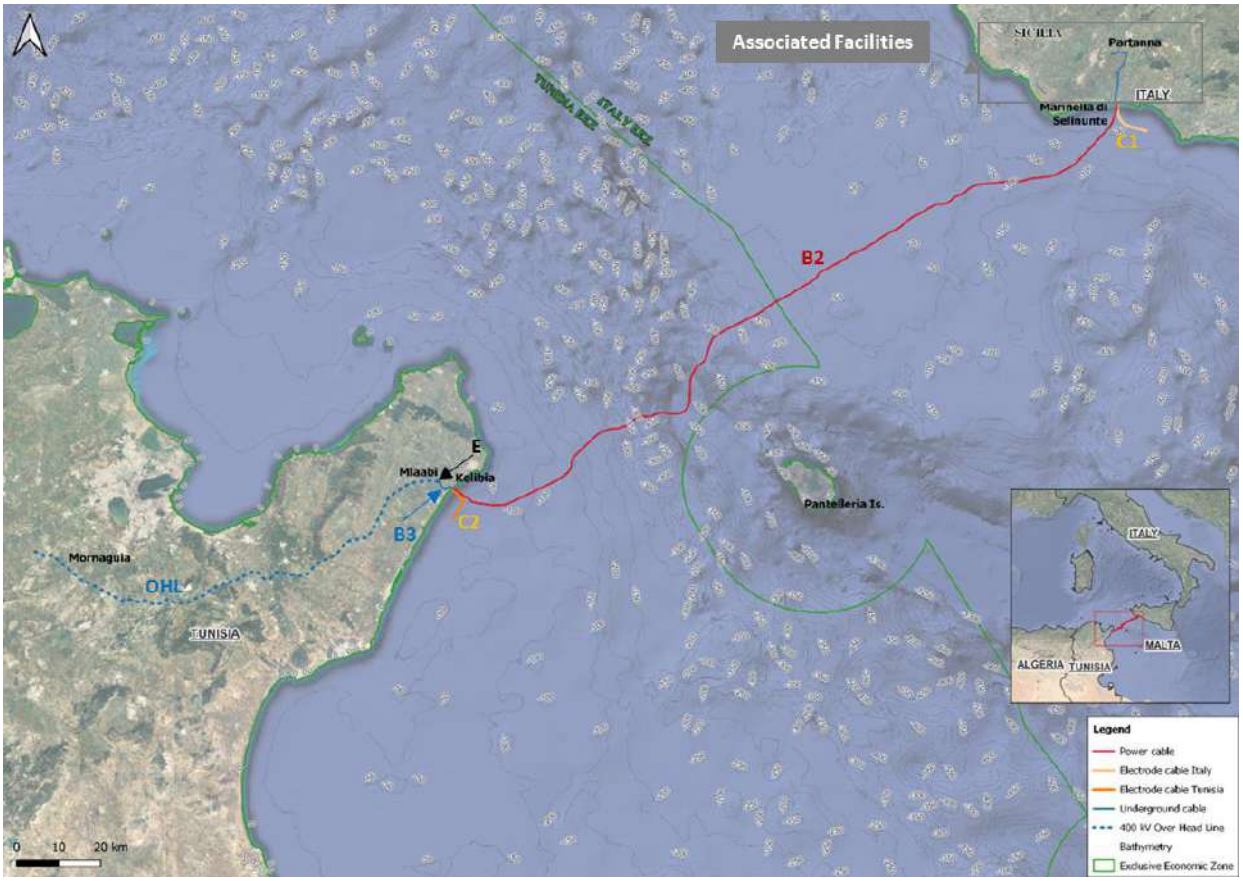

Figure 1.2: Project components

Table 1.1: Project components

World Bank - finance "project"	**MARINE COMPONENTS**	
	Marine HVDC cable	HVDC cable in the Tunisian EEZ (approx.100 km) (**B2**)
	Marine electrode cable	Electrode cable in Kelibia (**C2**)
	TERRESTRIAL COMPONENTS TUNISIAN SIDE (PHL Mlaâbi- Mornaguia)	
	Converter substation	DC/AC converter station in Mlaâbi, Nabeul Tunisia (**E**)
	Land routing section	DC underground cable between the landfall point and the Mlaâbi converter station (6 km) (**B3**)
	Landfall	Transition point between DC marine cables and terrestrial cables in Kelibia
	400 kV OHL	400 kV Overhead Line between the converter station at Mlaâbi and the substation at Mornaguia (**OHL**)
Associated Facilities	**MARINE COMPONENTS**	
	Marine HVDC cable	HVDC cable in the Italian EEZ (approx.100 km) (**B2**);
	Marine electrode cable	Electrode cable in Marinella di Selinunte (**C1**).
	TERRESTRIAL COMPONENTS ITALIAN SIDE	
	Converter substation	AC/DC converter station near the HV substation in Partanna
	Land routing section	DC underground cable between the landfall point and the Partanna converter station (16 km)
	Landfall	Transition point from DC marine cables to DC terrestrial cables in Marinella
	Converter substation	AC/DC converter station near the HV substation in Partanna

1.4 Project Benefit and Need

The implementation of the TUNITA Interconnector presents several direct and indirect benefits:

- Energy efficiency: the HVDC interconnection allows electricity to be transmitted across large distances and between countries with minimal technical line losses, cutting down on energy waste and copper use. Increased efficiency of HVDC reduces losses from 5 - 10% in an AC transmission system to around 2 - 3% for the same application in HVDC. At the same time, it also improves the performance and efficiency of the connected AC networks.
- Emissions reductions: as a result of the cross-border interconnection and more efficient transmission, power can be distributed among the interconnected areas (EU-Nord Africa), with a significant reduction of the electricity that needs to be generated to satisfy electrical demands. This entails generating less carbon emissions (higher RES production and share) and operating at lower emission levels than expected to prevail or materialize under “without-project” conditions, contributing to global emission reduction targets. In addition, the Project has undertaken a climate neutrality assessment (“Climate Proofing study”), including a detailed mitigation analysis. Specifically, the carbon footprint assessment of the project and other climate-mitigation indicators elaborated from ENTSO-E cost-benefit analysis methodologies, following Regulation (EU) No 347/2013, show that the project is expected to be operating at lower emission levels than would be expected to prevail or materialize under “without-project” project conditions, or to maintain the same level of output while reducing related GHG emissions.
- RES (Renewable Energy Source) Integration: T&D systems interconnecting electricity markets are increasingly seen as an enabler for renewable energy and climate neutrality objectives, and as such, a mean to help achieve the dedicated goal of sustainable energy. The TUNITA project contributes to scaling up, diversifying and helping the deployment of RES between the two countries and overall in the Mediterranean region. The HVDC TUNITA Interconnector also reduces overgeneration and the need for frequency regulation that comes with a high penetration of renewable electricity sources. Further, the TUNITA project may allow more exchanges of green energy from an area where an excess of renewable generation is available to areas where only a small fraction of RES is generating energy. This contributes to avoiding the need to curtail renewable sources that cannot be used locally and increases the total amount of RES generation capacity that can be integrated into the electrical systems (EU-North Africa).
- Climate targets: the TUNITA project has gained increasing support from the Italian and Tunisian Governments, the EU and other international organizations, also with respect to the benefits it can offer to climate mitigation efforts. The IPPC’s climate projections underscore the importance for mitigation efforts to be mainly centered on the energy sector through a substantial increase of RES generation to reach national and global climate targets in the energy sector, with possible spillovers in other industry segments.
- Socio-economic benefits: the project may reduce socio-economic gaps in Europe and North Africa. Potential social and economic outcomes of the TUNITA project include (i) employment and income-generating opportunities; (ii) enhanced government capacity to provide reliable and competitive energy services; (iii) productivity gains in both public and private sector, associated with cost reductions and reliability/security of supply for buyers and consumers, improving “Social Economic Welfare” (SEW); (iv) improved electricity provision to the Cap Bon area of Tunisia.

Finally, the project could also encourage the role of Sicily as a European energy hub in the Mediterranean basin. Sicily, a lagging European region with low economic growth, could be favourably affected by the RES transition to overcome economic constraints. Economic progress of a similar scale can also sustain Tunisia's political progress.

2. REGULATORY FRAMEWORK AND WB ENVIRONMENTAL AND SOCIAL STANDARDS

For this project submittal has been made by the Tunisian Government for funding by the World Bank: therefore requirements set out in the World Bank's Environmental and Social Framework must be applied.
The latter sets out the World Bank's commitment to sustainable development through a set of Environmental and Social Standards (ESS), constituting mandatory requirements for the Borrower and the project.
In particular, *ESS1: Assessment and Management of Environmental and Social Risks and Impacts* requires the Borrower to "*conduct an environmental and social assessment of the proposed project, including stakeholder engagement*".

The World Bank has commissioned the ESIA study as part of the E&S instruments for the whole Project (Italian and Tunisian sides) funded under the Technical Assistance (TA) grant agreement signed with the Government of Tunisia for project investment financing of the Tunisian components.

Although the Project is not subject to an ESIA study in Tunisia, STEG should inform the Tunisian National Agency for Environmental Protection (hereinafter ANPE from the Tunisian acronym) about the Project to ensure that it does not create E&S concerns in any sensitive or protected area.
Given the above the ESIA considered both Tunisian regulatory standards and World Bank ESS and EHS guidelines. When the host country regulations differ from the levels and measures presented in the WB ESS and EHS Guidelines, the more stringent were considered.

At the Tunisian National level, an analysis of the applicable Tunisian policy and legal framework was conducted, as well as an institutional framework analysis.
With regard to the WB environmental and Social framework, applicable ESS taken into account in the performed ESIA are presented below.

Table 2.1: WB ESF and its relevance to ESIA

World Bank ESS	Main topics
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Assessment and management of E&S risks and impacts
ESS2: Labor and Working Conditions	The ESIA analyses the impact on local communities' economic growth, employment and income. Occupational health and safety and protection of fundamental rights of workers are considered
ESS3: Resource Efficiency and Pollution Prevention and management	Impact on resource efficiency and prevention of pollution is analyzed in the ESIA.
ESS 4: Community Health and Safety	Potential impacts on communities are assessed in the ESIA

World Bank ESS	Main topics
ESS 5: Land Acquisition, restriction on land use and Involuntary Resettlement	Land Acquisition and resettlement/compensations issues are in the RFP
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Protection of biodiversity and the sustainable management and use of natural resources are analyzed in the ESIA.
ESS 7: Indigenous People	Not applicable since there are no indigenous communities along the potentially affected areas
ESS8: Cultural Heritage	Impact on Cultural Heritage is analyzed in the ESIA.
ESS9: Financial Intermediaries	Not applicable to the Project
ESS10: Stakeholder Engagement and Information Disclosure	Importance of open and transparent engagement through disclosure of project-related information and consultation with stakeholders on matters that directly affect them. The theme is also included in the ESIA.

3. PROJECT DESCRIPTION

3.1 Project area

The following table and figure illustrate the administrative units that are affected by the Project.

Table 3.1: Administrative units crossed by Project terrestrial components in Tunisia

Governorate	Delegation	Sector (Imada)	Lenght (km)
Nabeul	Menzel Temime	Beni Abdelaziz	69 km
		Skalba	
		Lezdine	
		El Ouediane	
		El Asfour	
	El Mida	El Mida	
		Oum Dhouil	
	Korba	Beni Ayache	
	Menzel Bouzelfa	Errahma	
		Menzel Bouzelfa Nord	
	Beni Khalled	Bir Drassen	
		Beni Khalled Echarkiya	
		Beni Khalled Sud	
		Zaouiet Djedidi	
		El Kobba El Kebira	
	Grombalia	Nianou	
		Grombalia Est	
		Chammes	
		Khanguet El Hojjej	
Ben Arous	Mornag	Kabouti	26.5 km
		Djebel Ressas	
		El Kessibi	
		El Gounna	
		Ain Rekad	
		Oudna	
	Mohamedia	Sidi Frej	
Zaghouan	Bir Mchergua	Jebel Oust	9.5 km
		Ain Asker	
Manouba	Mornaguia	El Fejja	8 km

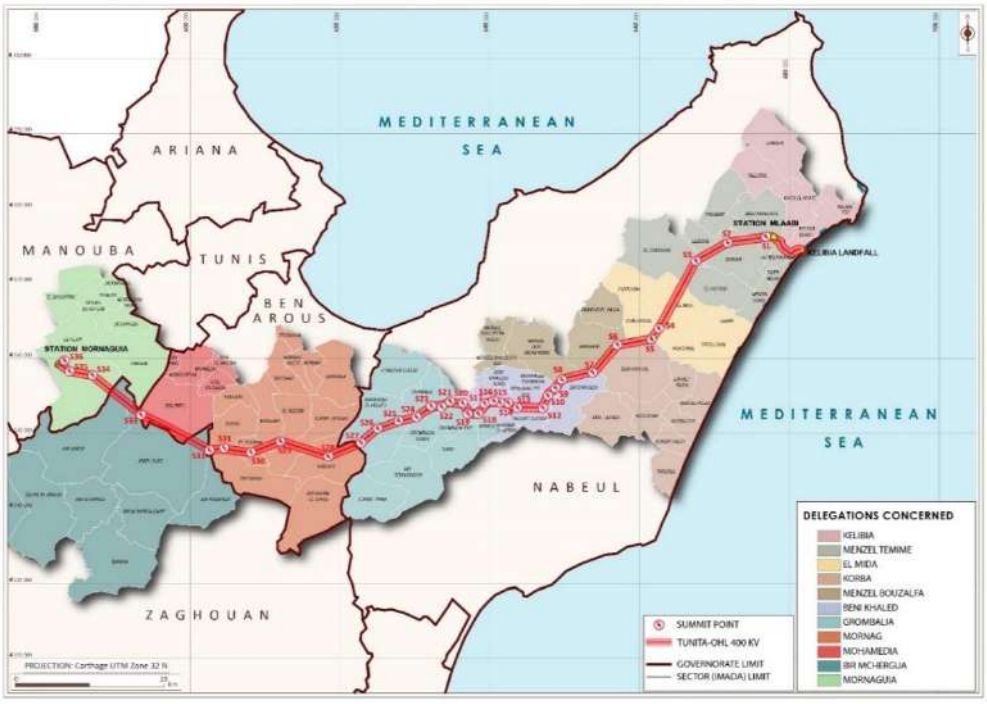

Figure 3.1: Project affected territory

3.2 Converter station

The power interconnector project includes the construction of a new AC/DC Converter Station in Mlaâbi (Municipality of Menzel Temim, in the province of Nabeul) to connect the Tunita project and the national grid through an overhead transmission line.
The total area occupied by the station will have a surface of 100,000 m^2; the area is currently used for agriculture purposes and is located in a future industrial zone, which will be developed by the Agence Foncière Industrielle (AFI), and which covers a total area of 60 Hectares. This station will form the Tunisian terminal of the new connection and will be formed of alternating/direct conversion modules and equipment necessary for the connection with the sections of the existing transformer station.
The following figure shows the main components of the HDVC part of the project: the converter station (polygon in yellow inside the red one, which is the industrial zone of Mlaâbi) and the proposed line route for the underground cable (in yellow).

Figure 3-2: Converter station area and HVDC underground cable route

The new Mlaâbi Converter Station will consist of a 600-MW AC-DC conversion module, connected on the DC side to the lines cable of the pole at ±500 kV and AC side to a newly built 400-kV kV OHL.
The module will be operated at a nominal power of 600 MW in a monopole configuration and will consist of nr 2 bays for the 400-kV overhead line, for connecting the existing Mornaguia Electrical Station with the 400-kV busbar planned inside the Converter Station.

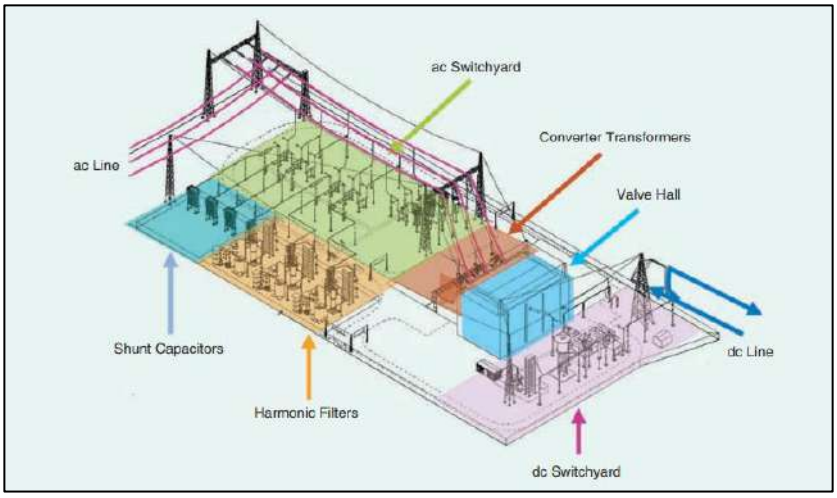

Figure 3.3: Example of a converter AC-DC station layout (source: IEEE Power & Energy Magazine)

3.3 Terrestrial underground cable

An underground pole and an electrode cable will be laid to connect the new Converter Station of Mlaâbi and the landfall site of Kélibia, in the Municipality of Kélibia. The landfall site represents the connecting point, where a joint box will be installed to connect the undersea and the terrestrial cables.

The terrestrial cable will cross the city of Jameledine and will pass through existing roadways (the regional road that links Menzel Temime to Kélibia).

In order to avoid major interferences within the city of Menzel Temime (and thus to prevent potential impacts on the social environment), the route has been planned in order to make use of existing roads outside the urban area: more than 2/3 of the route is located on rural area (using existing agricultural roads with sufficient width to facilitate the transit of vehicles). The route is illustrated in Figure 3-2.

The underground power cable used may have impregnated-paper insulation (MIND) or cross-linked polyethylene insulation (XLPE) depending on the technological choices made by the contractor. The external diameter of the cable will be in the order of 110-120 mm, and the weight in the order of 30/40 kg/m.

An electrode connection cable will also be laid in the same trench with the DC pole cable: this cable will have the standard characteristics of medium-voltage cables (external diameter in the order of 55-70 mm).

An optical fiber telecommunications cable will also be laid in the same trench of the power cable from the Converter Station to the landfall: the cable will have the scope of transmission of data for the protection, command and control system.

3.4 Mlaâbi to Mornaguia Overhead Line

The connection will begin at the 400 kV section of the new Mlaâbi Converter Station and end at the 400 kV section of the existing Mornaguia Electrical Station.

The overhead line (OHL) consists of a double-circuit line on separate pylons with a length of approximately 113 km. The OHL will have the same characteristics of the Kondar-Skhira overhead line project.

An overview of the basic technical characteristics of the transmission line is presented in the following table.

Table 3-2: Overview of technical parameters of the 400 kV OHL Mlaâbi Mornaguia

Parameter	***Description***
Nominal voltage	400 kV (Highest voltage 420 kV)
Towers	Steel-lattice hot zinc-coated, single circuit self-supporting towers with horizontal configuration of conductors. Different types of towers will be used for the proposed line. The final design of towers, by the contractor company, shall be compliant with specifications of the international standard IEC 60826. Typical footprint area that will be occupied by the four legs of the towers is expected to be around 200 m^2 (dimension of 14 m x 14 m). The distance between towers will vary between 350 m and 600 m, depending on the conditions of the crossed area and its nature (soil, presence of wetlands etc.). The average length spans between two towers is around 450 m.
Foundation	Foundations will be defined by the contractor company in charge of the construction of the OHL line and based on the results of field surveys (soil and topography). Bases of foundation will be made of steel section with equal sides (as for the towers). Materials to be used: concrete type HRS 42,5, water (according to the requirements of NF EN 1008 standard), sand and gravel, concrete armature with steel bars (with a minimum elastic limit of 4200 kg/cm^2)
Conductor	Type AAAC 570 Minimal cross section: 570 mm^2 Maximum work stress (with a 20° temperature): 0.0585 Ω/km
Protective wire	A tubular cable containing optical fiber (around 48 fibers type G 652 D and type G 655 D) covered by aluminum steel wires and/or aluminum alloy wires. Dimension: ≥2.5 mm
Insulators	The conductor to be used for the line double circuit will be equipped with composite as an insulator. The external insulation section is made of HTV (> à 50%) silicone.
Tower earthing	Type NFA 91 131 and/or NFEN 50189 Section: ≥43 mm^2
Insulator set fittings	Material: Steel hot zinc-coated. Dimension: Ø 8,4 ± 0,1 mm
Climate parameters	Wind pressure: average value 25 m/s / maximum 40 m/s External temperature: maximum 55° C/ minimum -5° C Moisture: up to 100 %

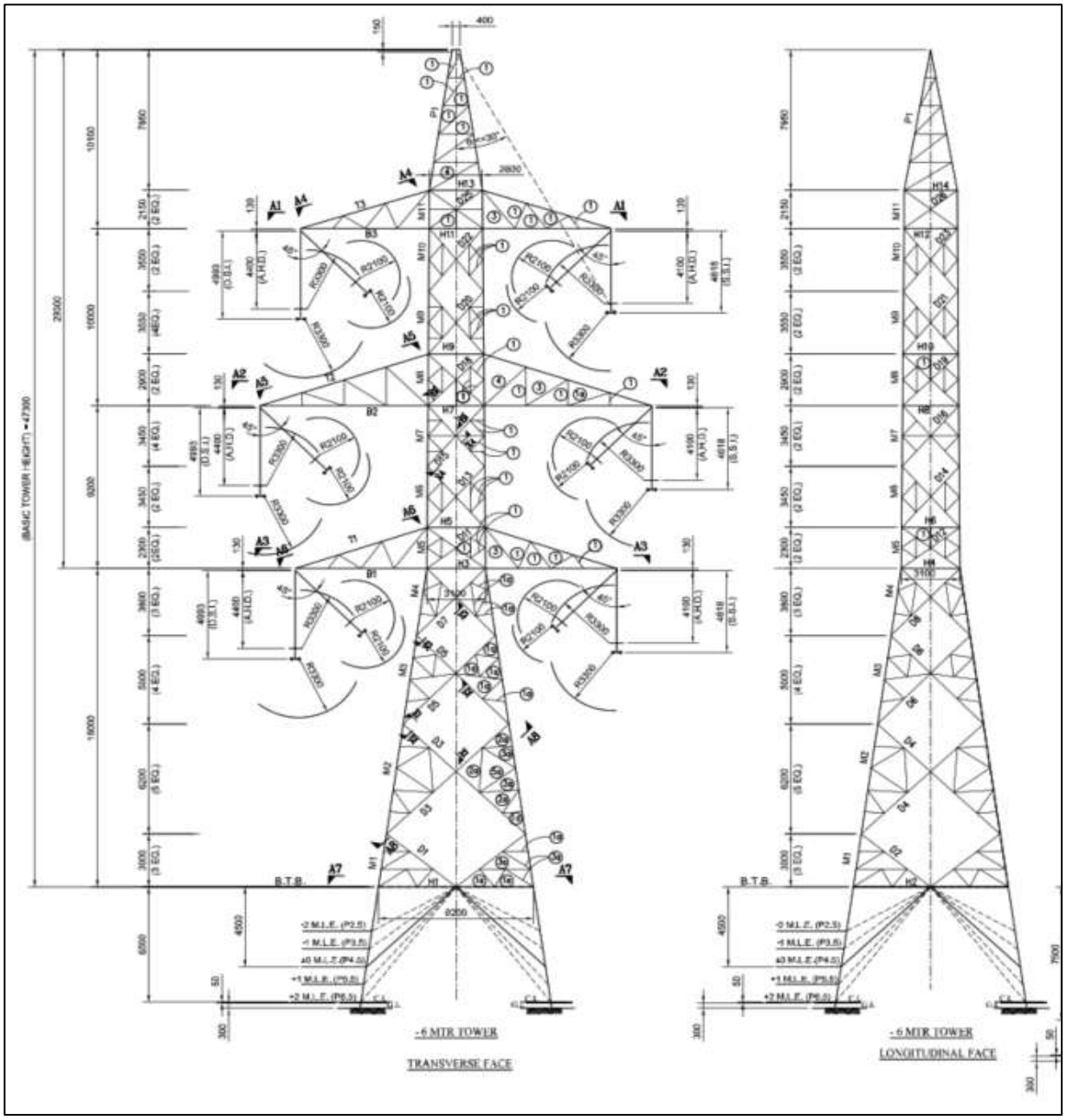

Figure 3.4: Typical of a double circuit 400 kV OHL tower (source STEG)

3.4.1 Clearances and Right of Way

For the 400 kV OHL line, the suggested minimum clearances between the line corridor and houses and other facilities (roads, existing transmission lines, railway projects, telecommunication cables, etc.) and between conductors and other objects are presented in the following tables.

Table 3-3:Minimal vertical distances between conductors and existing obstacles/facilities (STEG standards)

Receptor / description		**Minimum Height to be respected for 400 kV OHL**
Common land/proprieties		9 m
Paths accessible to traffic	Common road	10 m
	High traffic road	11 m
Other crossings	Plantations (olive tree, citrus orchards)	10 m
	Powered Railway lines	12 m
	Railways	20 m
	Telecommunication lines	6 m
	Power lines HTA	6 m
	Power lines HTB	7 m

The table below presents the minimum distances to be respected between conductors and existing residential buildings and other structures.

Table 3-4: Minimum clearance with residential building (source STEG)

Description	**Minimum clearance for 400 kV line**
From conductor location	16 m
From tower location	Tower height

A land corridor will be fixed as a Right of Way for the proposed double circuit transmission line. The RoW is required in order to protect the equipment (avoid contact with trees to protect the system from any potential hazards as power failures or forest fires) and will include access roads to be used for construction and maintenance purposes.
The development of the OHL component does not include any major access roads.

3.5 Landfall

At the landfall site, the transition of undersea cables to land will be engineered through the application of the Horizontal Directional Drilling (HDD) technique. The landfall area in Kelibia shown in the following figures: the precise location of the landfall point will be defined during the executive design phase.
The landfall will house underground joint boxes in which the undersea and underground cables will be connected (land-sea or L-S joints). Separate joint boxes, with different dimensions, will house power, electrode and telecommunications (optical fiber) cables.

Figure 3-5: View of the landfall area in Kelibia

Figure 3.6: Aerial view of the landfall area in Kelibia

3.6 Marine power cable

The undersea pole connection will link the two landing sites, one in Italy at Marinella di Selinunte, and the other in Tunisia at Kelibia. The length of the route is:

- approximately 100 km in Italian waters with a maximum bathymetric depth of approx. 160 m;
- approximately 100 km in Tunisian waters with a maximum depth of approximately 800 m.

Together with the pole cable, an undersea fibre-optic cable will also be laid, which will be used to enable operation and communications of the two converter stations.

The undersea pole cable will be of the impregnated-paper or XLPE type; in any case the cable will be insulated for 500 kV (reinforced insulation) and equipped with steel armour. The type of cable may change based on the technological choices made by the contractor. The external diameter of the cable will be in the order of 100-140 mm, and the weight in the order of 25/45 kg/m.

An optical fiber telecommunications cable will be laid at the sea bottom close to the power cable: the cable will have the scope of transmission of data and communication. Mechanical protection of the cable is offered by double armour steel wire. The external diameter of the cable will be in the order of 25-37 mm.

3.7 Marine electrode

The electrode system is essential equipment for operation of an HVDC connection with monopolar configuration. It is made up of appropriate dispersers (sub-electrodes), each of which has individual elements of a sufficient number and size to guarantee dispersion of the rated current of the connection under system operating conditions.

A typical configuration for the undersea electrode is presented in the following figure.

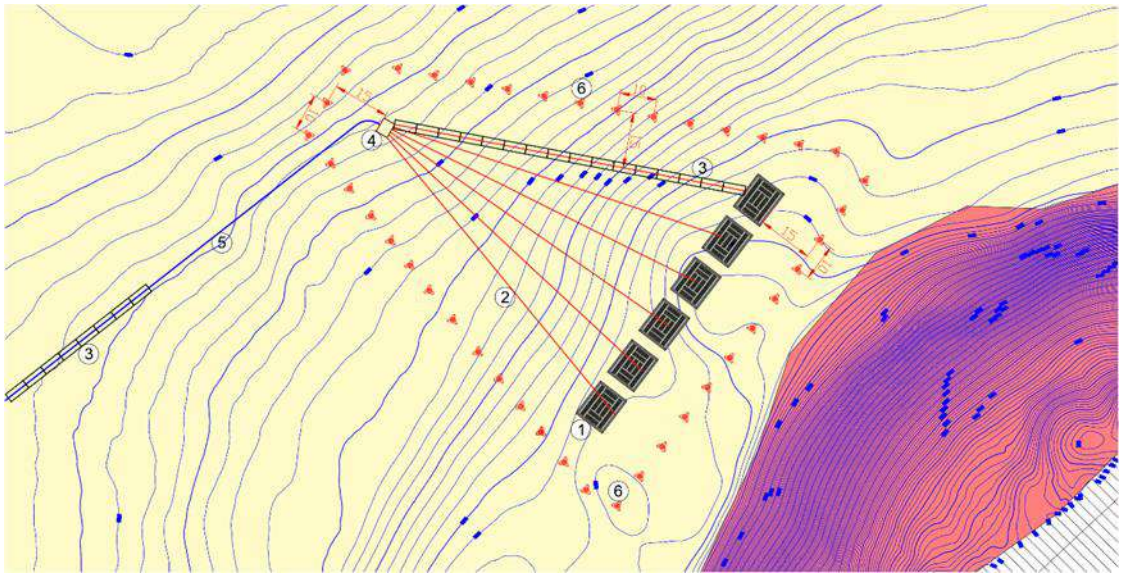

Figure 3.7: Typical layout of electrode system

In order to limit the risk of snagging by anchors or other fishing equipment (for example trawling equipment), the area around the electrode may be protected by a perimeter of deterrents of suitable size and shape, normally by cement tetrapod structures or similar.
Undersea electrode cables, operating at medium voltage with extruded insulation, will start from the land-sea joint hole at the Kelibia landfall and will stretch out for approximately 9 km towards the marine area where the electrode will be installed in the sea. This area is planned south of the landfall and approximately 4.5 km from the coastline.
The electrode (cathode or alternatively anode) of the connection will be located on the seabed at a maximum depth of less than 40 metres approximately 4,5 km from the coast.
The undersea electrode will be connected to the land by two undersea cables with extruded insulation (cables with rated voltage of 12/20 kV), with copper conductor. The external diameter of the cable will be in the order of 70-100 mm, and the weight in the order of 20/30 kg/m.

4. DESCRIPTION OF THE CONSTRUCTION PHASE

4.1 Converter station

Works for building the new Converter Station will include:

- site preparation: fencing, preparation of access road, removal of vegetation and any existing structures;
- topsoil removal and installation of construction yard facilities;
- earthworks and area leveling;
- construction of foundations;
- construction of buildings;
- construction of firewalls;
- installation of machinery, electrical and electromechanical equipment;
- installation of prefabricated kiosks: these contain the peripheral switchboards for the auxiliary and command and control services of the bays;
- installation of prefabricated conduits and cable ducts;
- installation of electrical grounding system;
- water drainage systems;
- installation of utilities;
- road systems.

Figure 4.1: Single-core equipment foundations

Figure 4.2: Prefabricated kiosk

Figure 4.3: Firewalls – Shunt reactors

4.2 Terrestrial underground cable

The installation of underground cables requires a sequence of operations which are described hereafter:

1. segregation of work areas with suitable fencing
2. preparation of the work area (removal of vegetation and surface obstacles)
3. investigations to verify the position of potentially interfering underground utilities
4. excavation of a trench
5. laying and installing the cable
6. filling the excavation up to ground level with suitable material
7. cable jointing
8. terminations
9. cable testing

The route is mainly located along existing roads: consequently trenches for cables will be dug preferably on road surfaces or otherwise at the border of the roads.
Trenches will have approximately the following dimensions: 0.70-0.80 m wide and 1.6 m deep.

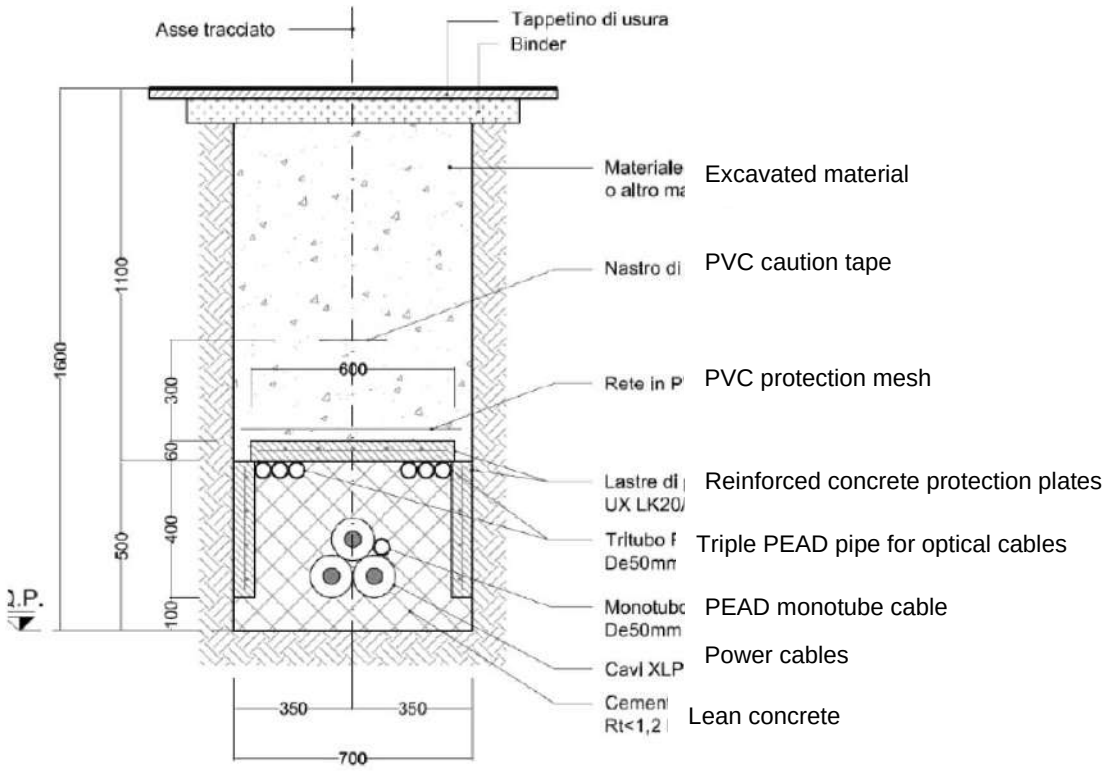

Figure 4.4: Typical of terrestrial cable laying on paved road

In highly urbanised areas cables are generally installed in PEAD (high density polyethylene) pipelines: this allows to restore the working areas in a shorter time, and therefore induce a shorter impact on the road. With this approach the only open excavations during the laying of a cable between two joint holes are the inspection holes for checking the passage of the cable during installation, which are usually placed in locations where there is a change in direction of the route.
Excavated material must be stored in a temporary storage area close to the worksite; excess material will be disposed.

Figure 4.5: Example of cable installation on a paved road

After excavating the trench, the cable is installed. The cable is laid for the entire length of each section of the worksite comprised between two consecutive joint holes (usually from 500 to 800 m), according to the following procedure:

- positioning of the winch and of the reel containing the cable at the two extremities of the section;
- positioning of metal rollers in the trench to reduce friction during cable pulling;
- installing a steel pulling cable that connects the pulling winch to the head of the cable in the reel;
- installing the cable through the recovery of the pulling rope by the pulling winch.

Activities are constantly looked after by personnel located along the entire route and especially at critical points (bends, underpasses, pipelines etc.). The operation is repeated for the power cable, the electrode cable, the equipotentiality copper cables and the optical-fiber cables.

Typically, the width of the worksite is around 4 m; larger areas may be required at the extremes of the worksite where joint pits are planned.

In the case of open-pit installation, the cables laid inside the trench are covered by a layer of about 50 cm of cement mortar. The cables will be mechanically protected by reinforced concrete plates showing the tension level of the cable duct arranged on the sides and on the top of the duct. An orange safety barrier will then be placed on this screen.
The remaining portion of the trench will be filled with excavated material or other suitable material; in the middle of this filling, additional caution tape will be put in place. Finally, the excavation trench will be definitively closed, in case of installing on roads, with resurfacing of the pavement.
In case of cable pipeline installation, the trench will be generally filled with the excavated material. The trench will be closed (in case of installing on roads) with a layer of binder and, following the natural settling of the materials used for filling the trench, the pavement will be eventually restored.
If along the route waterways are encountered, they will be under-crossed so to avoid any hydraulic risk.
Adequate protection works will be designed in order to prevent any risk of erosion.
For major interferences HDD technique will be applied.

Figure 4.6: Example of cable laying in a trench

4.3 Over Head Line

The land requirement for the OHL line includes the following aspects:

- development of access roads, which will be used both for construction and maintenance activities;
- installation of construction camps for workers and storage sites for equipment and materials;
- exploitation of borrow pits to provide aggregates.

The construction of the line will require a series of activities:

- detailed topographical survey;
- detailed geological survey with on-site and laboratory soil investigations (to verify the soil compatibility for foundations),
- definition of the route and of the towers' location;
- foundation and structural design;
- site preparation;
- construction of towers' reinforced concrete foundations;
- installation of conductors;
- wire tensioning and fastening.

The entire route of the transmission line is accessible through the major regional roads and other agricultural roads. The construction contractor will use existing roads to reach the tower worksites: only if access is not available, a new access road will be prepared.

4.4 Construction yards and transportation

A series of construction yards will be installed for the works:

- a major construction yard in an area close to the perimeter of the CS;
- a smaller worksite (approximately 1200 m^2) at the landfall site;
- a series of small storage areas along the route of the underground cable and of the OHL.

All materials for construction will be transported to the worksites by truck.
Traffic induces by works will be:

- For underground cables and the OHL in the order of 5-10 trucks/day;
- For converter station in average in the order of 10-20 trucks/day.

Personnel employed in the worksites will be transported by car or van.

4.5 Marine cables

4.5.1 Horizontal Directional Drilling

The HDD (Horizontal Directional Drilling) technique involves drilling straight holes of appropriate length and depth so that they are not subject to problems of “uncovering” of the system due to coastal erosion.
During the drilling operations, plastic tubes are installed, with an internal pulling line that will serve, during installation of the undersea cable, to slide the head along the inside of the pipe.
This method will be applied at landfall sites: in particular 3 drillings will be executed, one for each cable: electrode cable, DC power cable and fibre-optic cable.
In general, the angles of entry and exit for drilling depend on: morphology, obstacles to avoid, ground properties, diameter and rigidity of the tubes to install.

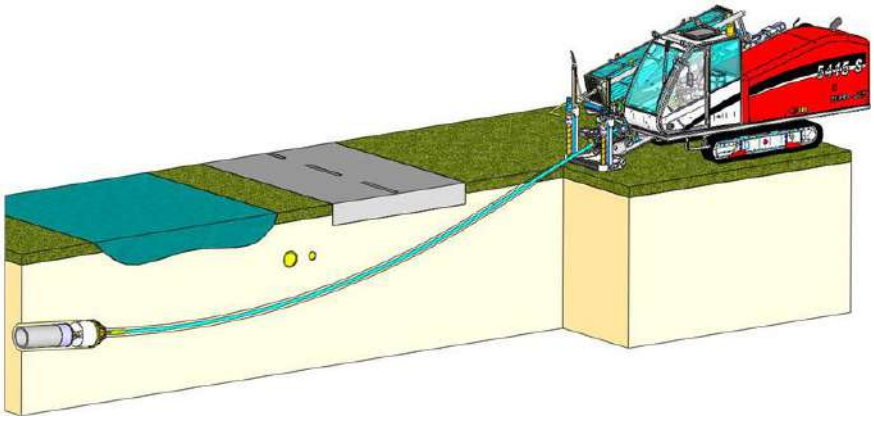

Figure 4.7: HDD technique

Considering the technology currently used for similar applications, and the limits imposed by soil properties, HDD may be used:

- on stretches generally no longer than 600–800 m in plan
- with depths of the exit hole under the sea level below 30 m, considering the need for support from Technical Divers for cable pulling operations;
- with drilling from land towards the sea.

The area occupied by the worksite for operations on land will cover approximately 1200 m^2.
Drilling machines consist of a tracked vehicle (drilling unit) with a drilling tower (mobile element that can be tilted, which carries out the different drilling phases).
Drilling with this technology is carried out in sequence with the following phases:

- drilling of pilot hole
- reaming
- installation of conduit.

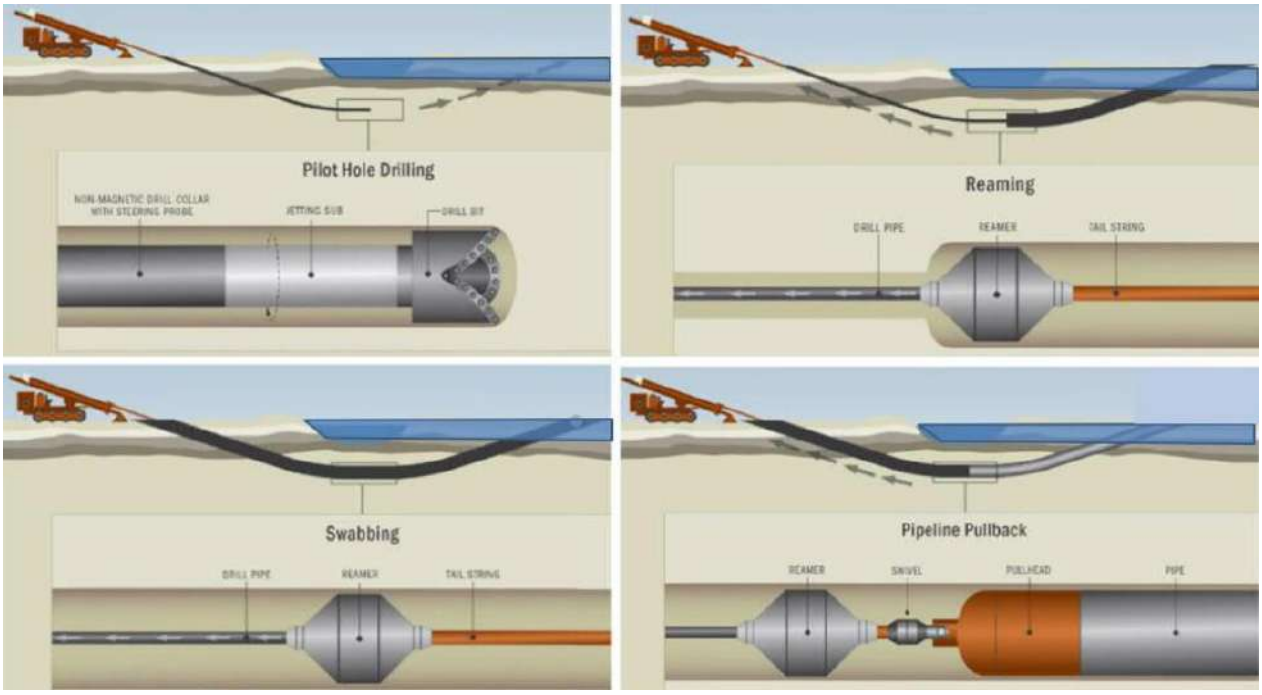

Figure 4.8: Diagram of drilling operations

4.5.2 Laying of undersea cables

Laying of undersea cables is carried out by a special cable-laying ship: using a winch, the reel of the cable is unwound, and the cable is laid across the seabed.
Cable laying works are a 24 hours / 7 days activity. Before the laying process, the route is cleared using a grapnel to remove any potential obstacles. In sensible areas this operation will be carried out by underwater technical operators.

Figure 4.9: Cable laying vessel Giulio Verne

For installation at the landfall sites, the procedure indicated in the following figures will be applied, involving the use of service boats to assist the main vessel when pulling the cable heads to land, held at the surface by floats during work, and the pulling of the cables from sea towards land in the conduits previously installed using the HDD technique.

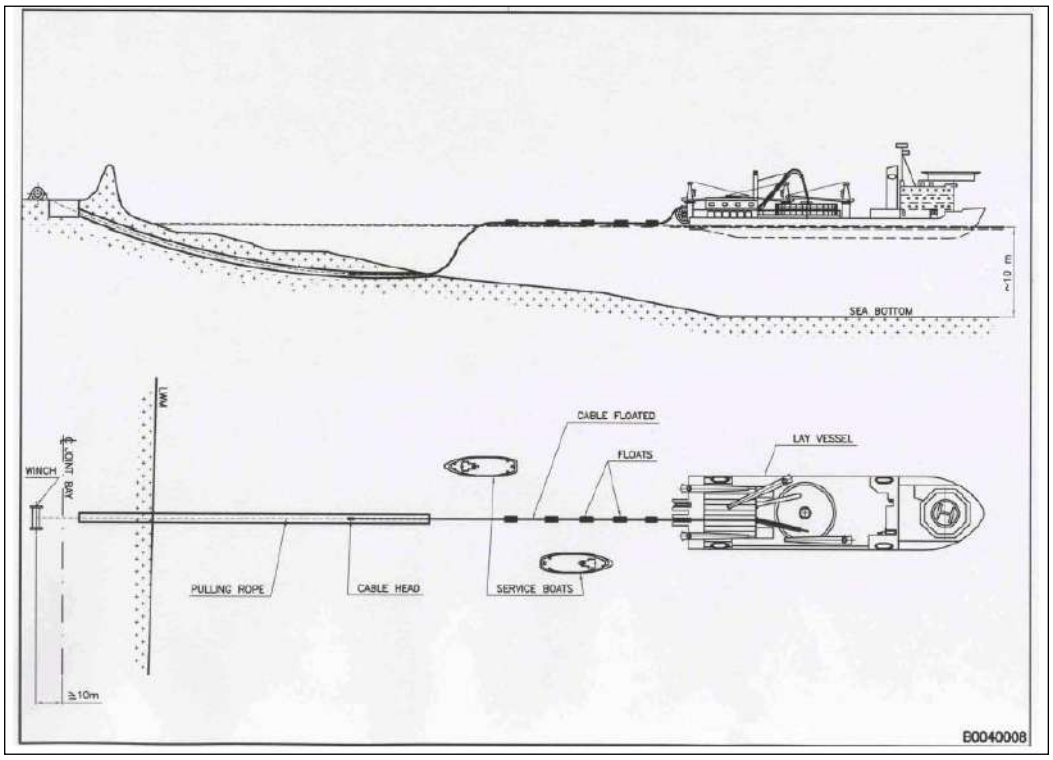

Figure 4.10: Typical pulling of undersea cable from land using conduits installed with HDD technique

4.5.3 Protection of undersea cables

Cable burying is required for safeguarding a strategic infrastructure belonging to the National Electricity Transmission Grid. Intensive human activity (fishing) is recently increased also in areas colonized by marine biocenoses and represents a significant risk of damage for undersea cables, with potentially dramatic consequences for the electrical connections.

Outages, in addition to being extremely costly for the electricity system, require maintenance and repair activity for the creation of joints in the damaged cable, thus creating disturbance, although limited, to the marine environment. Once a fault has been identified, maintenance activities require to hook the cable from the seabed, lift it up onto the ship used for the work, create the joint on board and then reinstall the cable with the same methods normally used for installation and protection.
Cable protection is therefore an essential measure and even more so in the presence of important biocenoses such as *Posidonia oceanica* meadows, as these areas are experiencing great pressure from human activities, in particular illegal bottom trawling.
Cable burying can reduce the occurrence of faults due to human activity and thus need for repair work: so, it also acts as a protective measure for the biocenoses, which will be affected only once by operations for installation and protection of the cable.

The following figure shows various images of damage generated by human activity on unprotected undersea cables.

Figure 4.11: Unprotected undersea cables damaged by human activity

The technologies that will be applied for cable protection are illustrated in the following paragraphs: the choice will depend on seabed soil characteristics and will therefore be defined directly by the Contractor during the final planning phase.

4.5.3.1 Jetting

The jetting technology involves protection of cables by burying them with sand using a machine that sprays jets of water; this technology can be applied where the seabed is made of uncoherent sediments, e.g., sand, clay, or loam. Generally, the machine uses the water jets also for propulsion. Where it is not possible to propel the machine using hydraulic means, self-propelling jetting machines with tracks and/or a ROV can be used.

Figure 4.12: Self-propelled jetting machine

For generating the trench, the machine is positioned over the cable to be buried: the action of high-pressure jets of water liquefies the soil, creating a trench into which the cable settles and is then naturally covered by deposition of the suspended sediments within the trench. Currents action on the seabed contribute to completing the process of naturally burial of the cable, guaranteeing its effective protection.
In standard conditions the base width of the trench is approximately equal to the diameter of the cable (15–20 cm), whereas the top width depends on the friction angle and the cohesion of the displaced sediments.

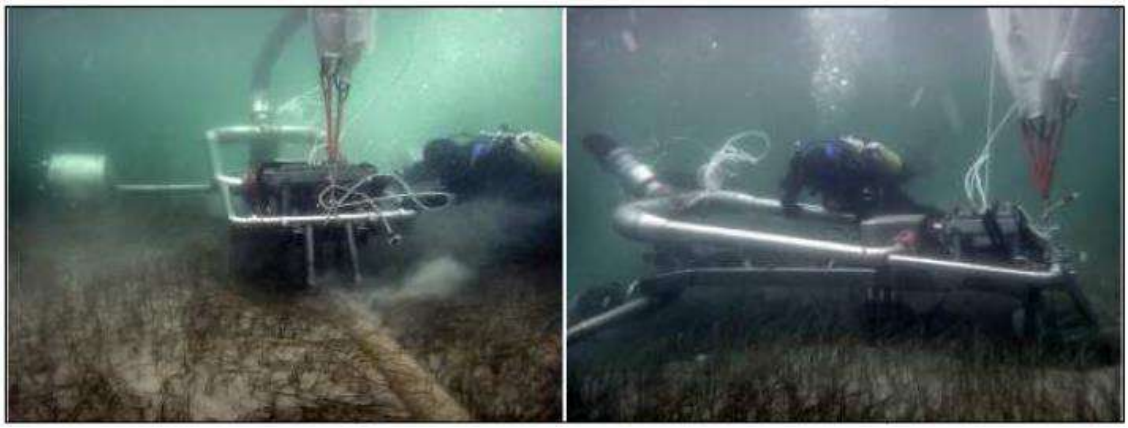

Figure 4.13: Machinery for jetting over Posidonia oceanica on sand sediments

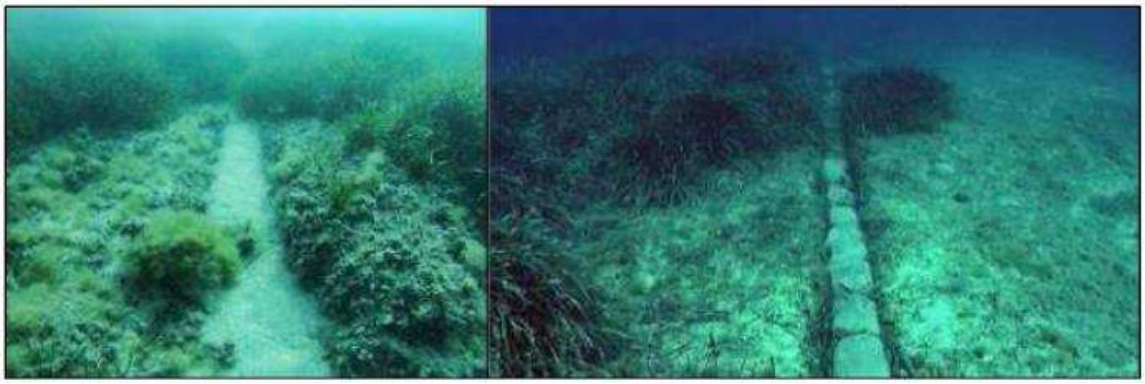

Figure 4.14: Trench over Posidonia on sand generated with a jetting machine

At shallow depths protection operations may be carried out manually by Technical Divers with the same effects above described in terms of width of the trench and volume of material displaced.

For uncoherent seabed sediments colonized by important biocenoses (e.g., *Posidonia oceanica* or *Cymodocea nodosa*), it is possible to use machinery for jetting that, in addition to being maneuvered directly by technical divers, is connected to a floating system so to reduce the impact to the sole width of the trench (30–40 cm). This type of machinery basically has no lateral footprint and allows for a minimum impact on the area around the work.
In case of trenches to be excavated in areas with significant biocenoses, such as *Posidonia oceanica* or *Cymodocea nodosa*, filling of the trench is normally carried out by backfilling, i.e. with the same material excavated, by promoting natural closing of the trench.

4.5.3.2 Trenching

Trenching technique is used with cohesive or cemented sediments. The trench is dug using a machine equipped with a disc tool or a toothed chain. The material removed during cutting is laid at the border of the trench: backfilling occurs as a natural process due to the action of bottom currents.

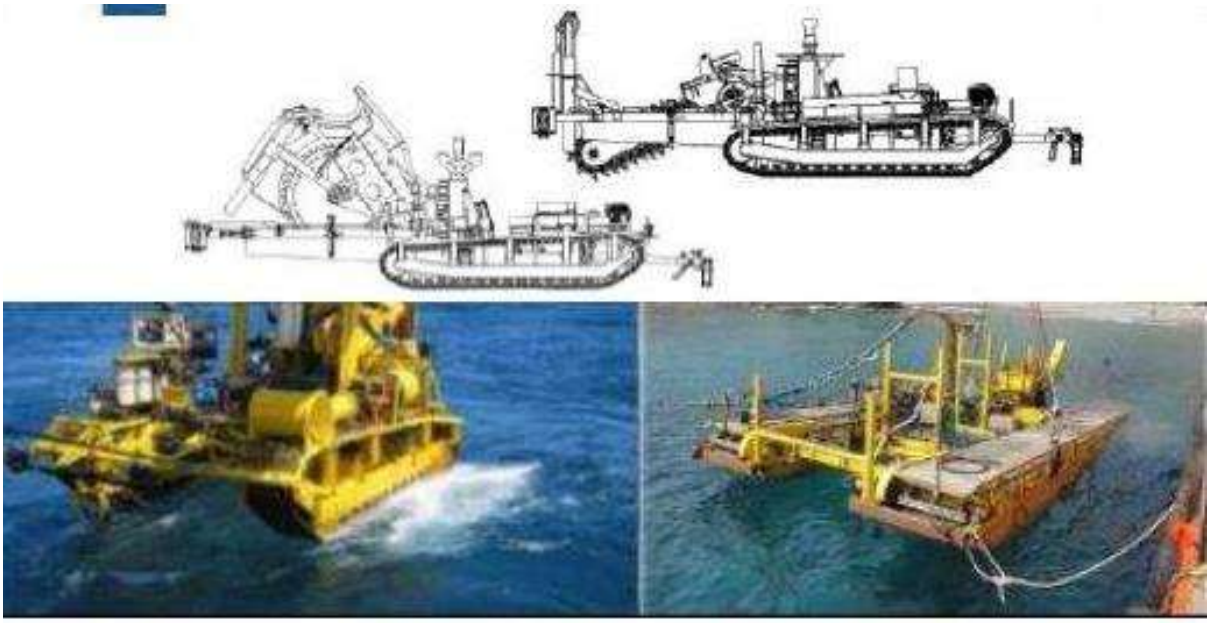

Figure 4.15: Conventional trenching machine

Where sensitive habitats are interfered trench filling (in proper technical and environmental conditions) can be carried out using materials suitable for recolonization by phanerogams, such as sandbags or rock dumping. This allows both to restore the seabed vegetation and to increase cable protection.
Another technique for minimizing impact on phanerogams consists in the use of controlled floating trenching machinery, that allows to reduce the footprint on the seabed to the actual width of the trench. The machine is directly managed by divers. The cutting system may be combined with a dredging pump if it is necessary to maintain the trench free of debris.
Since the machine is adjustable in terms of weight and therefore friction against the seabed, it is possible to ensure that the pressure on the leaves of the phanerogams is practically zero as sliding of the runners is facilitated by the leaves of the plants without any damage to them. The resulting trench, given the compact nature of the surface of the matte and the level of cohesion of the sediments, has a width only slightly greater than the diameter of the cable.

Figure 4.16: Cutting tool for trenching machine

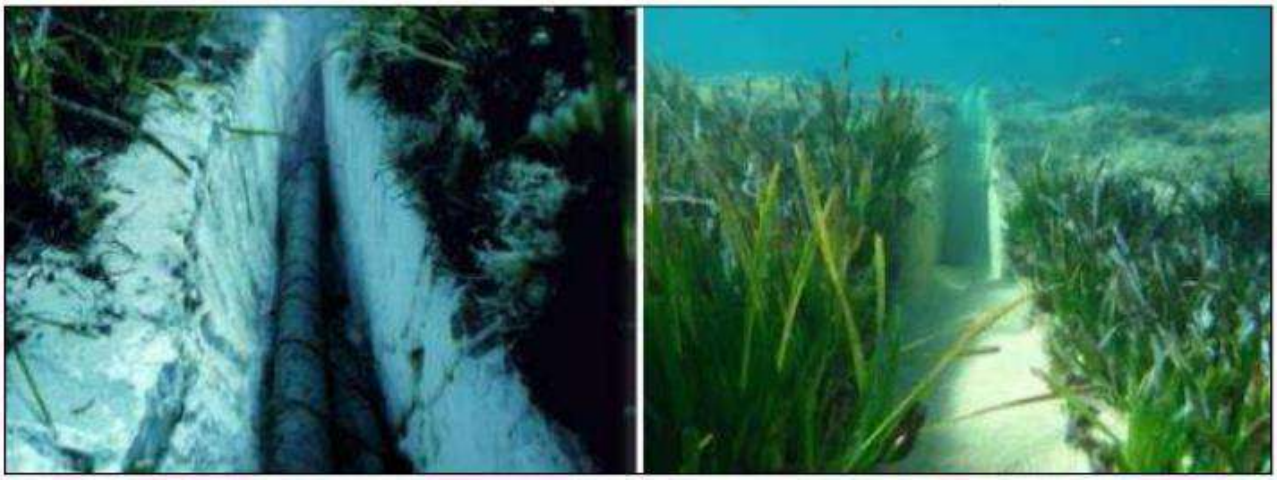

Figure 4.17: Trench over Posidonia generated with controlled floating trenching machinery

4.5.3.3 Rock dumping

Where characteristics of seabed or of sediments do not allow using one of the previously illustrated protection methods, the undersea cable will be simply laid on the seabed and then protected by covering with fine, mixed gravel mechanically deposited by a ship. The geometry of the protection system is shown in the following figure.

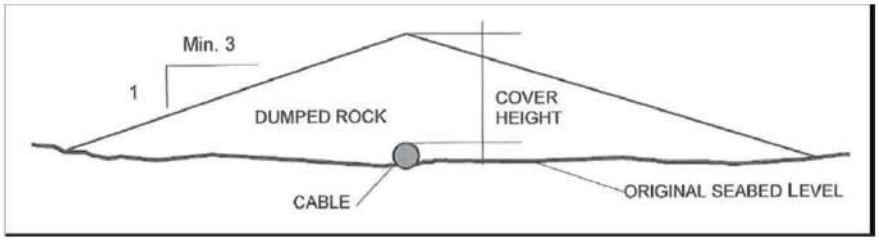

Figure 4.18: Typical of rock-dumping geometry

4.5.3.4 Deterrents

Deterrents are systems used for protection against trawling, generally made in concrete and shaped for their role. These are placed on the seabed in order to intercept trawling nets and minimize human activity in the area where the cable is installed.
They are laid:

- at a minimum distance from the cable of approximately 50 cm in order not to obstruct monitoring and repair activities;
- at depths greater than 10–15 m, given their height of some meters.

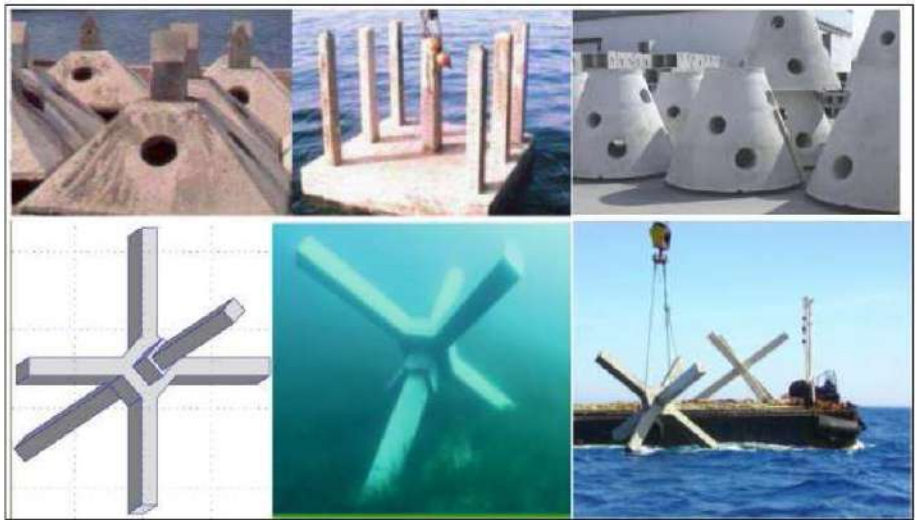

Figure 4.19: Example of deterrents for protecting undersea cables

4.6 Construction duration and timing

The total duration of works is estimated to be approximately 4 years, including testing and final commissioning of the electrical link.
The following table illustrates the construction time estimated for the various works.

Table 4.1: Construction time estimated for main works

Works	Duration
Mlaâbi Converter Station	40 months
Marine power cable from Tunisia to EEZ limit	2,5 months
Marine electrode cable	2 months
HVDC underground cable Mlaâbi – Kelibia	6 months
OHL Mlaâbi - Mornaguia	24 months
Associated facilities	
Partanna Converter Station	40 months
Marine power cable from Italy to EEZ limit	2,5 months
Marine electrode cable	2 months
HVDC underground cable Partanna – Marinella di Selinunte	22 months
HVAC underground cable Partanna CS – Partanna Station	6 months

4.7 Environmental and social mitigation measures

The required environmental and social mitigation measures to be implemented during the construction phase are described in the ESMP section (Part 2 of the Executive Summary).

5. DESCRIPTION OF THE OPERATION PHASE

5.1 Operational activities

All equipment and plants of the project will be managed and controlled remotely by the appointed Italian and Tunisian Operations Centre.
Also, in the Mlaâbi Converter Station, presence of permanent personnel will not be required: the CSs will have Control, Automation and Remote-Control Systems which, in normal operating conditions, will allow complete remote control of the plant from one of the Terna Integrated Remote Control Centers (CTI). In particular operating and/or maintenance situations, the station can also be managed at local level by the emergency support personnel.
The Control and Automation System will supervise both the correct functioning of the AC-DC Converter equipment (Conversion Bridge, Converter Transformers etc.), and the traditional systems and equipment (SPCC) interfacing the CS with the HV Grid.
The Control and Automation System will manage the “new Italy - Tunisia interconnection” connection in different operating procedures in relation to the multiple network needs (e.g., import or export, power control, frequency regulation) or failure situations of various systems or devices (e.g., malfunction of the telecommunications system). The redundancies and the physical and logical configuration of the Control System will be such that the failure or voluntary decommissioning of an element of the system, or of the communication, will only result in the partial degradation of the overall performance.
The Control System will have system diagnostics that will constantly allow overall monitoring of the station both remotely and locally, thus allowing online control and emergency response.
The Remote Control and Telecommunication Systems will fulfil the twofold need for coordinated control and implementation of protective actions during normal and fault operation between the two conversion terminals in the Partanna and Mlaâbi stations, and for the exchange of information between the two converter plants and the Integrated Remote-Control Centres.
The Converter Stations will therefore be equipped with telecommunications equipment which will guarantee, with the appropriate redundancies, the transmission of information and data to the various recipients, via optical fiber connections and alternative emergency channels. Any interruptions or deterioration of the transmission links will result in automatic switching to reserve connections or to particular operating arrangements of the Converter Stations, ensuring as far as possible the continuity of operation and the safety of the plants.

5.2 Maintenance

During the operational phase of the project, STEG personnel will carry out regular inspections along the underground cable and overhead lines.
Regular maintenance work will be carried out by specialized teams, whilst extraordinary maintenance works will require procedure (and induce impacts) similar to those of the construction phase.

5.3 Environmental and social mitigation measures

The required environmental and social mitigation measures to be implemented during the operation phase are described in the ESMP section (Part 2 of the Executive Summary).

6. PROJECT ALTERNATIVES

6.1 Landfall project alternatives

Two landfall project alternatives were proposed: Kelibia and Menzel Horr: the two alternatives are shown in the following figure.
Geophysical investigations were carried out in order to evaluate the technical feasibility of the landfalls and to evaluate the best possible routing for power and electrode cables.

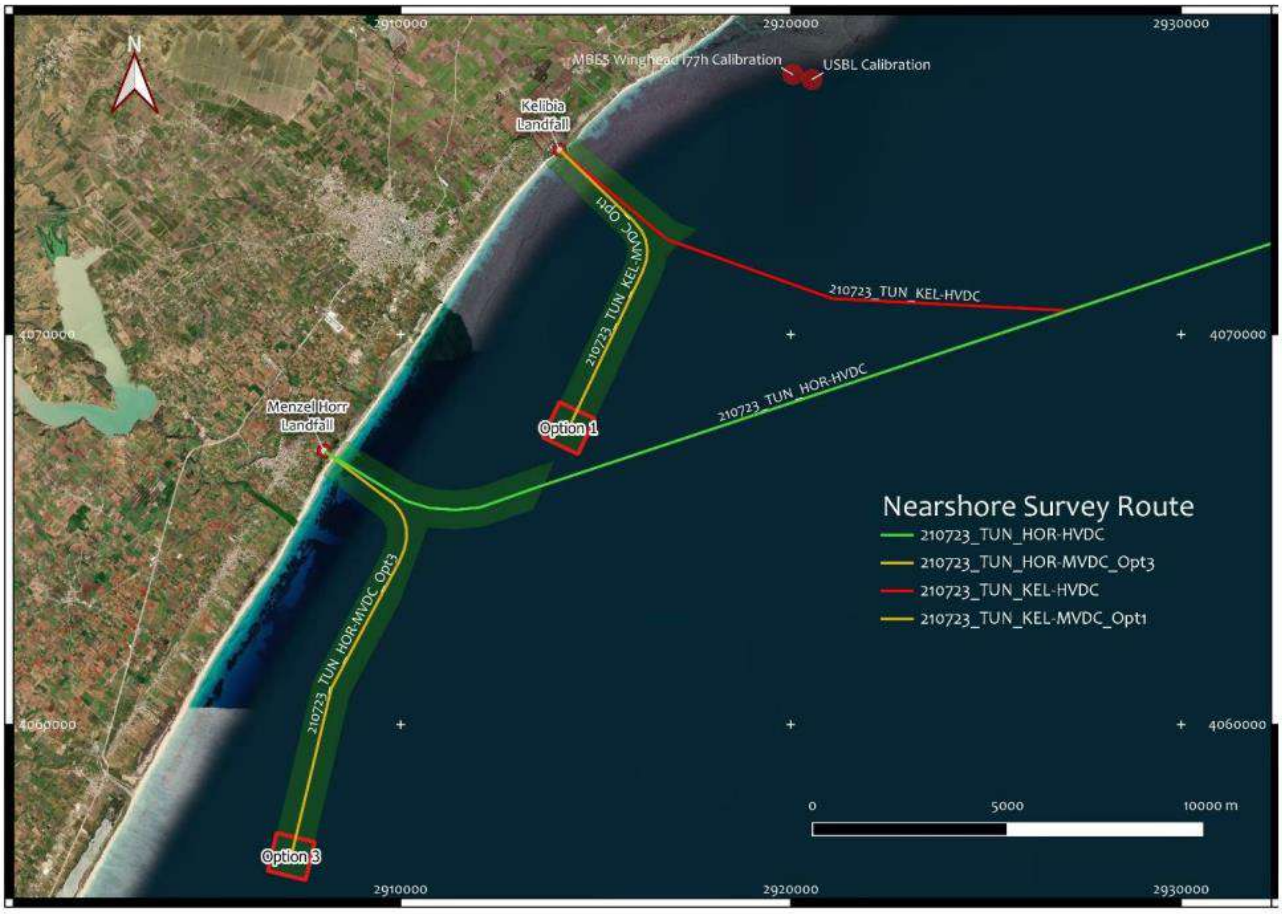

Figure 6.1: Alternative landing options: investigated routes for power and electrode cables

6.2 Terrestrial cable route project alternatives

Each of the above illustrated landfalls determined a set of possibilities for the terrestrial route of the underground cables; the studied alternative terrestrial routes are shown in the following figure.
The length of the route from the landing point to the Mlaâbi converter station is about:

- 9 km for the Kelibia landfall;
- 13,5 km for the Menzel-Horr landfall.

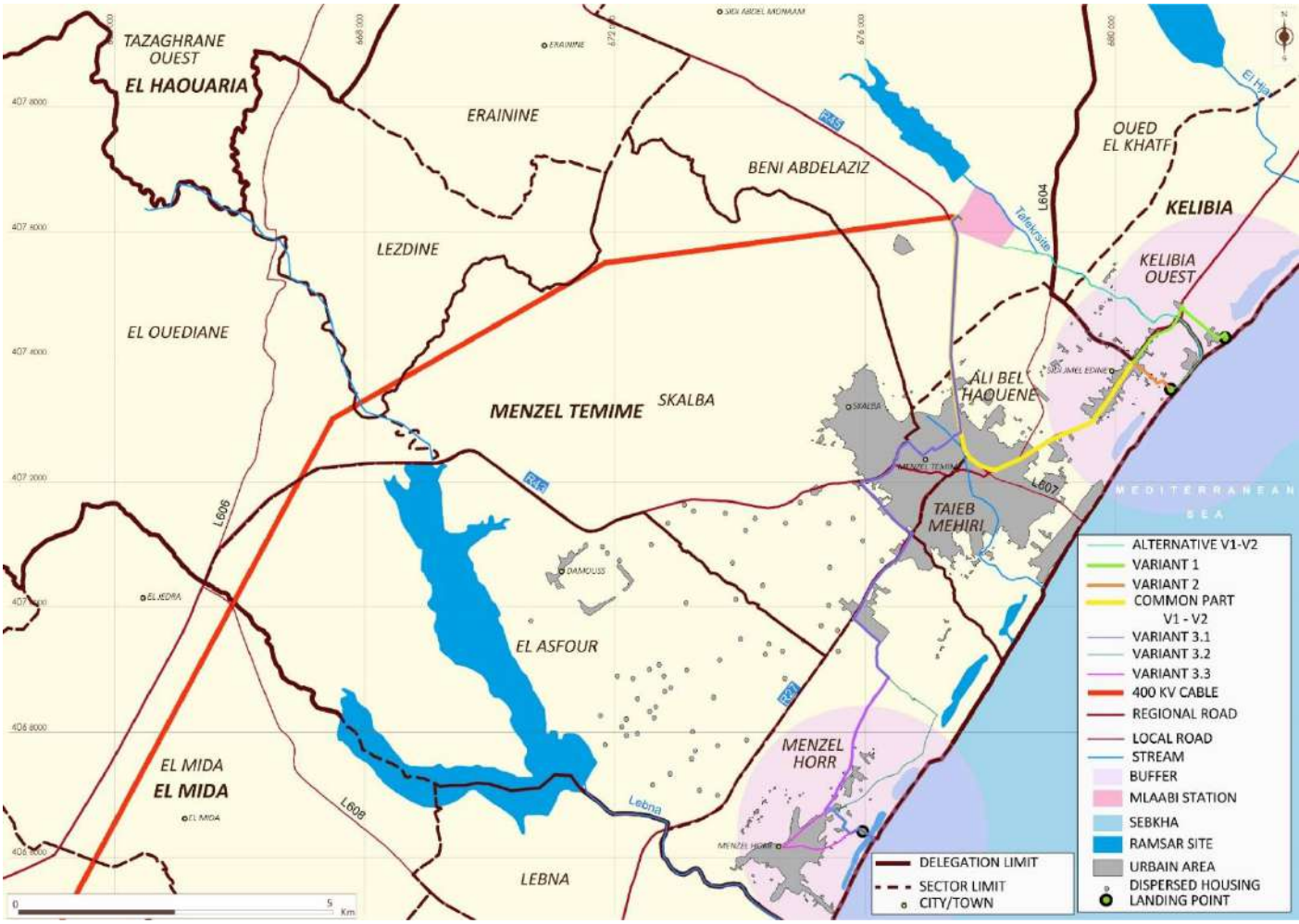

Figure 6.2: Alternative routes for terrestrial cables (in different colours) for the two alternative landing points of Kelibia and Menzel-Horr

Component/option	Location and description of the crossed zone	Comments and observations
Variant 1 ***Landing point of Kelibia***	- Two delegations concerned by the underground cable: Kelibia and Menzel Temime; - The crossed area in Kelibia is mostly rural; - The landing point is located near an abandoned military base and the line route (about 1 km) to reach the regional road N°27 (RR27) is enough large to pose the cable between the landing point and the conversion station in Mlaâbi.	→ The line route between the landing point and the RR27 is large with and accessible; → The suggested method of landing (HDD) will avoid/reduce the project's impact on the dune and coastal component; → No significant constraints along the rural portion: the RR27 and RR45 regional roads have a good space, and the works can be carried out on the roadside without disturbing buildings and economic activities along this portion; → The main constraint concerns the passage through the agglomeration

Component/option		Location and description of the crossed zone	Comments and observations
		- Concerning the part located in Menzel Temime: a portion essentially rural outside the urban area over 6km; and an urban portion over 3.95km between Sidi Jameledine and Menzel Temime (heavily populated area with a commercial market located along the line route).	of Menzel Temime: the works will seriously impact the existing infrastructures (water, internet, electricity, etc.), economic activities and the traffic in the city. → It is recommended to avoid the urban area of Menzel Temime.
Landing point of Menzel Horr	***Variant 3.1***	- The longest route compared to the other options; - The proposed line route pass through an existing road that crosses an agricultural area (annual crops) and its size seems to be enough for the cable pose; - Among the 14 km of this option, about 4 km crosses the urban area (3 km in Menzel Temime and about 1 km in Menzel Horr); - The rest of the proposed line route is located in a rural area with significant agricultural activity (cereal and horticultural).	→ A RAMSAR site (N°1707) near the landing point. → This option affects a large urban area compared to the other variants. It will generate more problems/damages on the existing houses and facilities and will affect the traffic in Menzel Temime and Menzel Horr. → Seems to be the most constraining option, as it passes through two populated areas and the costs for the compensation of PAPs during the construction phase will be very high. → It is recommended to avoid these urban areas by following the routes/tracks located outside the two agglomerations of Menzel Temime and Menzel Horr or the by-pass proposed in the PAU document.
	Variant 3.2	- This option avoids the city of Menzel Horr and follows a route (about 6 km) before reaching the RR27 of Menzel Temime. The first part of this proposed option is rural with an agricultural activity along the line route; - The line route will cross a RAMSAR site and a Sebkha; - The second portion will follow the RR27 through Menzel Temime (west and north of the city) to reach after that the RR45 and the industrial zone of Mlaâbi.	→ A RAMSAR site (N°1707) near the landing point. → As with the others options, this variant will affect the urban area (about 4 km in Menzel Temime). → By passing through the agglomeration, the cable may cause problems: perturbation of the traffic, damage to the urban facilities/networks (water, internet, electricity, gas, etc.) and pollution. → It is recommended to avoid the urban area of Menzel Temime by following the existing trails in the northern part of the city or by choosing the by-pass proposed in the PAU.
	Variant 3.3	- This option follows the same line route proposed for the variant 3.2 except for	→ A RAMSAR site (N°1707) near the landing point. → The cable will pass by the city of Menzel Temime and it will generate

Component/option		Location and description of the crossed zone	Comments and observations
		a 2.6km portion connecting Menzel Horr to the RR27. In this option, the cable will cross an agricultural area before reaching the industrial zone located near the RR27. - After that, the cable will pass through the city of Menzel Temime and the RR45 to finally reach the conversion station of Mlaâbi.	impacts on the infrastructure, commercial activities and other facilities. → As with other options, we recommend avoiding the urban area of Menzel Temime.

The option parallel to Oued Tafekhsite is also assessed as an alternative to variant 1.

The following table shows the lengths of the underground cable for the proposed options, separating the sections crossing urban areas (heavy constraint during the construction phase) from other sections crossing a rural or unoccupied zones.

	Total distance (km)	Portion crossing an urban area (km)	Portion crossing a rural/unoccupied area (km)
Variant 1	9.61	3.95	5.66
Variant 3.1	13.4	4	9.4
Variant 3.2	14.2	4.01	10.19
Variant 3.3	14.7	5.34	9.36
Option parallel Oued Tafekhsite (as an alternative to variants 1 and 2)	4.88	0	4.88

The choice of the landfall was guided by constraints on terrestrial route: discussions with municipalities and economic evaluations were the drivers for the landfall point being located in Kelibia.

After deciding on the Kelibia landfall, the line route of the underground cable was optimized in terms of length/cost (parallel to Oued Tafekhsiite) and avoidance of environmental and social constraints.

Figure 6.3: Oued Tafekhsite, alternative option for variant 1 (36°47'49.75"N ; 11° 1'59.75"E)

Figure 6.4: Landing point of Menzel Horr (36°43'43.62"N; 10°58'20.94"E)

Figure 6.5: Road between Menzel Horr and Menzel Temime (36°45'24.45"N, 10°58'26.71"E)

6.3 Overhead line project alternatives

The OHL route was defined after a detailed study of the territory between Mlaâbi and Mornaguia, that considered the following constraints:

- minimizing interference with agricultural land;
- minimizing interference with forested land;
- avoiding interference with critical habitats;
- guaranteeing appropriate distance (related to regulations on electromagnetic fields) on residential areas and sensitive receptors (schools, hospitals, etc.).

For this scope preliminary studies were carried out, that allowed to converge to the proposed OHL route.

6.4 Offshore project alternatives

Three alternatives for the offshore route were analyzed in the first stages of the project development and are shown in the following figure.

The choice for the project route, that was investigated through a detailed marine survey was based on a desktop study; the offshore reconnaissance survey area consisted in a corridor NE-SW oriented, 3000m wide and approximately 187 km long.

The final route was then identified as a result of the reconnaissance survey, taking into account all the constraints identified on the sea bottom.

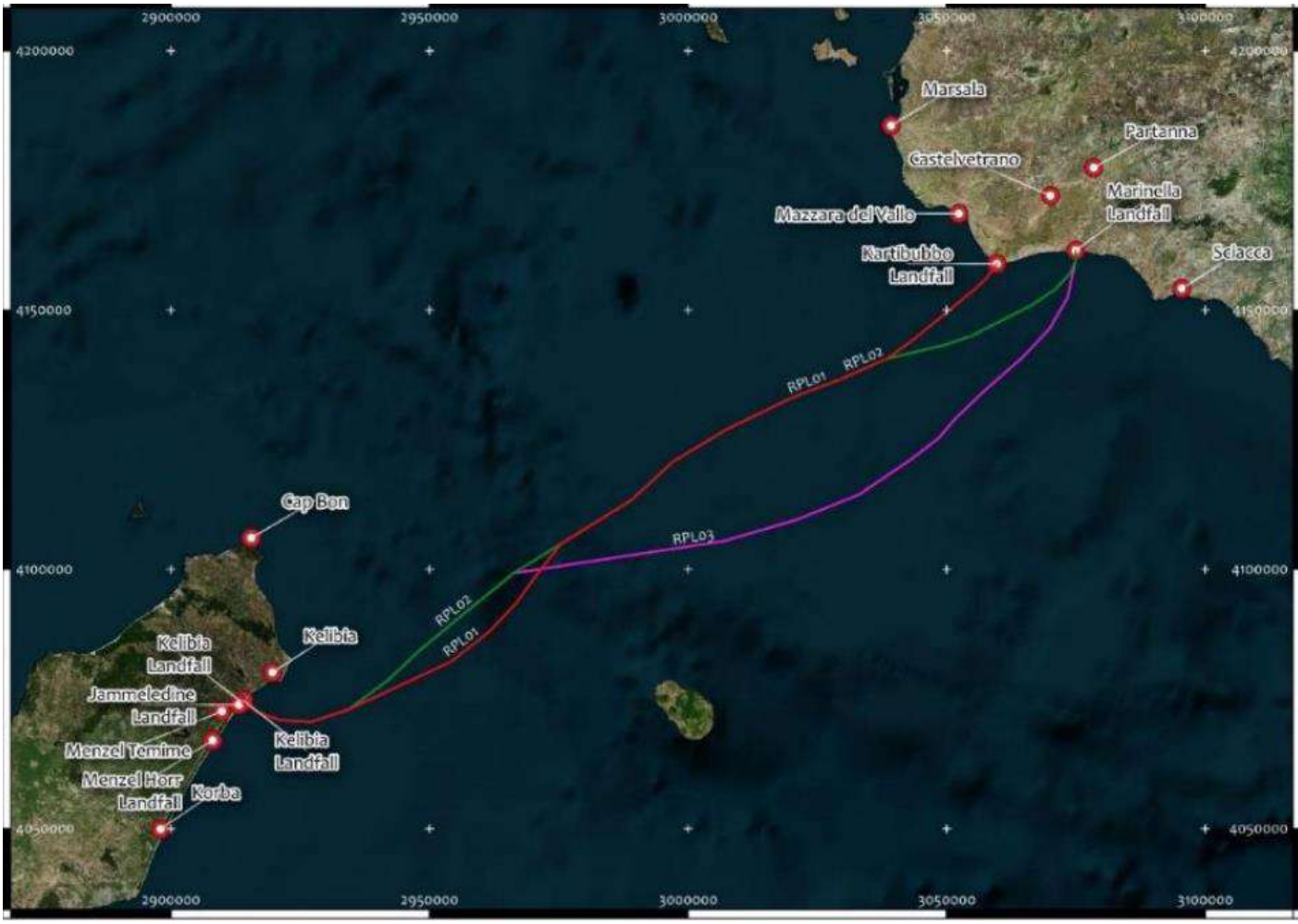

Figure 6.6: Marine cable alternative routes

7. ENVIRONMENTAL BASELINE

7.1 Marine domain

7.1.1 Marine survey

A reconnaissance survey focused on defining the marine cable route was carried out between October and December 2021 by the Joint Venture formed by the companies RINA Consulting S.p.A and COMETE Engineering. The scope of work for the survey and assignment to the Joint Venture were defined by Elmed.

This survey provided important elements for defining the environmental baseline for the marine domain.

The survey comprised two separate activities:

- nearshore survey: this is related to the area from the shoreline to 40 m water depth;
- offshore survey: this is related to the offshore area with water depth greater than 40 m.

7.1.1.1 Offshore survey

The Offshore Survey was divided in two phases:

- Reconnaissance survey: bathymetric and morphological survey by means of MBES, installed on the offshore vessel along 3 km wide corridor from 40 m water depth at Italian side to 40 m water depth at Tunisian side. This activity was aimed to acquire bathymetry and morphology information of the study's corridor. During this phase there was a continuous and online assessment of the data to define the best RPL and then the relative corridor for the second phase.
- Detailed survey: bathymetric, morphological, and geophysical survey by MBES, SSS, SBP installed on ROV, along 500m wide corridor centred on the route selected after the reconnaissance survey. During this survey, a target visual analysis was also carried out in order to identify UXO's and archaeological targets.

Figure 7.1: Reconnaissance survey plan

The offshore survey (geophysical and ROV survey) was executed by the OSV Artabro.

Figure 7.2: OSV Artabro

7.1.1.2 Nearshore survey

This activity was aimed to characterise the seabed in front of the landing points and it was performed along the routes at both the Tunisian landing options.
Nearshore survey was performed with the following equipment installed on vessel:

✓ Multi Beam Echo Sounder (MBES).

✓ Side Scan Sonar (SSS).

✓ Sub Bottom Profiler (SBP).

Nearshore survey included the investigation of:

✓ the pole cable corridors

✓ the electrode cable corridors

✓ the electrode positioning areas

After the geophysical survey a detailed ROV visual inspection was also performed to identify items of major interest.
The near shore survey vessel mobilized for the geophysical and ROV surveys from 3 m to 40 m water depth is the LINO VICCICA.

Figure 7.3: M/B LINO VICCICA - Nearshore Vessel

Two alternative landing options were investigated: Kelibia and Menzel-Horr.

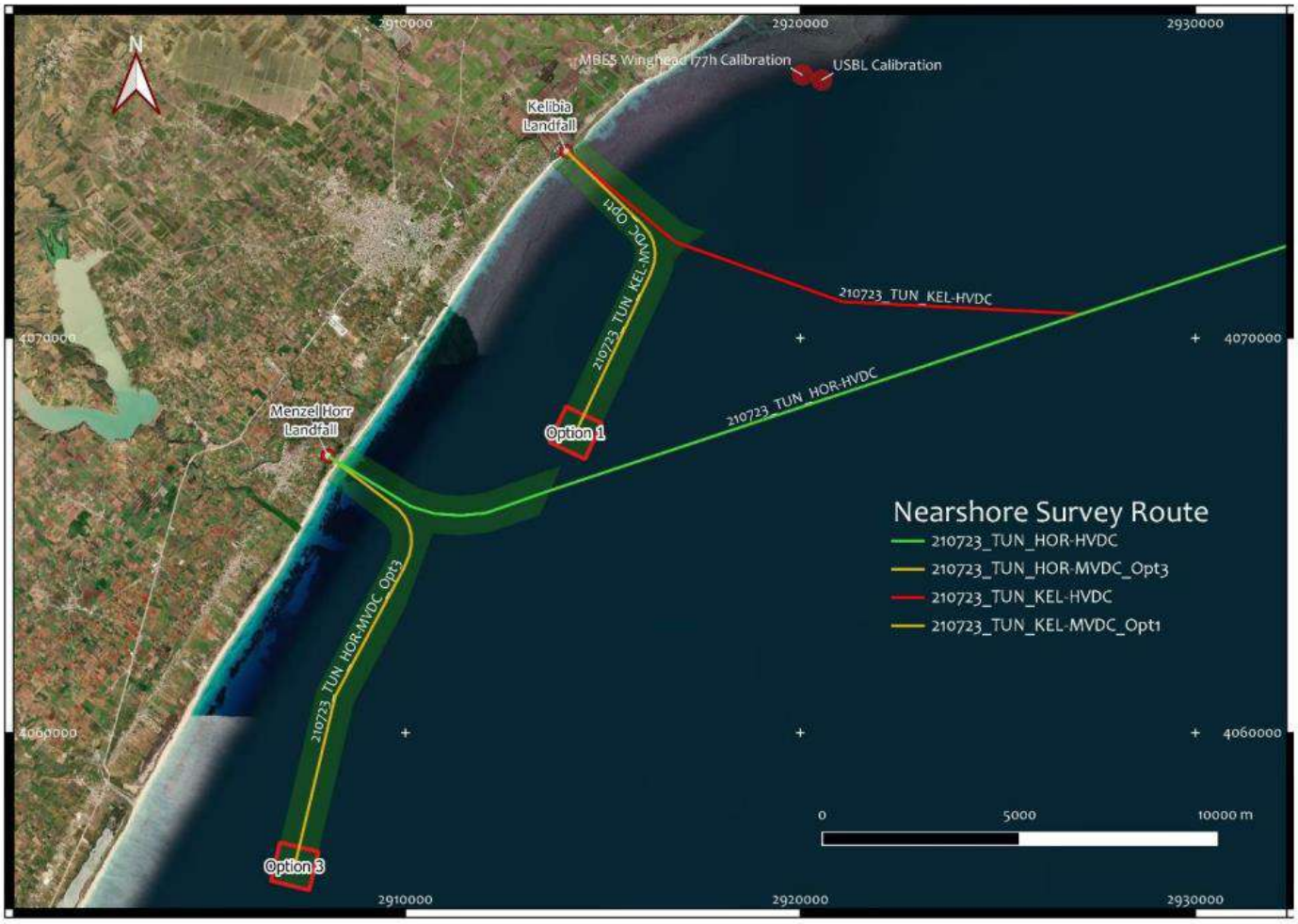

Figure 7.4: Alternative landing options and areas (shaded in green) investigated by the survey

7.1.2 Physical environment

The Strait of Sicily separates the island of Sicily from the coasts of Tunisia and divides the Mediterranean Sea into two main basins: the western Mediterranean Basin with more Atlantic influence and the eastern Mediterranean Basin. The two basins remain to some extent disconnected.

The topography of the Strait of Sicily consists of shallow banks along the Sicilian and Tunisian coasts where the water depth ranges from 50 to 200 m.

The strait has a minimum width of about 150 km (between Cape Bon and Mazara del Vallo), a length of about 600 km, and a mean sill of about 400 m depth. It is characterized in the southwest by the wide Tunisian continental shelf and in the northeast by the Sicilian shelf.

The bank on the Tunisian side covers a substantial part of the surface area in the strait. Deeper channels with depths to around 1,000 m exist between the shallow banks. Proceeding southeast from Sicily the depth ranges from 50m to around 600m in the shelf break region.

These two banks are separated by deep water areas from which arises the volcanic island of Pantelleria. Morphologically, the Strait of Sicily exposes irregular bottoms, canyons, seamounts and banks. Maximum depths are reached in three different basins: Pantelleria basin (1,317 m), Malta basin (1,721 m) and Linosa basin (1,529 m) where sediments tend to pile up. It communicates with the western and eastern basins by a narrow sill, NW of Pantelleria Island (400–500 m deep), and a wider channel, SE of Malta (500–600 m deep), respectively. The

complex topography of the Strait influences water circulation characterized by filaments, meanders and eddies.
The following figure shows the bathymetrical profile along the power cable route from Italy (left side) to Tunisia (right side).
The maximum water depth is around 800 meters.

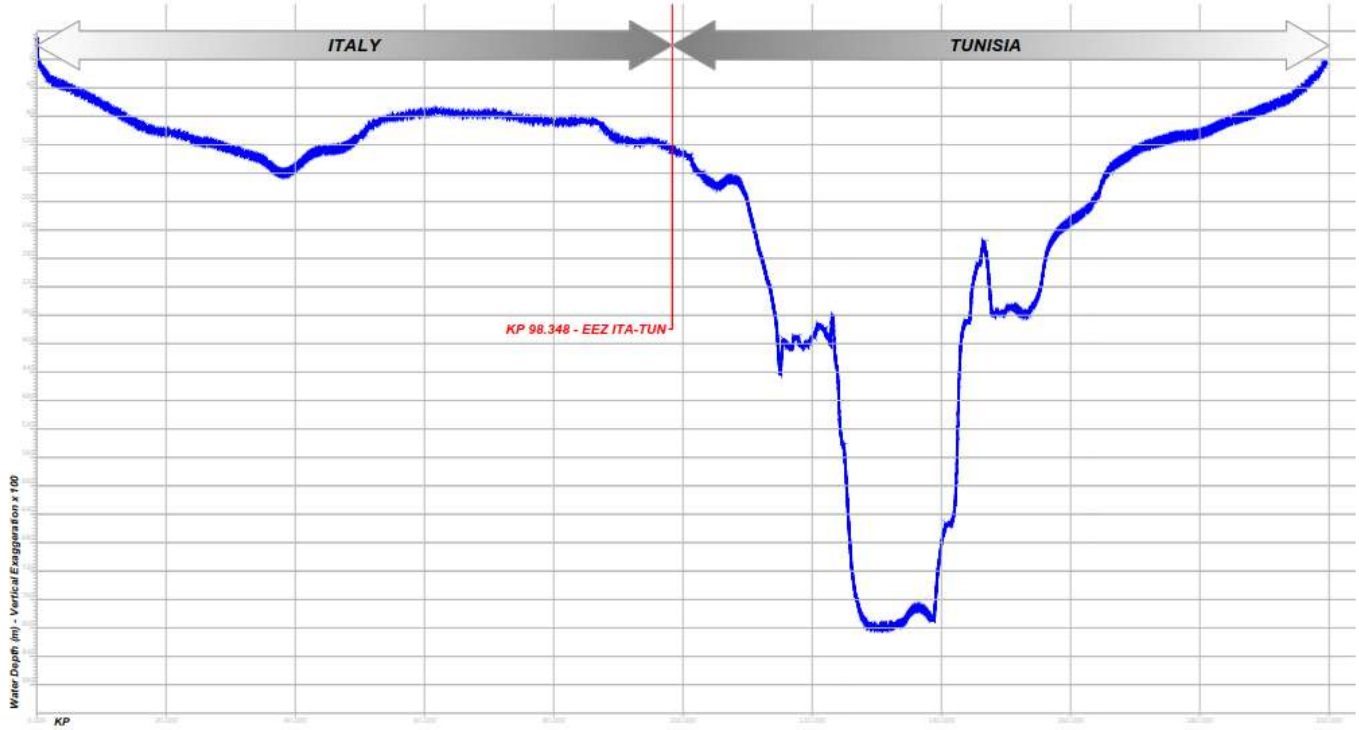

Figure 7.5: Bathymetry along the power cable route

7.1.3 Biodiversity

7.1.3.1 Marine survey main results

Water depth in Kelibia varies between 3m and 41m where the seabed deepens gently SE-wards with sediment thickness recorded between 0m and 3m with low slope values ranging from 0° to 20°. The seafloor is mainly characterised by loose fine to coarse sand with numerous patches of hardened concretions all across the survey area. These concretions have most probably a biogenic origin with the presence of pre-coralligenous communities. These habitats may host a high variety of species (i.e. sponges, gorgonians, crustaceans, molluscs Ruitton et al.) that may be included in IUCN red lists. They are considered sensitive habitats by the European Habitat directive 92/43/CE Annex I (habitat code:1170, reef) and in the EU Marine Strategy Framework Directive 2008/56/EC, (MSFD).
Furthermore, survey results highlighted two main areas of seagrasses, the first with spreads of *Posidonia oceanica* (in the shallow zone) and the other with spreads of *Caulerpa sp*. (most likely *taxifolia* in the deeper zone) with the whole surveyed area appearing to be severely scared by anchors, most likely from intensive fishing activities. Posidonia extends over all the width of the survey corridor except for a 70m to 100m wide channel located at approximately 500m West of the route from 3.0m to 29.0m depth. The ROV Visual Inspection showed that Posidonia characterises the northern sector while the biogenic concretions within a coarse sediment and Caulerpa sp. are observed across the southern sector.

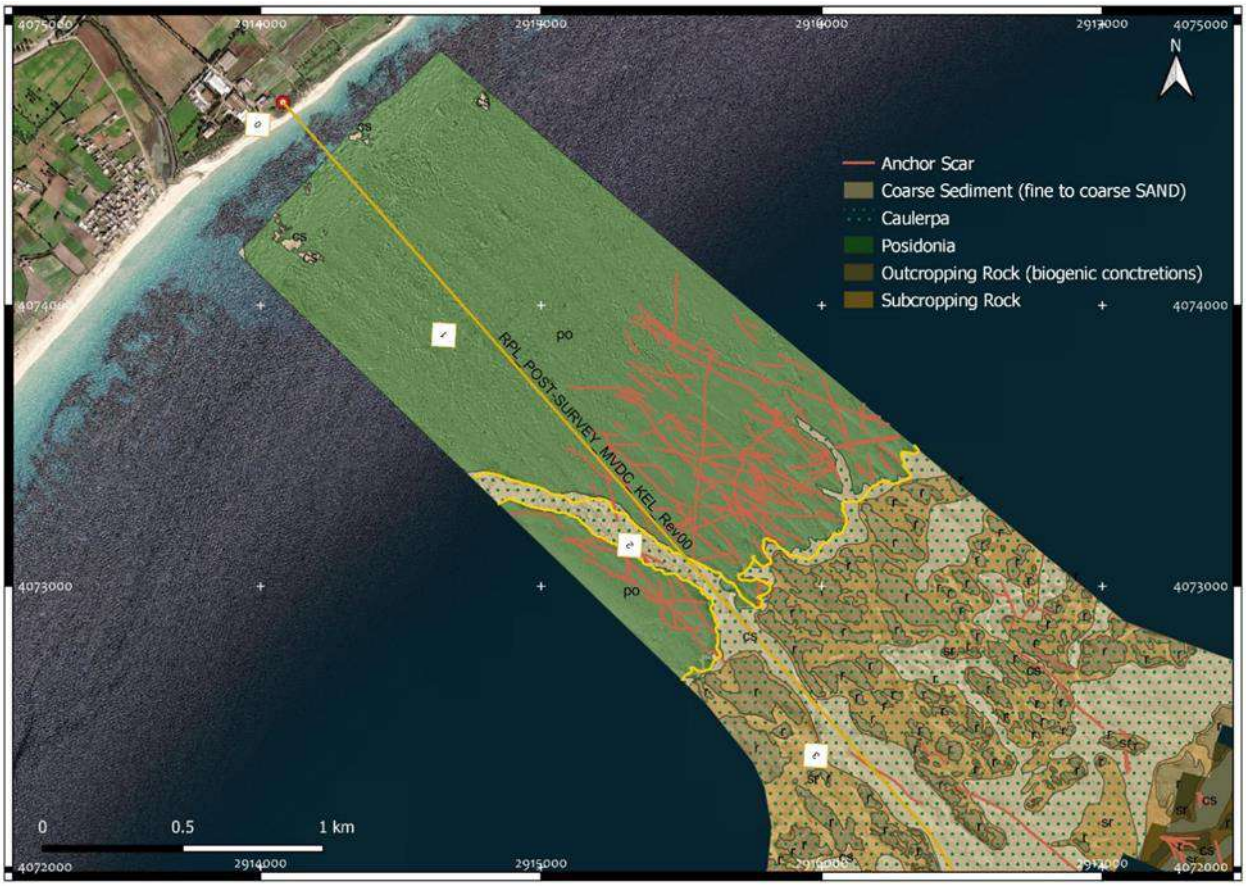

Figure 7.6: Kelibia: Map of Posidonia and Caulerpa along the cable route (yellow line)

7.1.3.2 Flora

As described above, the nearshore survey identified two main flora species in Kelibia, *Posidonia oceanica* and *Caulerpa sp*. on the cable route.

7.1.3.2.1 Posidonia oceanica

Posidonia oceanica is endemic to the Mediterranean Sea and forms extensive underwater meadows from the surface to over 40m depth with a temperature range between 10 and 30°C. The species propagates mainly via vegetative reproduction through rhizome elongation and cuttings with the fruit requiring 6 – 9 months to ripen. They usually drop off between May and July and float for a while before settling.
Currently, *P. oceanica* is listed as “Least Concern” by the IUCN Red List.

Based on the life cycle of Posidonia, and regarding works that disturb this seagrass, two windows represent themselves that allow reducing impacts to the minimum by order of priority:

1) Summer season from beginning August until the end of September; and
2) the Winter season between the beginning of December and the end of February.

Visual inspection that the plants have shed all their fruits if works are to be conducted in the summer should determine the beginning of works while visual inspection about the stage of the developing fruits and length of the leaves is also important for winter works (leaves are usually still sprouting and if fruits started to develop, they are not too ripe).

Figure 7.7: Posidonia images from ROV survey

7.1.3.2.2 Caulerpa sp.

Caulerpa sp. is a green marine macro-algae native to tropical waters of the Indian, Pacific and Atlantic oceans. In the 1980s, a specifically bred cold-resistant clone of *C. taxifolia* spread by accident in different parts of the Mediterranean Sea from a public aquarium in Monaco. Known as the 'aquarium strain', it grows rapidly between the months of July and November, is known to smother seagrasses and are extremely difficult to eradicate. In the Mediterranean, it reproduces by vegetative dispersion, being greater in summer at shallow depths than in the other seasons or in deep waters.

In order to mitigate the spread of this species, works are best carried-out in the winter season when sea water temperatures are at their lowest.

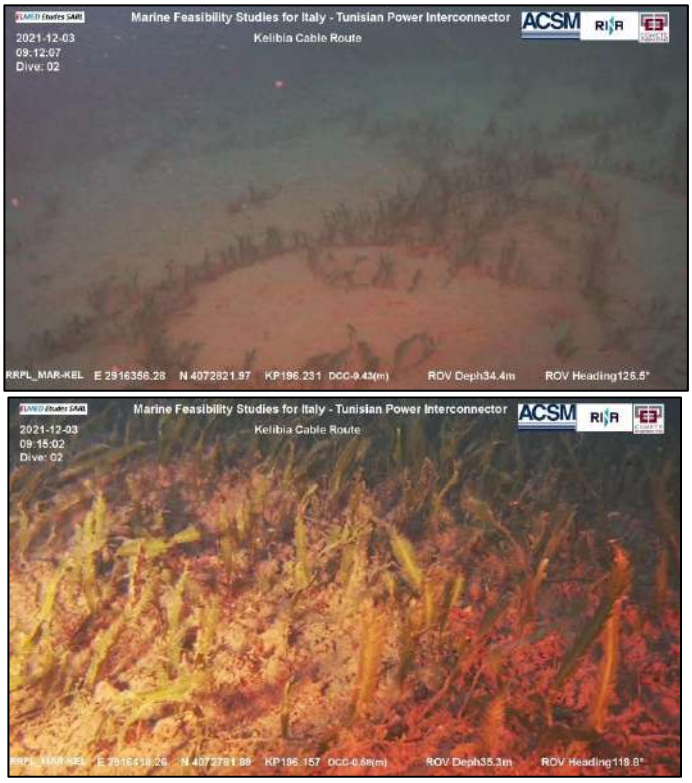

Figure 7.8: Caulerpa sp. images from ROV survey

7.1.3.3 Fauna

7.1.3.3.1 Cetacean Fauna

The strait of Sicily hosts various cetaceans species associated with deep waters; the following table illustrates the main subpopulations.

Table 7.1: Main cetacean subpopulations in the Strait of Sicily

Cetacean Subpopulation	Description
Striped Dolphin (*Stenella Coeruleoalba*)	Striped dolphin in the Mediterranean is currently proposed to be listed on the IUCN Red List as Vulnerable. The Mediterranean population of striped dolphin is particularly exposed to high levels of chemicals and heavy metals, which have severe effects on their reproduction and immune system. It qualifies for listing as Vulnerable based on criterion A4 (UNEP, 2015).
Short-beaked Common Dolphin (*Delphenus Delphis*)	The *Delphenus Delphis* (short-beaked common dolphin) is a small cetacean species with a wide distribution. In 2003 the Mediterranean common dolphin 'subpopulation' was listed as endangered in the IUCN Red List of Threatened Animals, based on criterion A2, which refers to a 50% decline in abundance over the last three generations, the causes of which 'may not have ceased or may not be understood or may not be reversible'. The species is present in the Sicily Channel with larger groups being observed around Malta and the Cap Bon area (Northern Tunisia).

Cetacean Subpopulation	Description
	Today they survive only in small portions of their former Mediterranean range.
Common Bottlenose Dolphin (*Tursiops Truncatus*)	The bottlenose dolphin is one of the most frequently observed cetaceans in the Mediterranean. They occur in most coastal waters of the basin and have been reliably reported in the waters of Tunisia, Sicily, Pantelleria, Malta and Lampedusa. They have been studied only in relatively small portions of the basin, and wide areas remain largely unexplored. Even though the species was classified as Vulnerable and is also listed in the Annex II of the Habitats Directive (Council Directive 92/43/EEC), as a Species of Community Interest, the Mediterranean subpopulation has been reassessed by the IUCN Red List of Threatened Species in 2021 and listed this subpopulation as Least Concern (LC).
Fin Whale (*Balaenopetra Physalus*)	The fin whale is the largest free-ranging predator found in the Mediterranean. Mediterranean fin whales are currently defined as a distinct subpopulation from those in the North Atlantic, perhaps extending out to southern Portugal (IWC 2009). Analysis of the bottom topography of the strait of Sicily points out the existence of attractive top predators' features, considered a likely suitable features to the Mediterranean fin whale sub-population during winter. Fin whale presence in this area has been supported also by the stranding data accessible from the ''Mediterranean Database of Cetacean Strandings'' (MEDACES) and the Tunisian stranding network. Due to the endangered status of the fin whale world around, and not especially in the Mediterranean basin, this species has been protected under both the Endangered Species Act (ESA) (as endangered) and the Marine Mammal Protection Act (MMPA). Although, it is listed as "endangered" by the IUCNand is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (known as CITES).
Sperm whale (*Physeter macrocephalus*)	Sperm whale observation in the strait of Sicily is restricted to few occasions during the monitoring of this area through ferries. The relatively common occurrence of sperm whale mortality events along the Tunisian coastline is quite constant year round with highest relative frequencies during spring and summer. These events were mainly taking place in the western Mediterranean part exclusively for single individuals. No mass stranding was reported in this area and body lengths varied from 6 to 14 m. Although there are historical accounts of large groups of sperm whale in the strait of Sicily, recent visual and towed hydrophone surveys indicate rather low densities.

7.1.3.3.2 Caretta Caretta

Caretta Caretta is a sea turtle species protected by international conventions (e.g., Bern Convention, Annex II; Washington Convention—CITES, Annex II) and by European national and regional laws (e.g., Habitat Directive 92/43, Appendices II and IV). IUCN Assessment: "Vulnerable" (Vecchioni et al., 2022).

It has been subject to several investigations lately especially with regards to its nesting areas and the negative effects of marine pollution of this endangered species.

7.1.3.3.3 Fisheries

Significant ecological and biological components coexist spatially in a relatively limited area considered as a biodiversity hotspot within the Mediterranean (Tunisia, Malta, Libya, Italy, and Egypt). Seamounts and deep-sea corals are found close to Sicily including mounds of white corals, which are vulnerable species and provide valuable habitat for a number of other species. The complex oceanographic conditions in this area lead to high productivity and result in good conditions for fish spawning, and therefore the relationships between environmental variables and distribution and abundance of living resources need further elucidation.

The Sicilian Channel is an important spawning ground for a number of commercially important fish species, including bluefin tuna, swordfish and anchovy, as well as a number of demersal fish species. It is also recorded as an important nursery area for the endangered white shark. The Sicilian Channel is thought to be the last important habitat for the critically endangered Maltese skate. Furthermore, the Channel is known as a spawning area for the Bluefin tuna and the International Commission for the Conservation of Atlantic Tunas (ICCAT) recognizes the Strait of Sicily as the most important spawning ground of the Mediterranean stock of the swordfish (*Xiphias gladius*).

Furthermore, the Strait is a biodiversity hot spot for a great number of shark species, some of which have become rare or are no longer present in other regions of the Mediterranean.

The Strait of Sicily is also one of the areas with the greatest richness of demersal species in the Mediterranean basin that are greatly affected by fishing activities. The area is particularly known or its rich community of elasmobranchs and accommodates the largest number of species in the north Mediterranean Sea. The greatest diversity though was reported from the offshore bank on the western part of the south Sicilian shelf.

Along the coast of the Middle East and North Africa until the Strait of Sicily, some Non-Indigenous Species (NIS) have recently become commercially valuable and have entered local fisheries. Such species are expected to increase across the whole basin due to the doubling of the Suez Channel in 2015. Even though the Strait of Sicily acted as a biogeographic barrier to a sudden expansion of NIS in the western Mediterranean, this role has been modified as response to rising temperatures due to climate change.

Furthermore, deep-sea coral assemblages associated with commercially important teleosts and crustaceans (habitats for fish and invertebrate communities) act as marine biodiversity hotspots and are indicators of the vulnerability of marine ecosystems. Since they are highly vulnerable to human impacts such as fishing due to their life history traits, their abundance has dramatically declined due to the effects of trawling.

7.1.3.3.4 Phytoplankton and Zooplankton Communities

Few studies have addressed the environmental factors affecting phytoplankton and zooplankton communities in the Central Mediterranean.

Primary productivity was recorded to be higher in the western sector of the Strait (Adventure bank) compared to the south-eastern sector. Oceanographic surveys carried out in the Eastern Mediterranean in the 90's showed an increased abundance of meso-zooplankton in the Strait with the recorded mean value almost one order of magnitude greater than in other areas. Measured zooplanktonic biomass values displayed clear spatial patterns with high density values in the western region corresponding to upwelling areas. In addition, zooplanktonic biomass recorded higher values in neritic waters than in pelagic and coastal waters.

7.1.3.3.5 The benthos

Information on the benthic communities of the Strait is limited due to the few and scattered studies in time and space. Furthermore, knowledge is mostly lacking on the main benthic communities on the offshore banks.

Hard substrates of infralittoral bottoms are dominated by the sea-grass meadows of Posidonia oceanica while deeper bottoms of the circalittoral are colonized by populations of large brown algae such as Cystoseira, Sargassum, and Laminaria as well as an array of other species.
The circalittoral are often sandy with grains ranging from coarse to very fine with abundant larger detritus of organic origin such as shell fragments and calcareous plants. These sedimentary bottoms host populations of green seaweeds, calcareous red algae (Maerl beds), sponges (e.g. Crambe crambe), cnidaria (e.g. Eunicella cavolini, Astroides calycularis), polychaetes (e.g. Serpula vermicularis), brachiopods (e.g. Argyrotheca cuneata), bryozoa, crustaceans (e.g. Lissa chiragra), echinoderms (e.g. Ophidiaster ophidianus), bivalves (e.g. Manupectenpes felis, Lima vulgaris) and sea squirts (Rhodosomacallense). In addition, the Strait of Sicily presents some species of sub-tropical origins such as the Portuguese sole Synaptura lusitanica and the corb Umbrina ronchus, Cynoponticus ferox, Facciolella oxyrhyncha, and Epigonus constanciae amongst many others.
The hard bottoms of the deeper bathyal layer are distinguished by huge, scattered clumps of 'white coral assemblages' making such grounds dangerous for trawl fishing and other activities on the sea floor. At higher depths, a less hard white coral, Dendrophyllia cornigera, also presents obstacles for activities taking place at the sea floor. In these areas, the most typical biological indicator species is the rare Sea pen Funiculina quadrangularis since its occurrence is closely related to the abundance of food supply. As for cartilaginous fishes, they are well and constantly represented by dogfishes (e.g. Etmopterus spinax, Scyliorhinus canicula) and skates (e.g. Raja oxyrinchus, R. miraletus).

7.1.3.4 Sensitive habitats

One of the main scopes of the study was to verify the presence of critical habitats, defined as areas with high biodiversity importance or value, including:
(a) habitat of significant importance to Critically Endangered or Endangered species;
(b) habitat of significant importance to endemic or restricted-range species;
(c) habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
(d) highly threatened or unique ecosystems.

Regarding the marine domain, the cable route crosses the Kelibia Important Marine Mammal Area (K-IMMA), the perimeter of which is shown in the following figure.
The trigger species for declaring the K-IMMA was the Mediterranean subpopulation of the Common bottlenose dolphin - *Tursiops truncatus* that was previously classified as Vulnerable.
Nevertheless, the IUCN Red List of Threatened Species re-assessed this subpopulation in 2021 and listed it as Least Concern (https://www.iucnredlist.org/species/16369383/215248781). Accordingly, the conservation status of this species in the area of works is not of main concern and the habitat cannot be considered as critical.

Figure 7.9: Cable route (in red) across Kelibia IMMA (perimeter in yellow)

7.1.4 Archaeological and historical finds

During the Offshore Survey one Archaeological and Historical target and two Historical targets have been identified. The post-survey route has been engineered keeping into account the survey data available in the surveyed corridor in order maximize as much as possible the distance from such targets (distance of the route from all of them is currently approx. 200m).
The Archaeological and Historical target Wreck “OSH_B7_ID0001” has been found in a fine sand sediment and classified as “Wreck”, with height of 0.54 m, length 34.50 m and width 8.09 m, a burial percentage of 30%, and material classified as “Metal – undefined”. For this target potential risk was classified as “Low”.

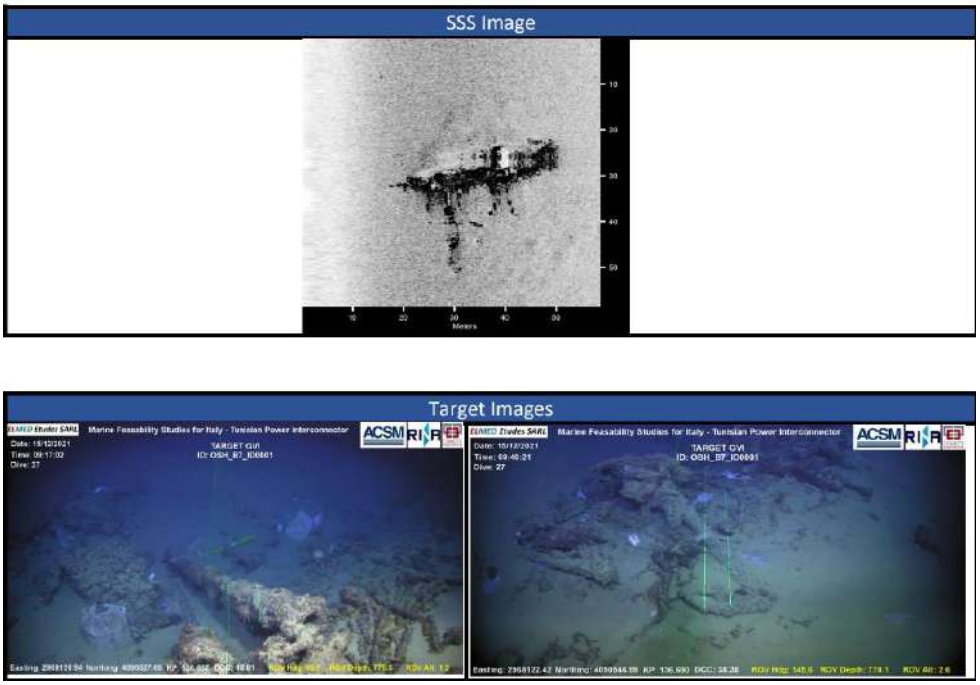

Figure 7.10: Sonar and ROV images of Archaeological and Historical target "Wreck OSH_B7_ID0001"

The Historical targets Metal Debris Area "OSH_B7_ID0002" and Engine "OSH_B7_ID0003" have been found in a fine sand sediment. The first one, "OSH_B7_ID0002", was classified as "Metal Debris Area", with length of 120.82 m and width of 91.07 m, with a low potential risk. The second target, "OSH_B7_ID0003", was classified as "Engine", with a length of 2.75 m, height 0.70 m, and width 2.53 m, with a low potential risk.

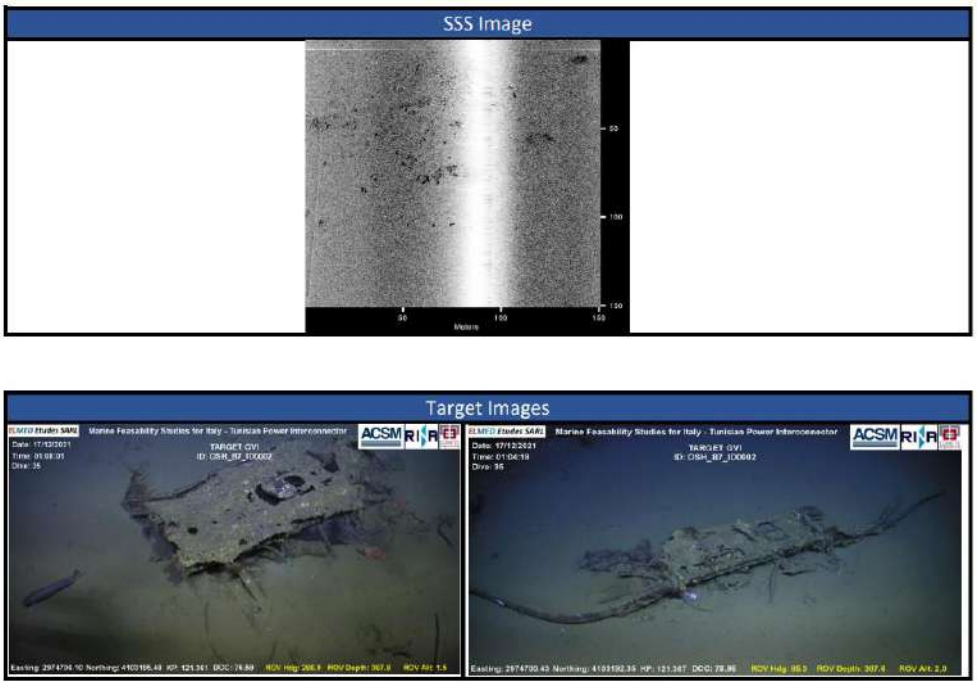

Figure 7.11: Sonar and ROV images of Historical target "Metal Debris Area OSH_B7_ID0002"

7.2 Terrestrial domain

7.2.1 Geology and geomorphology

The Cap Bon peninsula, oriented South-West / North-East, appears as a vast folded zone of which the Djebel Sidi Abderrahmene (Tunisian part of the Atlas Mountain chain) anticline constitutes the backbone. The eccentric position towards the West of this mountainous ridge, limited by the plains of Grombalia to the South, El Haouaria to the North, Takelsa to the West and Dakhla to the East, gives Cap Bon a dissymmetrical appearance.

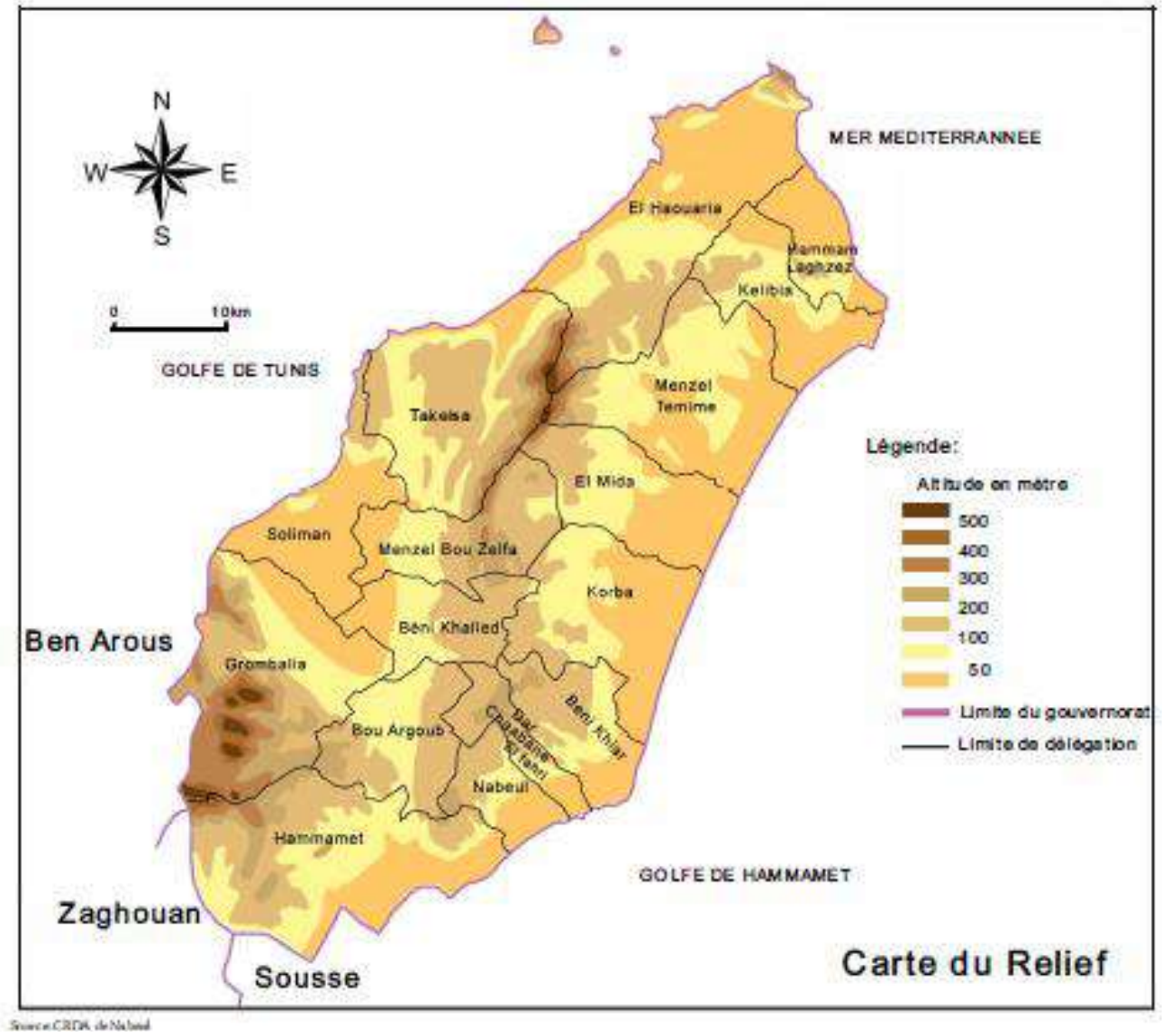

Figure 7.12: Topographic map of Nabeul

The western slope is steep and the coasts are rugged, rocky or overgrown with dunes. This steep western ridge contrasts with small, fragmented and much effaced ridges, almost flattened on the eastern flank. To the east, in fact, the foothills gradually descend to the sea; ancient beach formations, dunes and elongated lagoons border the coastline.

Cap Bon region is mainly an anticlinal structure under the Mount of Jbel Abderrahmen or Oued Chiba, the stratigraphic series is essentially of Moi Pliocene age and is presented by a succession of marly and sandy or sandy banks. The anticline of Jbel Abderrahmen is

bordered on its east-west flanks by two synclines formed essentially of marly layers; the synclines of Takelsa in the west and Dakhla in the east.
Jbel Abderrahmen anticline constitutes, in fact, a set of mountains that culminate at more than 600m. These different reliefs are subject to a pronounced erosion. Indeed, the center of the anticline which should present the maximum bulge, was eroded by the wadi Chiba to form an ovoid anticlinal combe of 15 km long and 7 km wide, notched in the Eocene marls.

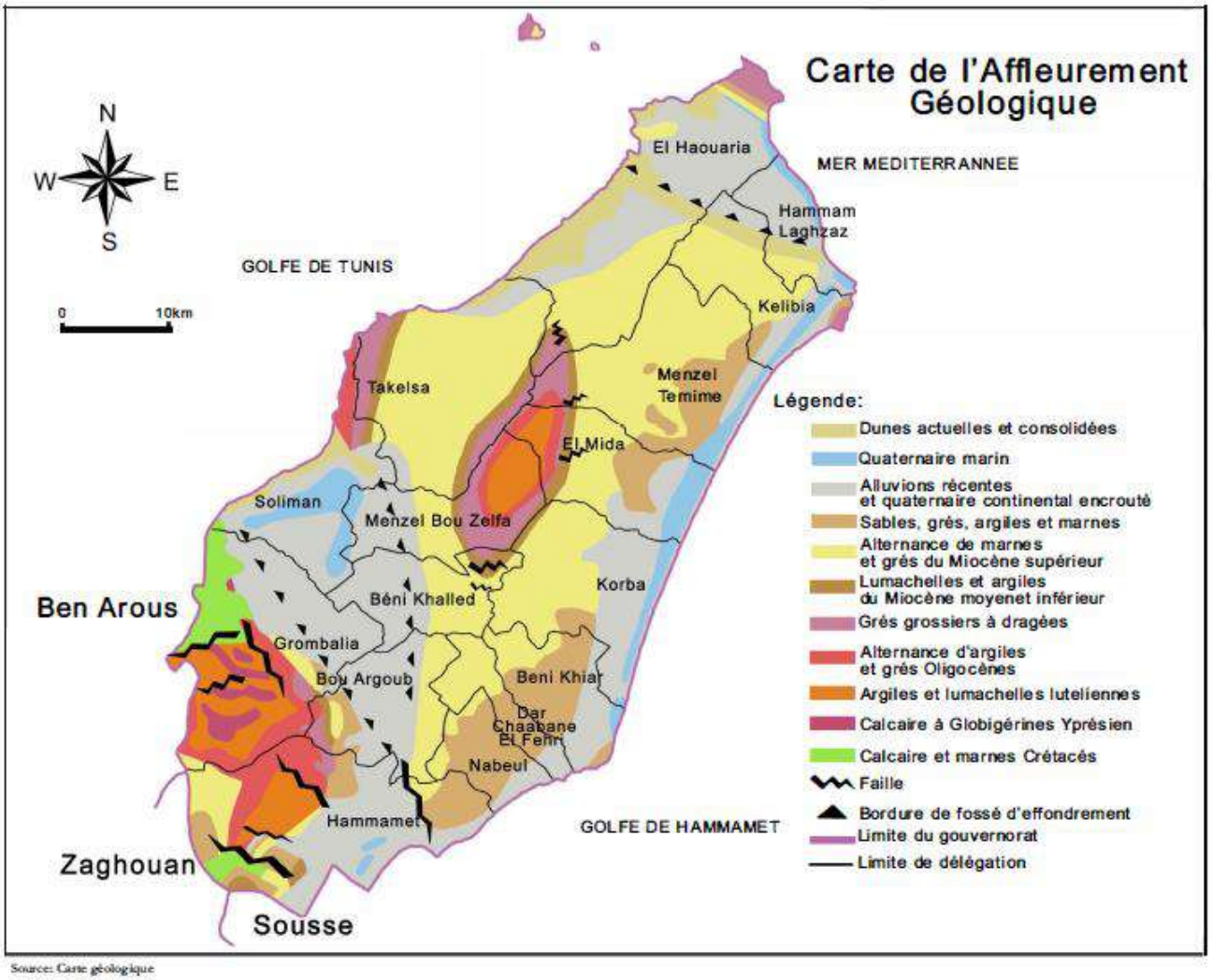

Figure 7.13: Geological map of Nabeul (source Atlas of Nabeul)

7.2.2 Hydrogeology and hydrology

A dense hydrographic network characterizes the Cap Bon region, as shown in the following figure.
The aquifer system in the region can be distinguished into two; that of the eastern coast and that of the western coast, both governed by different characteristics related to the geological and geophysical nature of the reservoirs, as well as their distribution. The east coast has two aquifers:

- surface: housed in Quaternary deposit,
- deep: housed in Pliocene deposit.

These two aquifers are overlapped hydraulically and lithologically: no impermeable separating layer has been identified.

Figure 7.14: Hydrographic network in the project area

7.2.3 Biodiversity

Natural habitats are areas composed of viable assemblages of flora and/or fauna species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.
Critical habitats are areas with high biodiversity importance or value, including:
(a) habitat of significant importance to Critically Endangered or Endangered species;
(b) habitat of significant importance to endemic or restricted-range species;
(c) habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
(d) highly threatened or unique ecosystems.

The identification and the analysis of existing natural habitats in the Project's Area of Influence (AoI) was carried out based on detailed site visits and by application of the Integrated Biodiversity Assessment Tool (IBAT[1]), completed with bibliographic resources.
This lead to identify in the larger AoI of 14 Protected and Key Biodiversity Areas (KBA) from which 5 KBA are located inside the AoI (buffer of 6 km each side of the line): Barrage (Dam) Oued El Hjar; Barrage Mlâabi; Barrage Sidi Abdelmoneem; Barrage Lebna; Barrage Chiba; and

[1] https://www.ibat-alliance.org/

Aqueduc de Zaghouan. The 4 first dams (barrage) cited above are Artificial Wetland classified internationally as Ramsar Areas.
The other KBA are located at between 0.5 km (Jbel Boukornine) and 14 km (Jbel Zaghouan) of the AoI.
The areas are shown in the following figure.

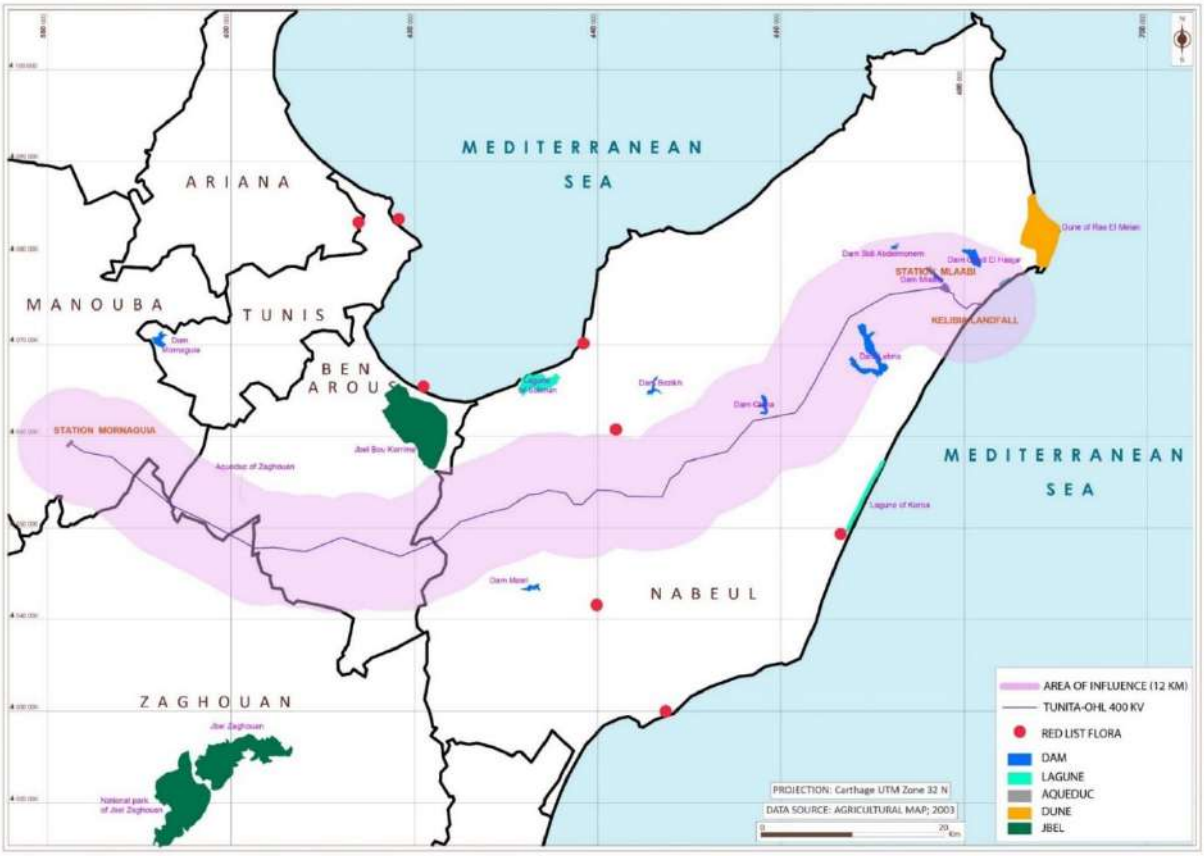

Figure 7.15: Protected and Key Biodiversity areas close to the Area of Influence of the project (source: IBAT)

Mlaâbi reservoir (IBA site TN006)

Located at around 500 m from the CS and OHL line, with an area of 200 ha, it is a man-made water body built for irrigation of local agriculture (cereal and olive tree plantations). Is an important area for many waterbirds species and considered also an important stop-over area for migrating birds crossing the Cap region before joining Garaet El Haouaria and after Europe. In particular it is an important site for *Oxyura leucocephala* (VU) and *Marmaronetta angustirostri*s (VU), where the two species breed.

Lebna reservoir (TN012)

With an area of 1000 ha it is considered the biggest artificial reservoir of the northern Cap Bon region. Flora species present in the area provide nesting habitat and cover for many waterbirds. Birds species observed within the area include two species with conservation concern *Oxyura leucocephala* (20–50 birds in winter) and *Marmaronetta angustirostris* (50–100 birds in winter). It also attracts other breeding species, such *as Porphyrio porphyrio, Tachybaptus ruficollis, Podiceps cristatus, Fulica atra.* and *Elaneus caeruleus*. It is an important site for waterbirds species as *Plegadis falcinellus, Platalea leucorodia*, but also for storks, waders and terns.

Oued El Hjar reservoir (RAMSAR site NO2013)

One of the biggest freshwater reservoirs in Cap Bon region covering 254 ha and constructed to provide water for agricultural purposes (cereal farming, animal rearing, vegetable and tobacco cultivation). The site is important for migratory, nesting and wintering species, including *Oxyura leucocephala* (up to a hundred in winter season) and *Marmaronetta angustirostris* (more than 4 000 in October 1999). It is also a favourite site for *Arythya nyroca*, *Oxyura leucocephala* and *Phoenicopterus roseus*.

Sidi Abdelmoneem (IBA site TN008)

A small man-made reservoir covering 250 ha; the natural vegetation present near the reservoir include *Phragmites australis*, *Typha angustifolia* and some *Juncus* species. It is considered as an important site for vulnerable species *Oxyura leucocephala* and *Marmaronetta angustirostris*, the reservoir is also a favorite site for many other species of waterbirds such as *Anas platyrhynchos, A. querquedula, A.clypeata, A. acuta, Aythya ferina, Fulica atra* and *Porphyrio porphyrio*.

The following figure shows classified sensitive natural areas potentially affected by the project: in the area of influence of the project they include some coastal wetlands: Lagunes du Cap Bon Oriental (4 sebkhas).

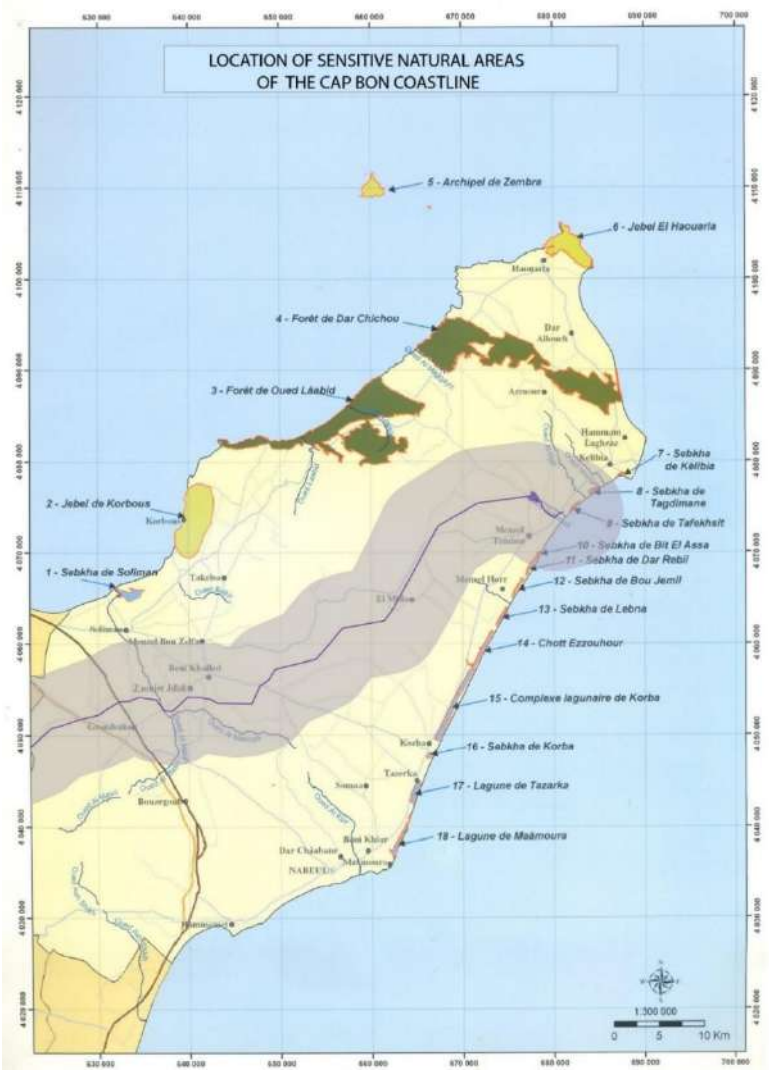

Figure 7.16: Sensitive Natural areas of Cap-Bon

Based on field visits three main types of habitats were identified in the Project area:

- Farming land
- Forest and scrubland areas
- Wetland and water reservoirs

The agricultural land is divided between arboriculture (olive trees, vines and citrus fruits), followed by cereal and market garden crops.

The only specified vulnerable flora taxa is *Leopoldia maritima* (VU): the IBAT Tool identified 8 spots of this red list specie in the Area of Influence of the project.

Agricultural land (cereal, annual crop) on flat land near Menzel Temime (Nabeul)

Agricultural land (olive tree plantations) between Beni Ayache et Bir Drassen (Nabeul)

A tower (OHL 90 kV) installed in a vineyard near Menzel Bouzelfa Nord (Nabeul)

Two existing power transmission lines installed on agricultural land between El Mida et Menzel Temime

Forest area with pine and olive tree, and scrubland in the upper areas (Khanguet EL Hojjej, Nabeul)

Scrubland with Pistacia lentiscus (Between Kabouti and Jebel Ressas)

Wetland- Barrage Mlaâbi (RAMSAR and IBA site) near the CS and OHL

Wetland-Barrage Chiba (a key biodiversity area) located at 500 m from the OHL corridor

Figure 7.17: Main habitats in the area of influence of the project

In Cap-Bon region, the avifauna is one of the richest in the country. The Cap Bon region contains several coastal lagoons and sebkhas with temporary water bodies, which fill up during the winter and dry up during the summer, except the sebkha of Soliman and the lagoon of Korba, which are characterized by a permanent water body throughout the year. These water bodies shelter a high biological wealth, including algae and microalgae, fishes and birds.

Forest areas in the area (scrub, natural forest, plantations) and wetlands provide a favourable habitat for several nesting and migratory species of birds. Forest plantation areas, especially in Dar Chichou and Rtiba, are mainly occupied by eucalyptus, pines, acacia and offer a suitable environment for many Fringillidae species.

Bird species classified as vulnerable or endangered, according to the red list of IUCN, and may be affected by the Project, in particular the OHL component, are as follow:

- White-headed Duck (*Oxyura leucocephala*) (EN)
- Marbled Teal (*Marmaronetta angustirostris*) (VU)
- Egyptian Vulture (*Neophron percnopterus*) (EN)
- Saker Falcon (*Falco cherrug*) (EN)
- Lesser kestrel (*Falco naumanni*).

Other fauna endangered species (fish, insects and reptiles) in the project area are:

- Punican Bleak (*Anaecypris punica*)
- Tunisian Bleak (*Tropidophoxinellus chaignoni*)
- *Thorectes puncticollis*
- Blanc's Fringe-toed Lizard (*Acanthodactylus blanci*)
- North African Shad (*Alosa algeriensis*)

The Cap-Bon peninsula is considered as an important feeding area and essential stopover for many migratory birds (including birds-of-prey and large soaring birds) on their seasonal journeys between Europe and Africa across the Strait of Sicily: around 71 bird species were inventoried in the area.

Migrations are diurnal in raptors, storks, cranes, swallows, swifts and grain-eating birds, nocturnal for several waterbirds.

Three migratory flows have been identified.

- **The spring migration** which extends from March to June, with Africa-Europe direction. This migration is characterized by flights in flocks comprising a large number of individuals. Spring migration is rapid, and birds returning to their nesting grounds are therefore in a hurry to reproduce.

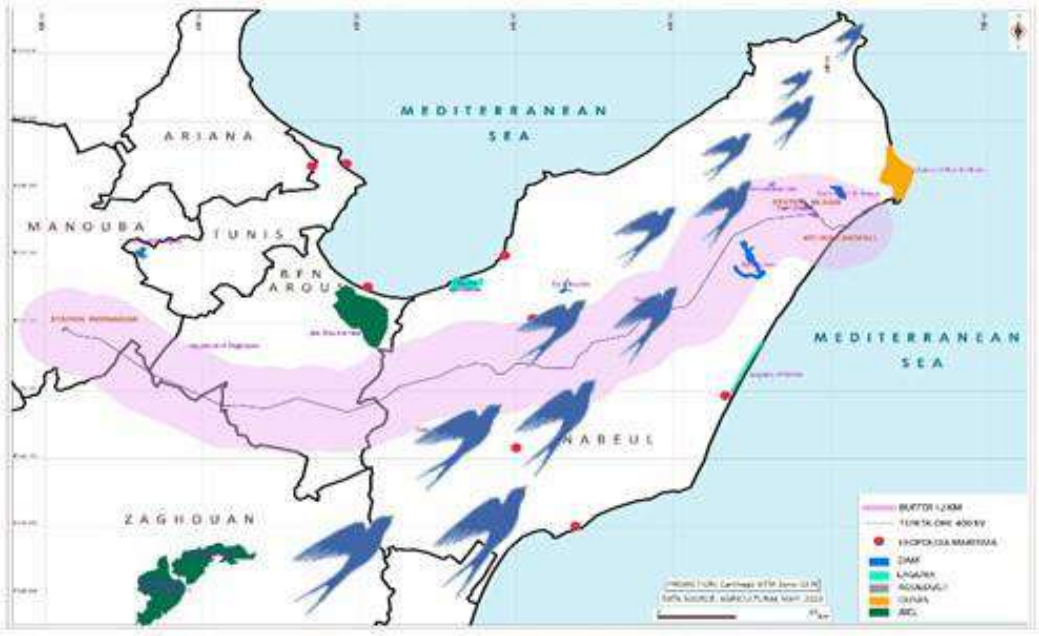

Figure 7.18: Spring migration corridor

- **The autumn migration** which extends from September to November in the Europe-Africa direction. The birds that migrate during this period are much more dispersed with several stopovers along the way.

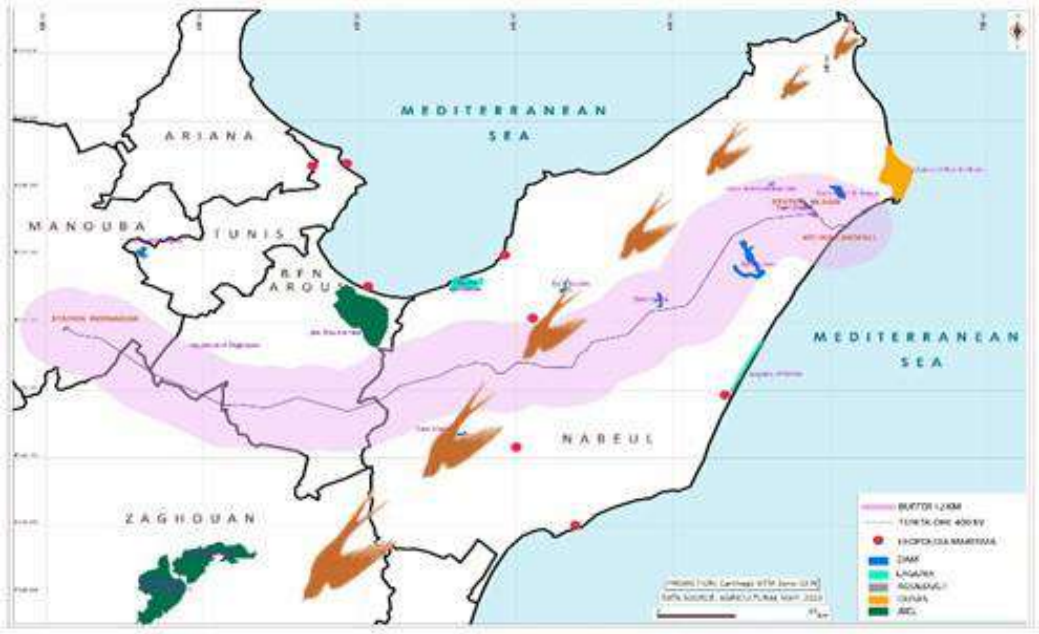

Figure 7.19: Autumn migration corridor

- **The winter migration** of water birds (ducks, geese) starting by the end of November from Europe to Africa, and by the end of February for the comeback.

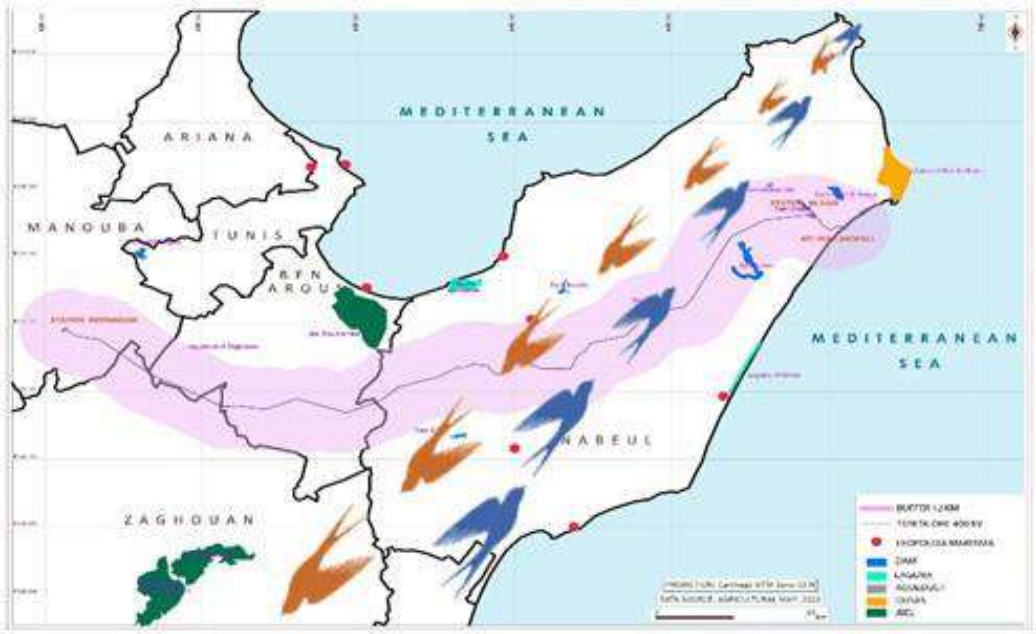

Figure 7.20: Winter migration corridor

7.2.4 Land use

The following map illustrates land use in the study area: agriculture (irrigated and rainfed) is the main land use in the region.
The flatlands between Menzel Temime and El Mida are used mainly for cereal growing and some areas of arboriculture (olive and citrus).
Areas around Menzel Bouzelfa, Beni Khalled and Grombalia are mainly used for arboriculture with citrus plantations and some areas of olive trees.
The areas between Bir Mchergua (Zaghouan) and Mornaguia (Manouba), are used for cereal growing.
The hilly areas are occupied by forest formations and scrub: this refers to the areas between Bni Ayach and Bir Drassen (Jbel Abderrahman) and the parts located between Jbel Ressas and the hilly areas of Zaghouan.

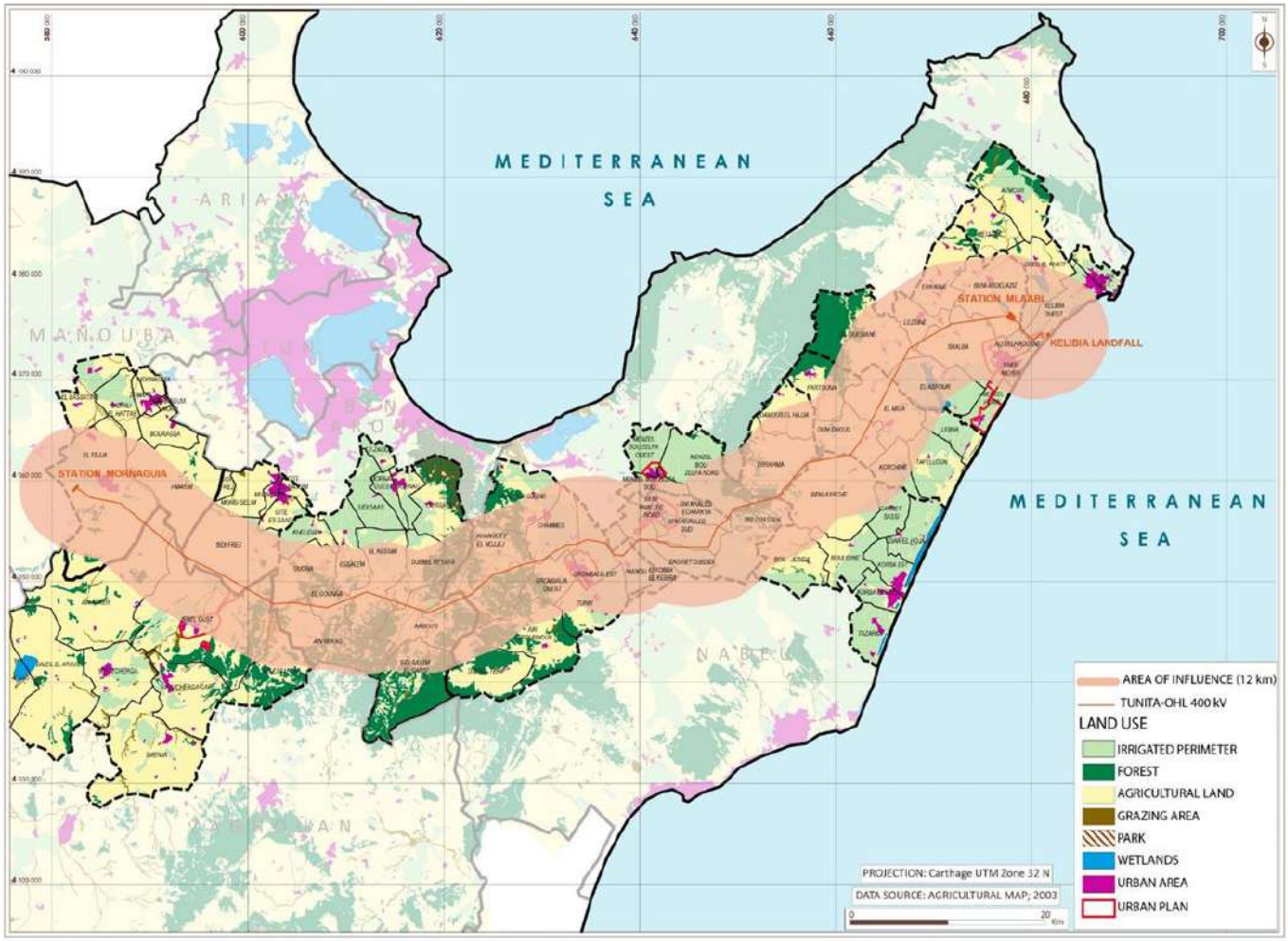

Figure 7.21: Land use

7.2.5 Landscape

The area between the landfall at Kelibia and he Mlaâbi CS is characterised by a predominantly flat morphology.

On the other hand, the OHL route crosses flat land between Menzel Temime and El Mida, between Beni Khalled and Grombalia and towards Mornaguia and also passes by relatively

uneven grounds towards Beni Ayech, Khanguel El Hojjej and over a large part located in Ben Arous.

There is an agricultural use of the soil, with the presence of tree crops, mainly olive groves and, to a lesser extent, vineyards and orchards (citrus groves especially in Menzel Bouzelfa and Beni Khalled delegations) and annual crops (cereal) widespread in the delegations of Menzel Bouzelfa and El Mida (Nabeul) and in the sections located in Zaghouan, Ben Arous and Manouba.

Although most of the area is heavily transformed by agricultural activities, the OHL line will also cross natural areas occupied by forest, especially between Nabeul and Ben Arous (Khanguel El Hojjej and Kabouti).
Based on the field observations, the following landscapes have been identified.

Landscape	**Key characteristics**
Residential and commercial (including industrial areas)	landscape dominated by human activities housing, commercial, roads and traffic and industrial activities  
Agriculture/annual crop	Areas of agriculture Medium to large scale farming land Annual crop (cereal) within an open landscape 

Landscape	Key characteristics
Agriculture/ arboriculture	Areas of agriculture: citrus orchards around Menzel Bouzelfa, Beni Khalled and Grombalia Small to medium scale land Area for citrus safeguarding 
Forest and scrubland areas	Areas occupied by forest and scrub cover on the mountains between Nabeul, Zaghouan and Ben Arous 
Wetlands	Natural and artificial wetlands (constructed for drinking water supply and agriculture) in the Cap Bon region 

8. SOCIAL BASELINE

8.1 Introduction

The contents of the socioeconomic baseline are the pursuit of the following specific objectives:

- Identify the key features of identified socio-economic receptors and resources in the project area in their current state, before any change implied by the Project (ante-operam characterization);
- Provide elements from the analysis that inform the impact assessment;
- Identify potentially impacted geographic areas and population groups.

8.2 Project Area of Influence

The project is located in the North-East of Tunisia. The terrestrial parts of the project (underground cable, Mlaâbi CS and OHL 400 kV line) crosses four governorates: Nabeul, Ben Arous, Zaghouan and Manouba.

The project crosses seven delegations in the Nabeul governorate (Kelibia, Menzel Temime, El Mida, Korba, Menzel Bouzelfa, Beni Khalled and Grombalia); two delegations in the governatorate of Ben Arous (Mornag and Mhamedia); one delegation in the governatorate of Zaghouan (Bir Mchergua); and one delegation in the governatorate of Manouba (Mornaguia).

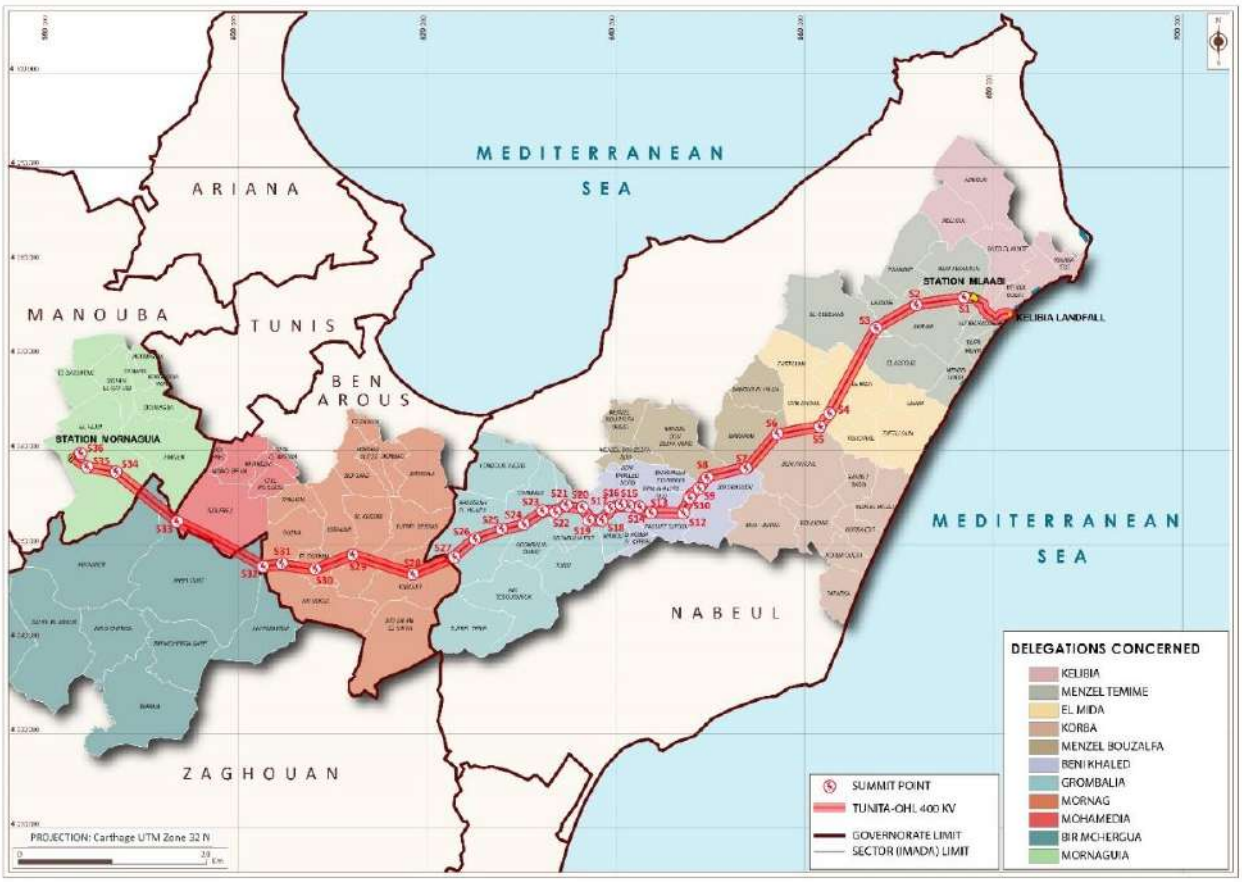

Figure 8.1: Project AoI

8.2.1 Nabeul Governorate

Located in the extreme North-East of the country and surrounded by the Mediterranean on both sides (north and east), the governorate of Nabeul or the "Cap-Bon Region" is the country's first seaside resort constitutes an important strategic geographical position in the heart of the Mediterranean Sea. The governorate of Nabeul covers 2,822 km², representing 1.8% of the country's total surface area and extending over 200 km of coastline. The region is also known for its agricultural wealth and touristic and industrial potential. The governorate of Nabeul has 16 delegations.

Figure 8.2: Administrative division of the governorate of Nabeul

8.2.2 Ben Arous Governorate

The governorate of Ben Arous comprises 12 delegations and covers an area of 790 km².

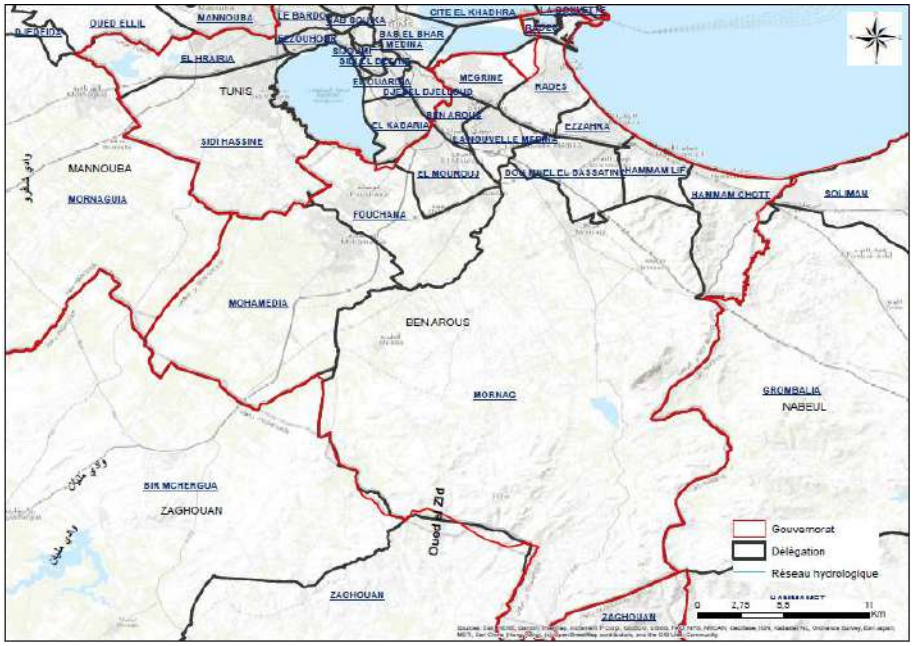

Figure 8.3: Administrative division of the governorate of Ben Arous

Table 8.1: Ben Arous delegation's list

Delegation			
Ben Arous	Hammam-Lif	Ezzahra	M'hamdia
Nouvelle Médina	Hammam-Chatt	Radés	Fouchana
El Mourouj	Bou M'hel El Bassatine	Mégrine	Mornag

8.2.3 Zaghouan Governorate

The governorate of Zaghouan is located in the North-East of the country and covers an area of 2,820 km² (1.7% of the country's surface area). The governorate is situated 51 km from the capital and is bounded by the Governorates of Ben Arous and Manouba in the North; the governorates of Sousse and Kairouan in the south; the governorates of Siliana and Béja to the West.

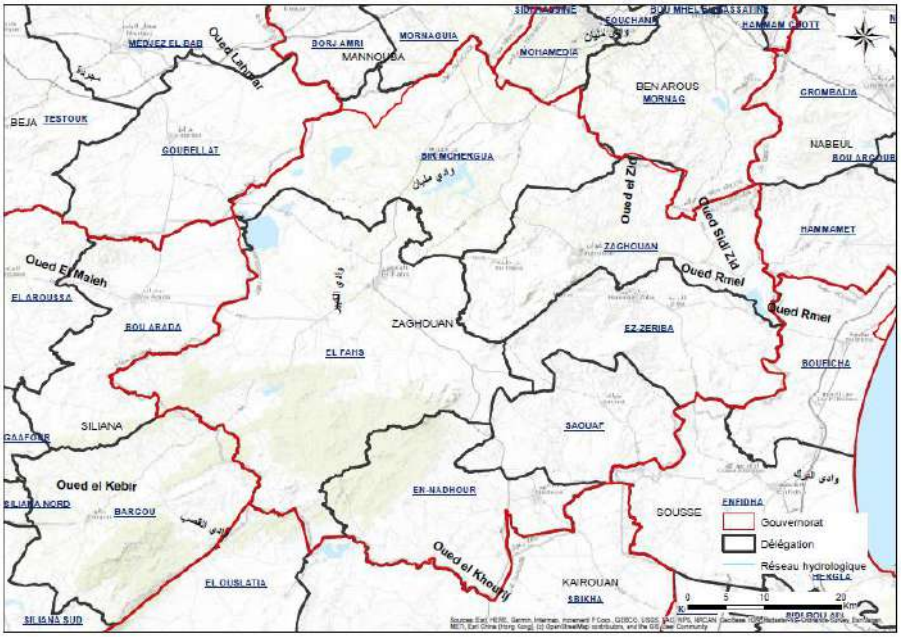

Figure 8.4: Administrative division of the governorate of Zaghouan

The governorate of Zaghouan is composed of six delegations: Bir Mcherga, El Fahs, Nadhour, Saouaf, Zaghouan, Zriba.

8.2.4 Manouba Governorate

The governorate of Manouba is located in the North-East of the country, and forms with the governorates of Tunis, Ariana and Ben Arous the District of "Grand-Tunis". Its total surface area is 1137 km², i.e. 1.12% of the total surface area of the country.

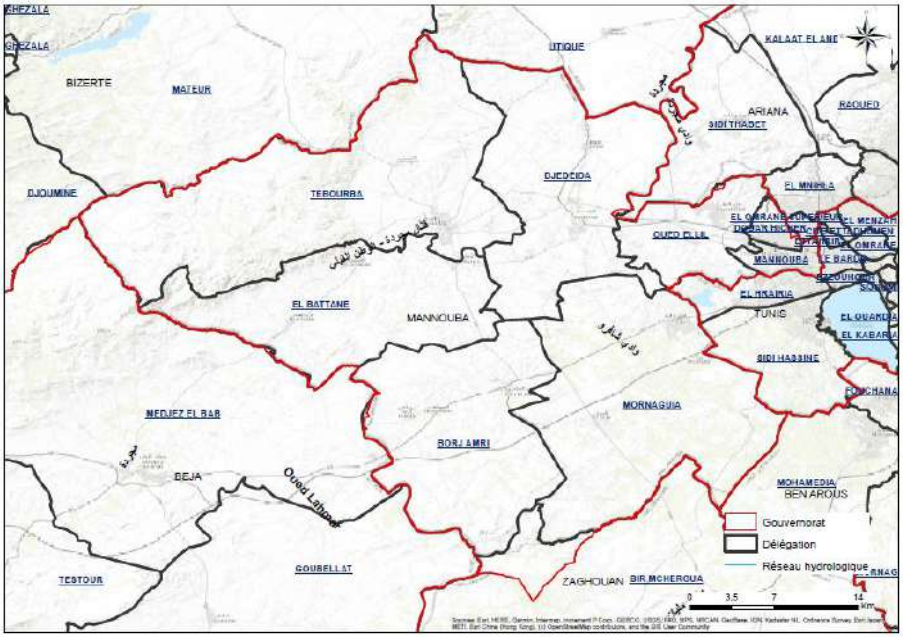

Figure 8.5: Administrative division of the governorate of Manouba

The Governorate of Manouba is composed of 8 delegations, 47 sectors and 9 communes.

8.3 Demographic trend

8.3.1 Population of the project area

total population of the governorates concerned by the project is estimated at 2,194.258 inhabitants in 2020, while the population of the delegations concerned is estimated at 602,496 inhabitants in 2020:

Table 8.2: Distribution of the population by Delegation

Governorate	Population in 2020	Delegation	Population in 2020
Nabeul	866 412	Kelebia	62 486
		Menzel Temime	70 600
		El Mida	29 478
		Beni Khalled	41 082
		Korba	75 263
		Grombalia	76 293
		Menzel Bouzelfa	41 123
Ben Arous	714 801	Mornag	64 756
		Mohamedia	81 422
Zaghouan	190 205	Bir mchergua	26 479
Manouba	422 840	Mornaguia	33 514
Total	2 194 258	Total	602 496

The most populated delegation in the project area is Mhamedia, with more than 81,000 inhabitants, while the Bir Mcherga is the least populated with just over 26,000 inhabitants.

8.3.2 Distribution of the population by age groups

The population of the project area is relatively young: 45% of the population is under 30 years old, while the population over 60 represents 13%.

8.3.3 Distribution of the population by gender

The gender distribution population of the project area is fairly balanced. Indeed, men represent 50.1% of the population and women represent 49.9%. EDUCATION

8.3.4 School enrolment and distribution of teachers for basic education

The project area has 65 642 students, 48% girls. The delegations of Menzel-Temime, Korba and Mhamadia have the highest number of students. The total number of teachers is 3,282 teachers. Female teachers represent on average 72% of the teaching staff. The average student-to-teacher ratio is 20. The highest ratio is in the delegation of Bir Mcherga (23) and the lowest is in the delegation of El Mida (17.4).

8.3.5 Education Infrastructure

The delegations concerned by the Project include 206 primary schools and 1,335 classrooms. The figure below lists the primary schools and classrooms existing in the project area by delegation:

The delegation with the largest number of primary schools and number of classrooms is Mornag. The project area has also 132 middle and high schools. These institutions have 1174 general study classrooms and 454 specialized study classrooms.

The figure below shows the distribution of infrastructure for the second cycle of basic education and secondary education.

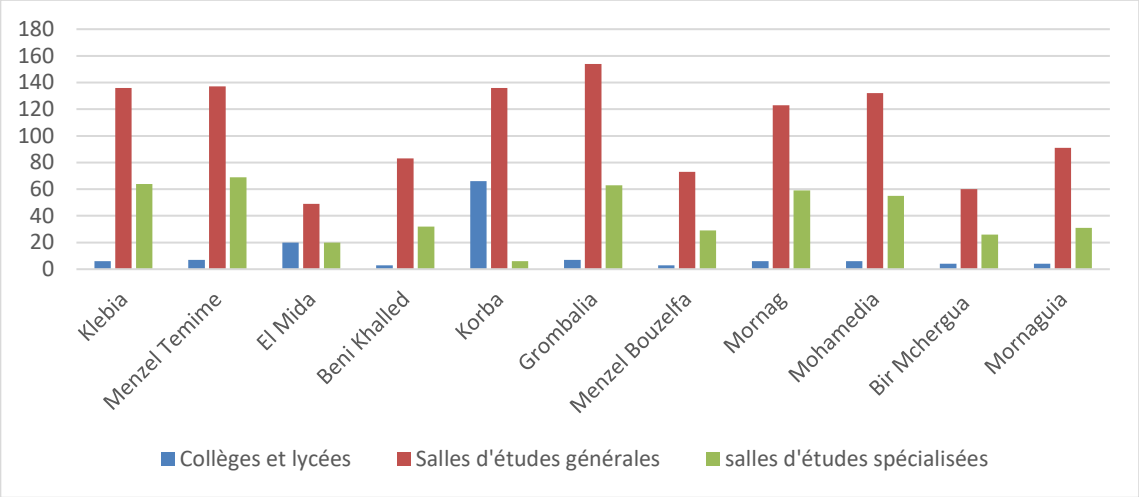

Figure 8.6: Upper basic and secondary education infrastructure

8.4 Public health

8.4.1 Public health infrastructure and equipment

The table below describes the distribution of public health infrastructure and equipment in the project area:

Table 8.3: Distribution of public health infrastructure and equipment

	Hospitals Reg ., of cir . and united.	Operating rooms	Number of beds	Basic health centers	Nbr of laboratories
Nabeul	11	21	1040	115	17
Ben Arous	1	12	364	47	7
Zaghouan	4	5	507	45	6
Manouba	3	8	976	41	6

Despite the availability of health infrastructures in the four governorates, these infrastructures are quite poor. Indeed, most establishments suffer from a lack of equipment and staff.

8.4.2 Medical staff

The following table gives the distribution of medical personnel in the governorates concerned by the project:

Table 8.4: Distribution of medical staff

Governorate	Generalists		Specialists		Dentists		Pharmacists	
	Audience	Private	Audience	Private	Audience	Private	Audience	Private
Nabeul	126	267	110	391	40	320	19	187
Ben Arous	105	226	84	344			8	203
Zaghouan	66	38	30	33	13	23	10	32
Manouba	71	121	109	53			12	74

The table shows an imbalance in the geographical distribution of medical personnel in the project area. Indeed, in the case of the governorate of Zaghouan, the lack of specialists is flagrant.

8.5 Infrastructures and services

8.5.1 Road infrastructure

The national road network totals 19,782 km of roads, distributed as follows:

- Local roads: 5,928 km;
- Regional roads: 6,513 km;
- National roads: 4,750 km;
- Roads under classification: 1,979 km;
- Highways: 612 km.

8.5.2 Water Supply

The drinking water supply rate in the project area is almost equal to 100%. The total population served is 2.2 million. The following table describes the situation by Governorate. Among the four governorates concerned by the project, the lowest Drinking Water Supply (DWS) network connection rate is observed in the Zaghouan region (85.8%), while the highest is observed in Ben Arous (99.8%) as shown in the table below.

Table 8.5: Household connection rate to the DWS network

Governorate	Nabeul	Ben Arous	Zaghouan	Manouba
Household water connection rate	95.30%	99.80%	85.80%	98.90%

Despite the high figures, the drinking water supply is experiencing significant disruption due in particular to the state of the distribution network and the drought that the country is experiencing.

8.5.3 Wastewater Management

The total number of households connected to the sanitation networks is 473,200 households. The table below details the number of families connected to the sanitation network and the connection rate by Governorate.

Table 8.6: Number of households connected to the sanitation network and the connection rate

Governorate	Nabeul	Ben Arous	Zaghouan	Manouba
Number of households connected to the sanitation network	166,800	184,200	25,400	96,800
Household connection rate to the sanitation network	69.70%	91.60%	49.40%	79.90%

The table shows an imbalance between regions in terms of connection rate. Indeed, while the Zaghouan region has a sanitation network connection rate of 49.4%, the Ben Arous region has a rate of 91.6%.

8.6 Energy

The household connection rate to the electricity network is around 100%, and the number of connected households is 612 500, as shown in the table below.

Table 8.7: Access rates to electricity by governorate

Governorate	Nabeul	Ben Arous	Zaghouan	Manouba
Rate of connection of households to the electricity network	99.90%	99.90%	99.80%	99.90%
Number of households connected to the electricity grid	239 100	201,000	51,400	121,000

8.7 Economic activities

The governorates concerned cover a total area of 746,508 ha. The local communities' means of livelihood are predominantly based on crop farming. Fishing activities do occur but are not a main source of livelihood for the local communities. The impact on local communities' livelihoods are therefore mostly limited to the land acquisition process during pre-construction and construction, and to changes in the river flow during operation. During construction, no construction activity will occur outside the Project's footprints. Some impacts on fishing activities are expected during construction, while no impact on fishing activities are expected during operation. Agricultural land represents 68%, non-farmable land represents 8%, while forests and pastures represent 24%.

8.7.1 Agriculture

Agriculture is the most important economic sector in the project area. The figure below shows agricultural production by type and by governorate.

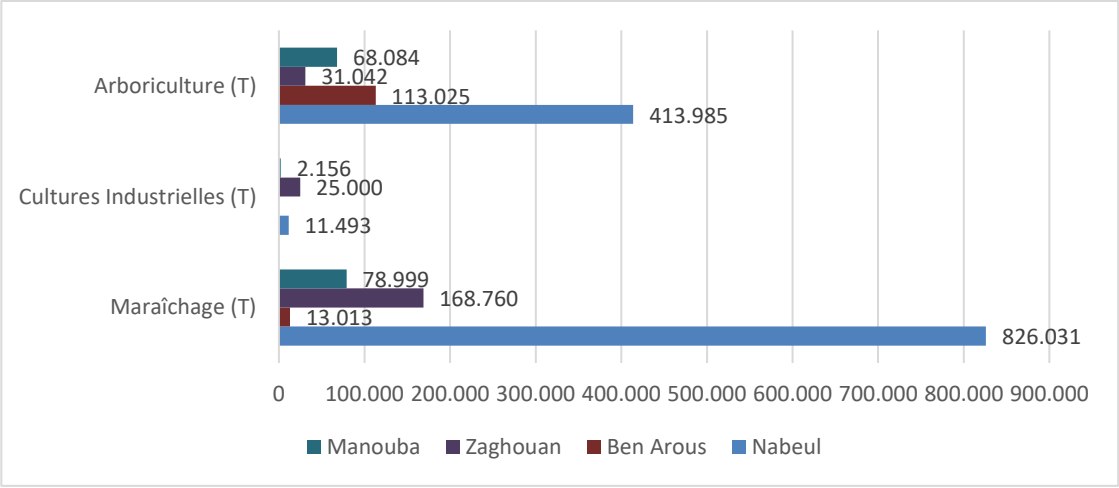

Figure 8.7: agricultural production by type and by governorate in 2020

Vegetable crops is the dominant agricultural activity in the four regions. In 2020, the total vegetable production is 1,086,803 tons, the total production of tree fruits is 626,136 tons.
The delegations of Mornag, Beni Khalled and Menzel Bouzelfa are the delegations that produce the largest quantities of fruit with 101,925 T; 8,589 T and 78,409 T respectively.
Industrial crops are only present in 5 delegations. The figure below shows the production of industrial crops by delegation in 2020:

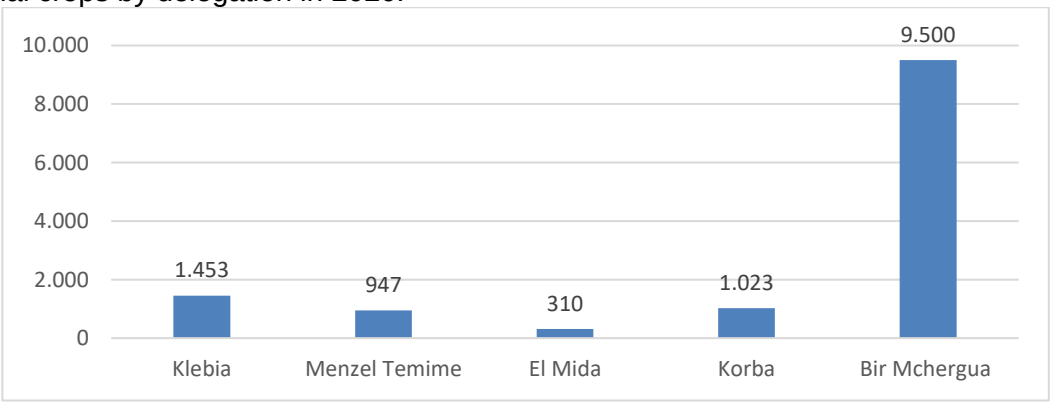

Figure 8.8: Production of industrial crops by delegation in 2020

Bir Mcherga's is the delegation that produces the largest quantities of industrial crops with 9500 tons.

8.7.2 Livestock

Livestock is a significant activity in the four governorates. There are cattle, sheep, goat and poultry farms. The figure below gives the size of livestock and the number of poultry units in the 4 governorates.
The four regions total 71,144 cattle; 530,127 sheep; 84,287 goats and more than 15 million poultry.
Korba and Menzel Temime delegations have the largest number of head of cattle. For sheep, goat and poultry farming, the Mornag delegation is the largest with 47 102 sheep; 9 609 goats and 3.745 million poultry.
In recent years, breeders have encountered much difficulty due to the drought, which has reduced grazing areas. In addition, the rise in feed prices for animal feed is making it difficult to maintain this activity.

8.7.3 Fishing and Aquaculture Activities

Among the four governorates concerned, only two are coastal regions: the governorate of Nabeul with 698 fishing fleets and the governorate of Ben Arous with 312 fishing fleets. Fishing production is 15,008 tons for Nabeul and 244 tons for Ben Arous. The fishing sector employs 3,410 people in the governorate of Nabeul and 624 people in Ben Arous.

8.7.4 Tourism

The tourism sector is one of the sectors that creates the most direct and indirect jobs. In 2019, tourism employed 11.14% of the working population. At the National Level, tourism is based on mass seaside tourism. The table below details the availability of reception facilities in the 4 governorates.
Cap Bon is one of the country's most important tourist centers and highly developed tourist activities in the governorate of Nabeul. This governorate has 157 classified hotels and a capacity of 50,881 beds.

8.7.5 Industry

The industrial fabric in the four regions is quite dense and varied. The types of industry present in these regions are:

- Food Industry (IAA);
- Building Materials, Ceramics and Glass Industry (IMCCV);
- Mechanical and Metallurgical Industries (IMM);
- Electronics, Electrical and Appliance Industries (IEEE);
- Chemical Industries;
- Textile and Clothing Industry (ITH);
- Wood and Cork Industry and Furniture (IBLA);
- Leather and Footwear Industry (ICC);
- Miscellaneous industry (ID).

The composition of the industrial fabric of each governorate is shown in the figure below:
The delegations of Grombalia, Korba and Bir Mcherga concentrate the largest number of industries with 130; 93 and 88 industrial units.
The industrial sector is the most important in terms of job creation in the project area. Industry employs 118 348 people. The figure below shows the number of people employed in the different industry types by delegation.

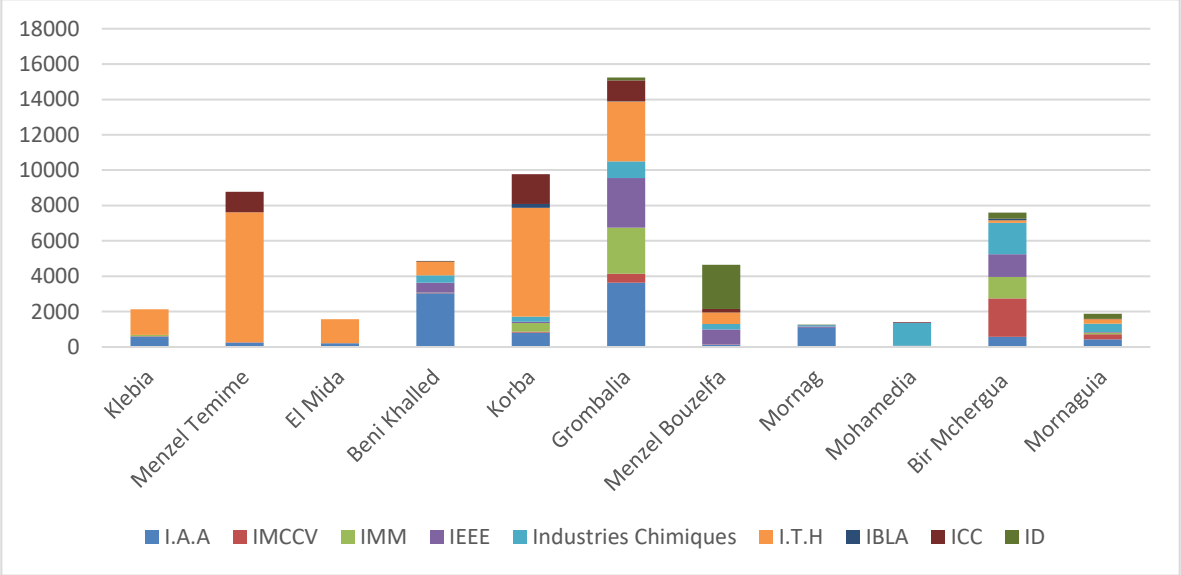

Figure 8.9: Number of people employed in the different types of industry by delegation

The textile and clothing industry is the industry that offers the most jobs (21,503 jobs), followed by the agro-food industry (10,825 jobs).

8.8 Poverty and inequalities

8.8.1 Poverty rate

The poverty rate at the national level is 21% of the population in 2020. The following figure gives the poverty rates by delegation.

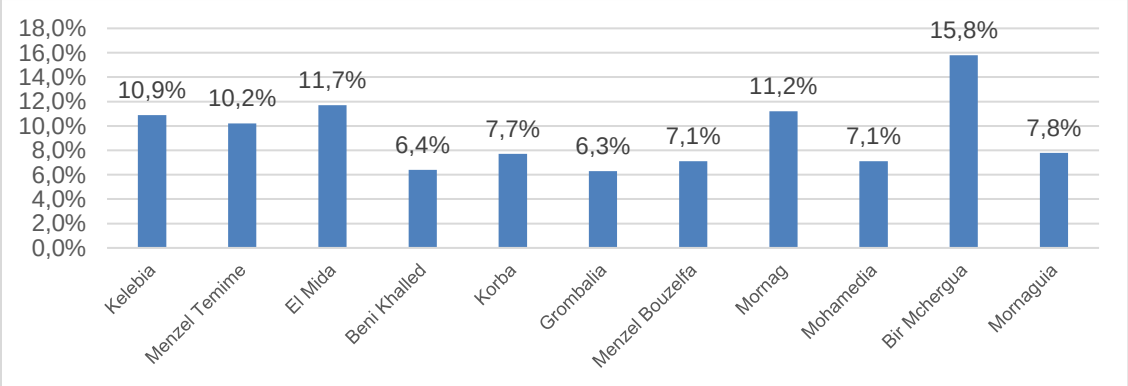

Figure 8.10: Poverty rate

The highest poverty rates are observed in the delegations of Bir Mcherga (15.8%), El Mida (11.7%) and Mornag (11.2%), but they are all below the national mean level.

8.8.2 Unemployment

The unemployment rate at the national level was 16.1% of the population in 2020. The following figure gives the unemployment rates by region in 2019:

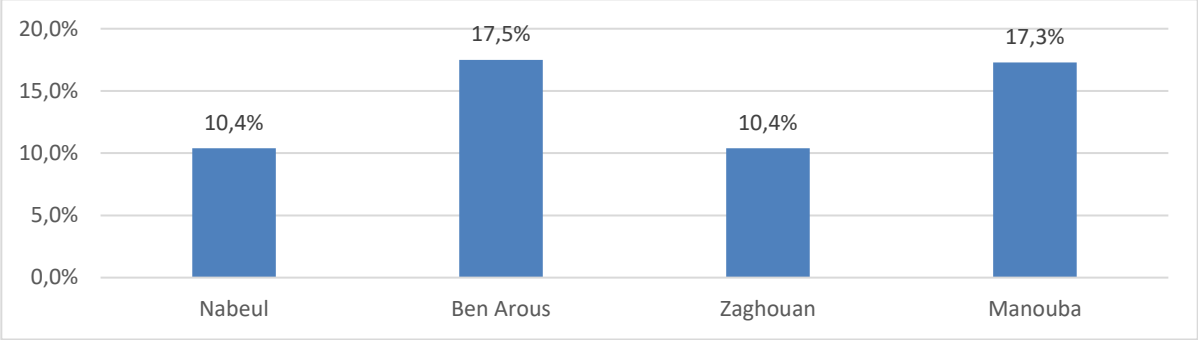

Figure 8.11: Unemployment rate by region June 2019

The figure below describes the evolution of the unemployment rate at the national level by gender:

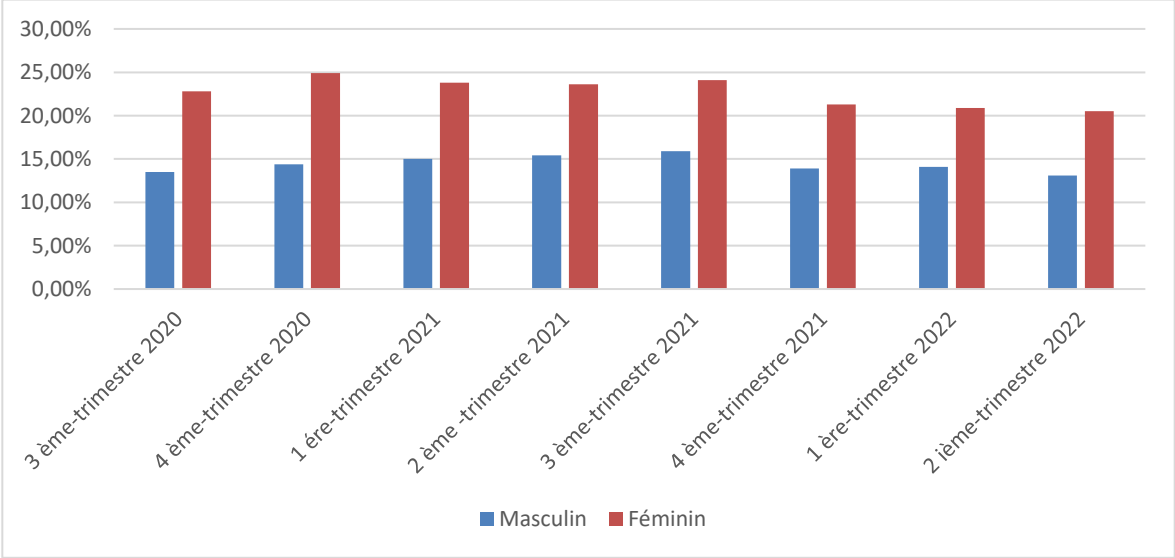

Figure 8.12: Evolution of the unemployment rate by gender

The graph shows a decrease in the unemployment rate in general. This reduction also concerns women, even though this rate remains quite high. Indeed, the national unemployment rates by gender in the second quarter of 2022 are 13.1% for men and 20.9% for women.

8.9 Cultural Heritage

8.9.1 Nabeul Governorate

The governorate of Nabeul has more than 30 historical monuments inscribed on the Tunisian national heritage list, including one of the country's foremost ancient sites.
The archaeological site of Kerkouane is among the most important. It is a Punic site located in the middle between the two points of the peninsula (Haouaria and Kelibia), in the middle of a rural area. This site is classified as World Heritage. The site of "Fort Kelibia" has lived through all the historical periods that Cap Bon has known and it sums up this story in a way. This citadel was built on top of a 1.50 m high rocky promontory which dominates the open sea on the northeast flank of Cap-Bon.

8.9.2 Ben Arous Governorate

The governorate of Ben Arous has 21 historical monuments inscribed on the Tunisian national heritage list, including one of the country's major ancient sites, Oudhna (ancient *Uthina*). The *Colonia Iulia Pietas Tertiadecimanorum Uthina* , known its apogee under the reign of the Antonines and Severes and whose main remains consist of an amphitheater that can accommodate 15,000 spectators, a capitol whose dimensions make it the one of the largest temples in Roman Africa, public baths with an area of approximately 10,000 m^2 , dating from the time of Emperor Trajan. It also has several patrician residences, the most important of which is the house of Ikariosqui (2300 m^2) and hydraulic monuments such as the aqueduct and the public cisterns.
This heritage comprises a myriad of monuments as diverse as the Dar El Bey or Husseinite Palace of Hammam-Lif or the Rades aqueduct bridge.

8.9.3 Zaghouan Governorate

The governorate of Zaghouan has an immense and very varied heritage potential, the number of which reaches 56 monuments which are still undervalued. The most famous ancient sites in the region are:

- The spa town of Jbel El Oust, presumably located on the ancient site of *Onellana* , halfway between the *Ciuitas* of *Uthina* and *Thuburbo Maius* and whose remains extend between the beginning of the Empire and the beginning of the 7th century. This site exhibits many remains from the Roman period, particularly a set of cisterns, probably connected to Hadrian's aqueduct and a pagan temple built in two phases (early empire and Antonine period) later transformed into a church. having hosted a Christian community, as well as magnificent thermal baths and sumptuous polychrome mosaics with floral and geometric motifs.
- *Thuburbo Maj* . This archaeological site is located on Oued Miliane in the vicinity of the city of Fahs and covers a total area of approximately 120 hectares. *Municipium* under the reign of Hadrian in 128, then honorary colony under Commodus (188), under the name of *Colonia Julia Aurelia Convenience* a . It exhibits several monuments such as the forum, the capitol and several temples including those of Mercury, Balaat , Saturn, Peace and the sanctuary of Caelestis , protective priestess of the city, as well as a Christian church of the 5th century refitted in the site of an ancient pagan temple and a basilica.
- The city of Zaghouan. Nestled on the slopes of the eponymous Jbel , this immemorial city (former *Ziqua)* is a veritable palimpsest and a significant component of the governorate's heritage. It conceals several archaeological and historical treasures including the nymphaeum better known as the Temple of the Waters built by the Emperor Hadrian around the year 130 AD. J.-C., and which is part of an imposing hydraulic

complex combining four components: the capture of four sources, a 132 km aqueduct which ends in the cisterns of the Maalga which supply the Antonine baths in Carthage [2]. Zaghouan is also known for its Andalusian medina built by the large community of Morisco refugees who came to settle after 1609 and whose major buildings are the Great Mosque, the marabout of the scholar Sidi Ali Azouz (early 18th century), but also the Hanafia Mosque , public fountains and the Rabha (public square).

Finally, the heritage is represented in the governorate by the national park of Jbel Zaghouan (creation decree dated March 29, 2010) which covers 40.2 km [2] . It abounds in a very rich and diversified flora and fauna, the most remarkable species of which are the holm oak, the Aleppo pine, the kermes oak and the carob tree, while the golden eagle, the peregrine falcon, Egyptian vulture, wild boar, jackal, mongoose, hare, lizard and grass snake are the main species of fauna. In addition to this biodiversity, there is great beauty of the landscapes and attractions such as the karstic caves (“Gouffre des 4 fous” with a depth of 265 m).

8.9.4 Manouba Governorate

The governorate of Manouba conceals numerous archaeological remains, including 14 monuments classified on the list of Tunisian national heritage. They cover the period from antiquity to modern times and whose main jewels are a portion of Hadrian's aqueduct extending between Manouba and Jdeïda, the dam bridge of El Battan , completed in 1690, and work of Morisco refugees who came to settle in Tunisia at the beginning of the 17th century. A good part of the governorate's archaeological heritage is made up of hydraulic installations and rural developments, as well as princely residences and industrial units (sheet factories, mills, etc.) dating back to the Mouradite, especially Husseïnite periods. The region is also renowned for its many historic towns and villages including the Julian colony of Tébourba de Thuburbo Minus (current Tébourba) and which are full of religious buildings (the Great Mosque of Tébourba , the Zawiya of Sidi Ben Aïssa , the mosques al - Haj Ramdhân al - Andalusî and Jaafar).

8.10 Land tenure and acquisition

8.10.1 Land Status

The different land statuses in Tunisia are:

- ✓ **Private land:** These are lands that belong to individuals exercising full ownership rights, including registered lands, lands subject to notarial deeds and lands subject to certificates of possession.
- ✓ **Registered land:** The land law of July 1, 1885 indicates the land registration system, revised by the code of real rights (law of February 12, 1965). The legal and material consistency of the registered buildings is determined by the registration which will be the subject of a land advertisement by making available to the public all the land titles (Land Book). About 60% of these titles are not updated; they have not been subject to transfer of ownership in the event of inheritance or sale.
- ✓ **Land subject to notarial deeds:** These are lands whose documents are notarial deeds which mention the origin of the property and the various transactions concerning the building and which attest to the right of ownership of the holder.
- ✓ **Land subject to a certificate of possession:** farmers who own agricultural land without a title may possess an administrative document called a "certificate of possession" which requires the farmer to work on a rural property for five consecutive uninterrupted and

[2]The dossier for this hydraulic complex was submitted in 2012 for inclusion on the World Heritage Tentative List ,

unequivocal years and especially in good faith as an owner. This certificate offers the possibility of having agricultural credits.

- ✓ **State lands:** These lands belong to the private domain of the State managed by the Ministry of State Domains and Land Affairs.
- ✓ **Collective lands:** Traditionally, these lands were used collectively and were the property of tribes or ethnic communities. Since the 1960s, the privatization of collective land has considerably reduced its surface area. State supervision over collective land is exercised under the authority of the Minister of Agriculture by the local guardianship council (at the level of each delegation), the regional guardianship council (at the level of each governorate) and the Governor. Each group owning collective land is represented by a Management Council composed of members elected by the community and members appointed by the Governor. The local and regional guardianship councils coordinate and control the management councils.
- ✓ **The "habous" lands:** These are lands definitively ceded to the habous; a practice of Muslim origin which designates elusive, inalienable and imprescriptible lands whose revenues are dedicated to social works. The abolition of these properties was pronounced by decrees in 1957 and 1965. The liquidation of the habous lands was made for the benefit of the state lands.

8.10.2 Land acquisition - National expropriation process for public utility

The new decree-law n° 2022-65 of 19 October 2022, amending and supplementing law n°2016-53 of 11 July 2016 on expropriation for public utility indicates (in article 5) that within the limits of the reserves available to the expropriator, an agreement may be reached with the owner of the property in the form of compensation in kind in accordance with the legislation and regulations in force. This article provides the possibility of compensation in kind for all expropriated immovable property and not only compensation for the loss of agricultural land in protection zones. This option could reduce the pressure on the public purse as the state could use its land holdings and allocate state land for compensation in kind to owners.
Under the article 16 of this decree, a permanent administrative commission was created in each governorate, called the "recognition and conciliation commission", responsible for recognising the legal and material situation of the properties to be expropriated. It is an administrative commission chaired by a judge, which makes administrative decisions.

8.10.3 Temporary occupation and right-of-way

Two decrees, dating from the time of the beylical dynasty regulate the right of easement or right-of-way in terms of power lines:

- **Decree of October 12, 1887** relating to the establishment, maintenance and operation of telegraph and telephone lines.
- **Decree of May 30, 1922,** relating to the establishment, maintenance and operation of power transmission lines.

These decrees allow power line projects to cross private property (including agricultural land or land used for other productive purposes) without the need to complete a land acquisition. There is therefore no transfer of ownership or expropriation to be carried out in the context of the power lines, neither directly above the line nor in line with the pylons.

According to these decrees:

- ✓ Easements are compensable: when they cause damage to the land crossed, compensation must be paid.
- ✓ The compensation concerns the operators of the land crossed whether they own it or not. When land is owned by an owner but operated by another person, it is the latter who is entitled to receive compensation.

- ✓ The passage of a power line is prohibited through any fenced property and overhanging existing buildings. Tunisian law therefore de facto minimizes the impacts that a line project could have on physical movement by prohibiting it. As part of the easement right, STEG concludes temporary occupancy agreements with owners and/or farmers before the start of works. The same agreements are concluded with the owners and farmers using the land where the pylons will be installed, even if the occupation will be for a much longer period.

These agreements give rise to the payment of compensation when damage is caused to crops.

9. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

9.1 E&S components and project phases

The impact assessment took into account the following environmental and social components potentially impacted by the Project, in alignment with the baseline analysis

➢ *Terrestrial Domain*

Environmental risks and impacts on Physical Environment

- Air Quality
- Geology and geomorphology
- Hydrogeology and hydrology
- Noise
- Electromagnetic fields
- Landscape and Visual amenities

Environmental risks and impacts on Biological Environment

- Flora and vegetation
- Fauna and habitats
- Protected areas

Socio Economic Risks and Impacts

- Economy employment and income
- Land and livelihoods
- Infrastructure and public services
- Community Health and Safety

➢ *Marine Domain*

Environmental risks and impacts on Physical Environment

- Meteorology and physical oceanography
- Seabed geology and geomorphology

Environmental risks and impacts on Biological Environment

- Noise
- Flora and vegetation
- Fauna and habitats

For each of the above components impacts have been identified and assessed for the following Project phases:

➢ *Project Phases* (*)

- Construction Phase
- Operation Phase

(*) The Project lifetime is estimated in 40 years: design of decommissioning works will be developed when the project will be close to its end of life: for this reason no information is presently available as to the activities related to this phase, and impact assessment can be based on the hypothesis of complete removal of all the works of the converter station, whereas underground and marine cables are simply put off-service but not removed.

9.2 Impact assessment methodology

The Impact Assessment (IA) methodology adopted in the present study is based on the ARVI approach, developed within the European commission's LIFE + project, IMPERIA: "Improving environmental assessment by adopting good practices and tools of multi-criteria decision analysis"[3].

The fundamental principle of the adopted IA approach is that for each environmental and social component one first assesses the sensitivity of the component in its baseline state, and then the magnitude of impact, which would probably affect the component as a result of the proposed project. An overall estimate of the significance of an impact is derived from these judgments.

Both the sensitivity of the component being analyzed and the magnitude of impact are evaluated systematically based on more detailed sub-criteria, as depicted in the Figure below.

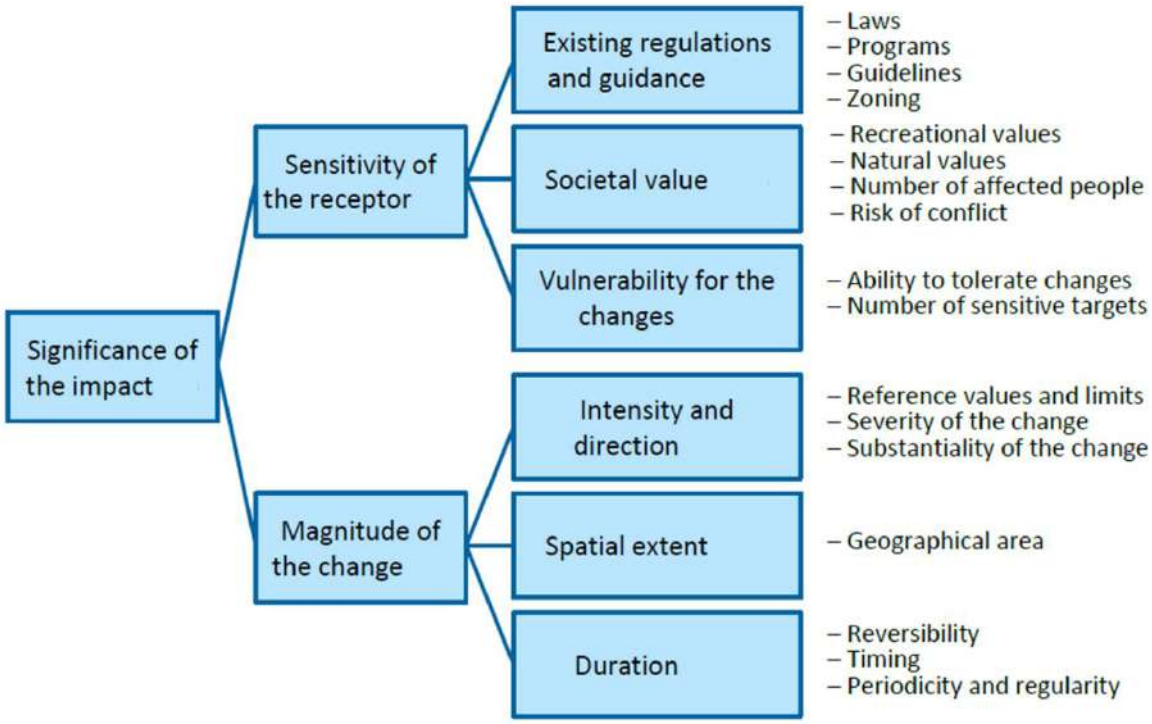

Figure 9.1: IA approach

Environmental and social expert judgement has been used throughout the assessment to derive the most appropriate level of sensitivity and magnitude, on a case by case basis.

The ESIA process is intended to reduce the negative impacts and enhance the benefits induced by the Project, by identifying impacts and benefits and the ways of dealing with them during the planning and design stages of the project.

[3] https://www.jyu.fi/science/en/bioenv/research/natural-resources-and-environment/imperia-project

The Project includes several “design” measures aimed at preventing and reducing environmental and social impacts. These measures are incorporated into the design development, and constitute an integral part of the Project.
In addition, when the assessment shows significant adverse effects on specific environmental and social components, further mitigations have been identified throughout the assessment to offset these impacts.

9.3 Risks and potential impacts assessment and mitigation measures – Marine domain

9.3.1 Construction phase

9.3.1.1 Physical environment

Construction works on the seabed can result in the disturbance and subsequent re-suspension of sediments. Substratum alterations are mainly created by equipment used for cable route preparation (grapnels) and installation of the cable (ploughing, jetting and cutting wheels).
In any case sediment plumes will be limited in extent (tens/hundreds of meters) and duration: at any given location on a cable route, disturbance will typically persist from a few hours to a few days. The significance of the impact, temporary and of limited extension, is estimated to be low.

Ships and hydraulic equipment pose a potential risk of accidental oil leakage during operations. Considering the accidental nature of potential contamination and the nature of potential spills, and taking into account standard design measures to prevent accidental pollution events implemented by the project, the significance of the impact is considered to be low.

9.3.1.1.1 Mitigation measures

At the current stage of project design, the following design measures and operational/management procedures for the prevention of impacts during construction are anticipated:

- Operational procedure to prevent and manage potential seabed contamination:
  - Availability on site of emergency response kits;
  - Use the best available technologies for the equipment and machineries and periodic maintenance of the equipment and machineries during construction phase in order to prevent accidental spills;
  - Adequate management of drilling muds;
  - Adequate waste management procedures.
- Procedures to prevent potential seabed disturbance during construction:
  - Use of floating machinery where seabed conditions require its application.

9.3.1.2 Underwater noise

Anthropogenic noise can be produced during route clearance, trenching and backfilling, cable and cable protection introduction by the vessels and tools used during these operations. Intensity and propagation of underwater noise will vary according to bathymetry, seafloor characteristics (e.g., sediment type and topography), vessels and machines used, and water column properties.
There is no clear evidence that underwater noises emitted during cable installation affect marine mammals or any other marine species, although it is accepted that many marine animals (notably mammals and fishes) detect and emit sounds for different purposes such as communication, orientation or feeding. Compared with other anthropogenic sources of noise, such as marine traffic, fishing activities, sonar, piling or explosions, underwater noise impact

linked to undersea cables remain low. Cable installation is a spatially localized and temporary event, so the impact of noise on marine communities is expected to be minor and brief.
It must also be noted that the project area is located in a region whit a highly intense maritime traffic, resulting in a high average ambient noise.
In any case, considering a behavioural threshold value for marine mammals of 120 dB re 1 µPa, the impact (temporary or permanent) could be considered as limited to the very proximity of sound sources. It must be noted, though, that these spatial extent evaluations do not take into account that motile species have the capability to avoid areas impacted by activities by moving away.
Due to the possible disturbance on species of high societal value as marine mammals, the significance of the impact is thus considered as moderate.

9.3.1.2.1 Mitigation measures

The following mitigation measures could be used for minimising the impact of noise, considering that no specific threshold are set by law in marine environment:

- Manage the schedule of activities in order to avoid most sensitive periods in marine mammals life cycle (e.g. mating, migration);
- Follow the recommendations of the “Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life” (IMO, 2014);
- All the machinery would have noise reduction measures according to environmental protection laws.
- Equipping ships and vessels with MMO during cable laying operations to spot and identify sensitive species like cetaceans and marine turtles amongst others and to monitor on-board adherence to related environmental guidelines

9.3.1.3 Marine biodiversity

Even though lay and burial and post lay burial usually displace sediments, marine cable installation has an effect that is quite limited. The majority of the displaced sediments will be deposited within tens of meters of the cable route. Regardless of the technique (ploughing or jetting), the effects will be localized as sediment plume impacts created by marine cable installation are of smaller magnitude than those associated with other marine activities. Different techniques though will potentially have slightly different effects.
Regarding shallow areas and intertidal habitats, they display low sensitivity to, and high recoverability from temporary disturbances like sediment displacement. Less stable habitats (sandy bottoms) recover quicker than more stable habitats (mixed sediments, muddy sands and mud). Infaunal species are likely to re-establish themselves relatively quickly due to their adaptation to an environment that is subject to regular disturbance (wave action, storm events, …) while motile species are usually able to avoid the area during cable burial. Maximum impact occurs between 2 – 3 m on each side of the cable, but as already stated, the environment and its associated biodiversity will make a speedy recovery. Although sensitive species may show longer recovery periods, the overall environmental footprint on the seabed and associated biodiversity is usually small and most habitats are expected to recover in a short period.
During the project construction, potential impacts on the seabed and marine biodiversity located in the area of works are primarily related to seabed disturbance, potential contaminant release from sediments, and artificial reef effects.

1. Seabed disturbance: impacts a very narrow strip (approximately of 10 m) for a very short period of time for the burial of the cables using the ploughing and/or jetting technique. Overall, the magnitude of impact is classified as low.
2. Potential contaminant release from sediments: the preliminary survey did not indicate any contaminated sites along the route, but the presence of contaminated sediments close to the landfalls cannot be excluded.

3. Artificial reef effects: the current project does not foresee any cable protection if not for dealing interferences with other infrastructures. In general the length of the artificial reef will be limited, so that the impact is expected to be low.

The nearshore surveys identified two main seagrass species, *Posidonia oceanica* and *Caulerpa sp.* in the marine environment of Kelibia. The project will apply the HDD (Horizontal Directional Drilling) technique that involves drilling from land towards the sea for a stretch indicatively up to 800m of length. This will avoid conducting works in the proximity of the shoreline but cable burying is expected to occur in parts of the nearshore area (up to 40m depth) with potential effects/impacts on seagrasses. The total cable length through seagrasses will be approximately 1500 m.

9.3.1.3.1 Mitigation measures

The following main mitigation measures will be applied during works:

- Selection of the marine cable route with the lowest environmental impact and highest resource efficiency.
- Burial technique should result in the lowest release of sediments.
- Construction window can further reduce seabed disturbance by managing the timing of works. In shallow areas, works are best conducted at low tide, while further offshore, works should be completed as quickly as possible.
- Conducting works in the winter season when seawater temperatures are low to prevent, avoid/reduce eutrophication from nutrient loading (low productivity periods).
- Applying technology that disturbs sediments to the minimum therefore reducing resuspension of contaminants from sediment disturbance.
- Using the minimum amount of artificial material for marine cable protection.
- Using very smooth, artificial substrate to reduce the capacity of organisms to attach.
- Equipping ships and vessels with MMO during cable laying operations to spot and identify sensitive species like cetaceans and marine turtles amongst others and to monitor on-board adherence to related environmental guidelines.

The following mitigation measures will be applied to reduce impact on seagrasses:

- Regarding works that disturb *Posidonia*, two windows represent themselves that allow reducing impacts to the minimum by order of priority:
  1) summer season from beginning August until the end of September; and
  2) the Winter season between the beginning of December and the end of February.

  Visual inspection that the plants have shed all their fruits if works are to be conducted in the summer should determine the beginning of works while visual inspection about the stage of the developing fruits and length of the leaves is also important for winter works (leaves are usually still sprouting and if fruits started to develop, they are not too ripe).
- For *Caulerpa*, works are recommended to take place between the month of December and June.

9.3.1.4 Cultural and historical heritage

A detailed geophysical survey will be carried out along the route by the Contractor, thus allowing to discover any object having archaeological or historical value that could be affected by the construction operations. In any case, since the cable is flexible, it is easy to avoid any interference with subsea objects.
No impact can thus be foreseen with cultural and historical heritage.

9.3.2 Operation phase

9.3.2.1 Physical environment

Local variations to the physical environment during the operational phase are connected to the temperature of the cable, that can increase the temperature of the surrounding sediments and water.
When electric energy is transported, a certain amount is lost as heat, leading to an increased temperature of the cable surface and subsequent warming of the surrounding environment. Important factors determining the temperature increase are cable characteristics, transmission rate and characteristics of the surrounding environment (ambient temperatures, thermal conductivity, thermal resistance of the sediment etc.).
The use of high voltages minimizes heat losses and resultant environmental warming effects because current loads are relatively small. Additionally, DC systems result in less heat loss to the environment for a given transmission rate than AC cables.
Where submarine power cables are buried, the surrounding sediment may be heated but cables, whether buried or not, have negligible capability to heat the overlying water column because of the very high heat capacity of water. Modelling studies carried out for a similar project (Viking Link, an HVDC link between United Kingdom and Denmark, consisting of two cables at ± 525 kV carrying 1400 MW) suggest that, depending upon cable design criteria, bundled cables will require between 0.7m and 1.15m of sediment cover to have a temperature increase at 0.2m sediment depth less than 2°C.
Therefore, considering the narrowness of the corridor and the expected weakness of thermal radiation, impacts are not considered to be significant.

9.3.2.1.1 Mitigation measures

Design measures that will reduce potential impacts consist of:

- Choice of cable coating depending on expected resistive heating;
- Evaluation of adequate burial depth.

9.3.2.2 Marine biodiversity

No impacts on marine biodiversity are expected by the operation of the HVDC cable.
Cable burial (a fundamental design measure for the protection and safeguard of the infrastructure) acts in fact as a mitigation of any potential effects on marine flora and fauna.

9.3.2.3 Cultural and historical heritage

No impact is foreseen during the operation phase: power cable operation does not generate any effect on wrecks or archeological sites.

9.4 Risks and potential impacts assessment and mitigation measures – Terrestrial domain

9.4.1 Construction phase

9.4.1.1 Air quality

During Project construction, potential impacts on local air quality are related to the following activities:

- Earthworks: clearing and grubbing, and excavation are expected to generate dust.
- Opening of access roads for the installation of towers.
- Vehicle movement and other equipment (*i.e*. excavators, bulldozers, side booms, trucks, cars), in particular on unpaved roads and construction sites will create dust.

- Use of engine driven vehicles and machinery (heavy equipment, generators, etc.) will generate exhaust gases (combustion) that contain pollutants, including sulphur dioxide (SO2), nitrogen oxides (NOx), and other volatile organic compounds.
- Transport of raw material, personnel and wastes to and from the construction areas resulting in an increase of traffic and consequent release of exhausts into the atmosphere

Estimated dust and exhaust emissions are not expected to lead during construction to exceedances of the Tunisian standards.
Considering the management measures described hereafter, the significance of impact can be considered as low.

9.4.1.1.1 Mitigation measures

The Project will implement the following mitigations measures specific for the prevention of diffuse dust emissions and the reduction of exhaust emissions:

- Watering unpaved surfaces to reduce wheel generated dust, especially in dry periods. Watering increases the moisture content, which conglomerates particles and reduces their likelihood to become suspended when vehicles pass over the surface.
- Vehicle speed limited to 40 km/h, reduced to 15-20 km/h on the construction site, to minimize dust generated by the transit of vehicles on unpaved construction areas.
- Covering/humidifying of materials that can be transported by wind (e.g. topsoil, aggregate) where possible.
- Use of best available technologies and carry out regular maintenance for all equipment and machinery.
- Monitoring actions will be undertaken for air quality parameters in case of complaints by residents.
- All residents potential affected by the construction activities (Sidi Jamel Eddine and other nearby residential areas crossed by the OHL line) will be informed about the start of construction works and all potential pollutants emissions.

9.4.1.2 Soil and subsoil

During the construction phase, potential impacts on soil and subsoil quality are primarily related to the following activities:

- Use of vehicles and machinery, site preparation and set up of worksites, potentially resulting in accidental spills of hydrocarbons or other contaminants on soil;
- Occupation of soil by equipment and machinery with limitation of soil functionalities (habitat, human activities, landscape), increase of waterproof surface and soil loss.
- Land clearing and vegetation removal along access roads and at towers foundations for the OHL, transit of heavy machinery and presence of construction equipment potentially resulting in soil disturbance and degradation.

An additional significant source of impact is land take. Soil is a non-renewable resource that performs many vital functions: food and other biomass production, storage, filtration and transformation of many substances including water, carbon, and nitrogen. Soil has a role as a habitat and serves as a platform for human activities, landscape and heritage and acts as a provider of raw materials. For this reason the occupation of soil is considered as a potential impact.
The expected land take is illustrated in the following table.

Construction phase – Land take	**Area (m^2)**
Mlaâbi CS Site (definitive)	100 000
Mlaâbi CS construction yard (temporary)	10000

HDD construction site (temporary)	1200
OHL 400 kV Mlaâbi-Mornaguia (definitive)	52 000

For the OHL line, the evaluation of the land take is based on the following estimation: total number of towers along the line route, considering one tower every 450 meters and with a 14*14 m as a right of way (i.e. 196 m^2 as the total footprint for each tower).
No land take is associated to the construction of underground cables given that both cables and related working site will be primarily located on existing roadways.

The overall significance of the impact, taking into account the mitigation measures illustrated hereafter, can be considered as low.

9.4.1.2.1 Mitigation measures

Operational and management procedures will be applied for the prevention of soil and subsoil impacts during construction; the main procedures are recalled hereafter:

- Availability on site of emergency response kits (liquid suction pumps, biodegradable material for absorbing liquid petroleum derivatives, containment barriers, containers for absorbing drips, materials for sealing leaks, etc.);
- Tanks, cisterns, drums for storing fuel, oil and waste will be in compliance with the law and located on an impermeable surface;
- Use the best available technologies for the equipment and machineries and executed periodic maintenance in order to prevent accidental fuel spills;
- Adequate management of excavated soil: soil stockpiles will be located in adequate areas, properly sign posted and soil to be sent to disposal will be stocked separately from the soil to be used for backfilling;
- appropriate storage and management of removed topsoil (e.g. limit stockpile height, watering, etc.) in order to allow for its reuse for restoration;
- All materials, classified as waste, will be grouped by homogeneous categories in the site area and properly identified for transfer to a suitable recovery or disposal facility, in accordance with national legislation in force and applicable international standards;
- Segregation of hazardous and non-hazardous waste and provision of adequate containers for each category;
- Temporary construction yards will be restored. All materials and paving will be removed. Prior to proceeding with the restoration of agricultural land, a deep harrowing of the soil will be carried out in order to remove the compacted layer generated by the loads induced by the work site activities.

9.4.1.3 Freshwater Resources (Surface and Groundwater)

With regard to water resources (surface and ground), the following potential negative impacts might arise during the project construction activities:

- Potential ground water contamination cause by accidental spills of wastes and fuel, leakage of drilling fluids into underground geological formations and excavation works potentially interfering with the water table;
- Alteration of ground water level caused by the reduction of groundwater supply due to the realisation of paved surfaces and to consumption of water resources that may contribute to increased pressure on water abstraction and a decrease in groundwater levels. The groundwater in Cap Region is in critical situation due to an over-exploitation by agriculture, so the water extraction for construction purpose can cause considerable impact on the

already stressed resources, especially without any supporting/mitigation measures to protect this resource.

The overall significance of the impact, taking into account the mitigation measures illustrated hereafter, can be considered as negligible.

9.4.1.3.1 Mitigation measures

With regard to the management of first rain waters, potentially contaminated, according to the project construction standards

The following measures will be implemented to mitigate potential impact due to accidental spillage of fuel and other chemical products:

- Maintenance operations for vehicles used during construction activities.
- Oil and chemical storage areas should be covered and have impervious floor and bund.
- Use of spill control kits to contain and clean small spills and leaks.
- The contractor company in charge of construction activities, and its subcontractors, have to prepare guidelines and procedures for appropriate clean-up actions to be taken in case of any oil/fuel or chemical spills.
- The contractor company have also to prepare a site-specific emergency response plan for soil clean-up and decontamination actions.
- A training program must be implemented by the company to its personnel about emergency procedures and good practices to prevent accidental pollution.
- Base camp and construction sites must be located at more 100 meters from the stream or water reservoirs, in particular for the Mlaâbi CS where the base camp must be installed away from the Mlaâbi Dam and Tafekhsite river.
- Construction yards will be equipped with at least one tank for the sedimentation of suspended materials and a de-oiling tank, while the civil discharges will have to be connected to public sewer, preventing groundwater pollution.

9.4.1.4 Noise

The project construction can lead to a potential increase in ambient noise level at sensitive receptors, associated to the following activities and related noise emissions:

- Earth movement, aggregate material handling, excavation, mechanical works and vehicle movements.
- Use of engine driven vehicles and machinery (*i.e*. excavators, bulldozers, side booms, trucks, cars).
- Transport of raw material, personnel and wastes to and from the construction areas resulting in an increase of traffic and related noise.
- Towers construction: tower foundations, tower assembly and erection, attachment of the conductors and improvement of access roads.

Modelling has been carried out in order to evaluate noise level during works.

The activities for the construction of the Mlaâbi Converter Station are expected to last 40 months: the surrounding area will be subject to noise emission for a significant time. During these activities, noise levels may exceed the limits fixed by the Order of the Municipality of Tunis and by the IFC, but the noise generated is likely to be attenuated within 500 m from the construction site, so that noise intensity should not exceed the fixed levels for sensible receptors (settlement and fauna).

For the landfall site estimated noise levels are compliant with the absolute noise limit set by the Order of the Municipality of Tunis, whereas they exceed the international IFC limit; with regard to the increase in background levels, both national and IFC differential limits of 5 dB(A) and 3

dB(A) respectively, are exceeded. Anyhow the working activities will be temporary, lasting for few weeks, and noise levels can be mitigated by soundwalls located on the perimeter of the construction site.

For all other works (underground HVDC cable and OHL) noise impact on close settlements can induce exceedance of noise limits, but the duration of each activity will be short, and so will be the duration of impact on each receptor.

The overall significance of the impact, taking into account the mitigation measures illustrated hereafter, can be considered as low.

9.4.1.4.1 Mitigation measures

To reduce potential impacts from noise generated by the construction activities, the following measures will be applied:

- All construction activities will take place only during day time, between 8am to 6pm.
- All major construction plant and equipment will comply with international noise emission limits;
- Switch off equipment when not in use;
- Minimising noise emissions, with implementation of a regular inspection and maintenance regime;
- Transportation activities and the delivery of construction materials will be planned during normal working hours;
- Limit noise activities to the least noise –sensitive time of the day;
- Locate noise generating equipment as far as possible from nearby sensitive receptors;
- Soundwalls will be located on the perimeter of construction sites close to residential settlements;
- Noise monitoring will be undertaken during periods when activities are taking place in close proximity to noise sensitive receptors to demonstrate compliance with IFC noise criteria and according to the ESMP.

9.4.1.5 Electromagnetic fields

The project construction phase does not generate electromagnetic fields, therefore no impacts are expected to occur in this phase.

9.4.1.6 Landscape and visual amenities

Visual impacts and physical changes to the landscape features will be induced by works as illustrated hereafter:

- The CS area has a sub-flat morphology: the CS construction will require the removal of existing vegetation, earthmoving, levelling operations and excavation and back-filling with re-profiling of the ground. Presently the construction site is used for agricultural purposes (fodder production): the start of the construction phase will change the landscape in this rural area.
  Landscape disturbance is also associated with the CS construction yard, as well as with the presence of machinery, materials and stockpiles.
- The construction of underground HVDC cables will constitute a temporary and reversible interference with the landscape; the impact will not be significant since work areas will be on existing roads and related temporary storage areas will be located on the carriageway.
- For OHL the main sources of impact will be related to:

- vegetation clearance and removal: areas of tree cover (forest), agricultural/plantations (olive, citrus, annual crops) will be cleared;
- disturbance due to degradation of views for the presence of equipment, machinery, storage areas, etc.

Construction activities will be more visible where carried out within an open landscape: flat ground with no dense vegetation cover, as happens in areas located between the Mlaâbi CS and El Mida delegation and around Grombalia where the main land use is annual crops with some vineyards. In forest areas (around Beni Ayech, Khanguet El Hojjej and Djebel Ressas and Kabouti), construction activities will be less visible for local communities

The landscape and visual human receptors includes the following:

- Resident persons located near the corridor of the transmission line;
- Travellers and tourists: visitors of the Cap Region especially during summer season and hikers who choose the natural protected areas, forest zones and cultural attraction sites (Nabeul and Ben Arous).

Given the above, the overall significance of the impact can be considered as low.

9.4.1.6.1 Mitigation measures

The mitigation measures envisaged during the construction phase include:

- Fence in construction sites and maintain them in orderly condition.
- Restore temporal work sites immediately after construction; for the OHL once construction operations of a tower are completed and before moving on to the next tower, the previous tower construction site should be restored and all generated waste removed.

9.4.1.7 Biological environment

Several impacts on the biological environment will be determined by construction works and are described in the following paragraphs.

9.4.1.7.1 Loss of vegetation and habitat disturbance – Work areas for HDD, HVDC cable, Mlaâbi CS

Most of land to be crossed by the HVDC cable consists of paved and unpaved roads located on urban areas and agricultural land (with cereal plots and olive trees).
Construction activities of HDVC may have a minor impact on a cypress windbreak, located along the access road to the industrial zone, and on vegetation species present on the bank of the Tafekhsite watercourse (last section of the underground cable to reach the Mlaâbi CS.

The HDD activities, at the marine cable's landfill in Kélibia, should not have any potential impacts on natural habitats or species as all works will be on an industrial area.
The Converter Station will be built on a future industrial area and construction activities will cause the loss of this agricultural land. The construction yard will also be located within the industrial zone in order to avoid any additional loss or disturbance of natural or sub natural vegetation in adjacent areas.

The proposed route for the 400 kV OHL between Mlaâbi and Mornaguia crosses a mix of modified habitats, mostly farmland (cereal crops, citrus orchards, olive tree plantations, vineyard, etc.), and some natural habitats, mostly located in mountainous areas. Generally the OHL will pass through relatively open and rural landscape, except areas occupied by citrus

orchards between Menzel Bouzelfa and Grombalia and forest areas and scrubland near Jebel Ressas (between Ben Arous-Nabeul and Zaghouan).
Tower construction will require removal of trees and shrubs at the construction site, whereas all vegetation under the conductors between two towers will be preserved. These activities and the construction of access roads, if any, are likely to cause localised changes in the natural habitats within the OHL corridor, with a small loss of species (flora and fauna).

9.4.1.7.2 Impacts on protected and sensitive areas

There are a variety of habitats in the territory affected by the project considered as a protected areas and key biodiversity areas. A list of protected and key biodiversity areas located around the Mlaâbi CS and the OHL is presented in the following table. In the table is also indicated the distance of each area from the Area of Influence (AoI) of the project, estimated to be around 6 km.

Table 9-1: Protected and Key Biodiversity areas (source: IBAT)

N°	Key Biodiversity Area (KBA)	Distance from AoI (km)	Typology	International Status
1	Barrage Oued El Hjar	inside AoI	Artificial Wetland	Ramsar Area
2	Barrage Mlaâbi	inside AoI	Artificial Wetland	Ramsar Area
3	Barrage Sidi Abdelmoneem	inside AoI	Artificial Wetland	Ramsar Area
4	Barrage Lebna	inside AoI	Artificial Wetland	Ramsar Area
5	Barrage Chiba	inside AoI	Artificial Wetland	
6	Barrage Bezikh	3 km	Artificial Wetland	
7	Barrage Masri	3 km	Artificial Wetland	
8	Barrage Mornaguia	7 km	Artificial Wetland	Ramsar Area
9	Lagune de Korba	6 km	Natural Wetland	Ramsar Area
10	Lagune de Soliman	5 km	Artificial Wetland	Ramsar Area
11	Jbel Boukornine	0.5 km	Moutain	
12	Jbel Zaghouan	14 km	Moutain	
13	Dunes de Ras El Melan	2 km	Coastal dunes	
14	Aqueduc de Zaghouan	inside AoI	Archeological site	

These protected and KBA areas, including forest and scrubland, may host a good number of sensitive floral species and wildlife (mammals, reptiles, birds and bats). Such areas are often used as breeding, feeding and nesting habitats for many bird and bat species, some of which are placed on the IUCN red list as vulnerable or endangered species.
The following table presents potential impacts of construction activities on sensitive species identified within the project's area.

Table 9-2: Potential impacts on sensitive fauna due to construction activities

Potential impact	Source of impact	Potentially affected species
Alteration and disturbance of bird habitats, used generally for breeding and nesting	Removal of vegetation and clearing of RoW for the CS and OHL line (at tower locations), with alteration of natural habitat for birds (migrating and nesting) used for feeding and roosting. Dust and waste, including chemical pollutants, generated by vehicle and construction equipment and that may be a source of pollution for wetlands used by birds Noise generated by the operation of vehicles and machinery may disrupt bird habitats during breeding and nesting seasons.	White-headed Duck (*Oxyura leucocephala,* considered as endangered (EN) by IUCN red list) Marbled Teal (*Marmaronetta angustirostris*, considered as vulnerable (VU) by IUCN red list) Glossy Ibis (*Plegadis falcinellus*) Eurasian Spoonbill (*Platalea leucorodia*)
Alteration and disturbance of bat habitats, used generally for breeding and nesting	Removal of vegetation, trampling and clearing of RoW of the OHL line may lead to the alteration of natural habitat used by bats for feeding and roosting. Removal of trees and shrubs used by foliage roosting bats, in particular in areas occupied by forest tree (Beni Ayech, Jebel Ressas). Accidental pollution due to movement of vehicle and construction equipment.	Potential bat species may be present within the RoW of the OHL line. Mountains areas located near Chiba Dam (Beni Ayech and Errahma) and Jebel Ressas (between Nabeul and Ben Arous) where some bats species are often found, such as: *Myotis capaccinii* (VU) *Miniopterus schreibersii* (VU) *Rhinolophus blasii* (LC)

Taking into consideration the duration of construction activities, their location, and the mitigation measures described hereafter, the overall significance of the impact can be considered as moderate.

9.4.1.7.3 Mitigation measures

The following mitigation measures will be applied to avoid and/or reduce impact on biodiversity:

- Minimize the duration of field works
- Consult with the competent authorities (Ministry of Agriculture and Forest Department DGF, APAL) and stakeholders (association and NGO such as AAO and ATVS) prior to any vegetation removal and clearing)
- Clearance of vegetation should be minimized, in particular for OHL sections crossing areas occupied by forest and shrub (nera Beni Ayech, between Grombalia and Jebel Ressas)
- Provide training for workers on biodiversity value and need to avoid any disturbing or destroying flora and fauna
- Avoid construction activities during breeding/nesting season in forested areas and near IBA/RAMSAR sites
- Avoid complete clearing of the RoW and protect trees located adjacent to the construction sites
- Fence in all construction sites to prevent vegetation disturbance outside.
- Use existing roads to reach the construction sites and restrict movement of construction vehicles to pre-designated routes

- At the end of construction, all disturbed areas and used roads must be restored
- Avoid external soil supply to avoid any introduction of invasive species
- Apply noise mitigation/management measures to avoid disturbance to fauna
- Limiting of vehicles speed, preventing possible wildlife-vehicles collisions
- Implementation of monitoring activities during construction works

Specific measures are required for the following design phases in order to define the final OHL route:

- Undertake an additional flora/fauna inventory during wet season to verify if there are any protected species within the project's area, in particular for ''*Leopoldia maritima*'' (considered as vulnerable VU by IUCN) and the '' *Thorectes puncticollis*'' (considered as EN by IUCN) around the HDD construction site.
- Monitoring of bird mortality (collision and electrocution): conduct a field survey of bird mortality on the existing power transmission lines in Cap Bon region to identify areas with high risk for birds. This survey will help to optimize the design of OHL line and avoid passing through these high-risk areas. A qualified ornithologist will be involved with the design team. The monitoring should cover all the area to be crossed by the OHL line and around the existing power transmission lines.
- Consult stakeholders and local community to collect information on bird incidents and areas with high risk of mortality.
- Before establishing the final design of the OHL, bird-use areas (breeding, nesting, etc.) should be reported to guide appropriate routing of the OHL and its roads access.
- Integrate bat protection during the design of the OHL: line and towers should be placed away from wetlands and any water points.

9.4.1.8 Stakeholder Engagement and Human Rights (including SEA – Sexual Exploitation and Abuse and SH – Sexual Harassment)

Potential impacts include:

- Stakeholders and local communities not meaningfully consulted and informed of the project impacts and benefits
- Protests and disruptions form potential affected persons (PAPs)
- Failure to obtain community acceptance of the project
- Lack of transparency with the public; non-ability of individuals and civic groups to participate in public life; lack of freedom of information and Control of corruption (transparency/participation in public life); gaps in facilitating citizen engagement; lack of participation in public life;

9.4.1.8.1 Mitigation measures

- Development and implement an ESS10-compliant Project Stakeholder Engagement Plan (SEP)
- Development and implementation of SEA!SH plan
- Implementation of the SEP and conduct of meaningful engagement with local and affected stakeholders
- Conduct a stakeholder mapping exercise to identify PAPs and vulnerable groups of a stakeholder database
- Revision and updating of Project social baseline
- Provision of information on employment opportunities that the project will offer
- Development and Implementation of Grievance Redress Mechanism
- Hiring and training of Community Liaison Officers (CLOs)

9.4.1.9 Land Acquisition, Restrictions to Land Use and Involuntary Resettlement- Potential impacts include:

Potential impacts include:

- Non-identification of PAPs
- Gaps in Entitlement Framework (focus on legal compliance/ informal settlers)
- Lack of focus/gaps in livelihood restoration
- Social conflicts and project failure
- Absence of social license to operate and community support
- Lack of compensation for physical/economic displacement. Economic displacement of farmers using lands within the RoW of the OHL (with or without legal compliance such as farmers on state-owned land)
- Restriction of farming within the RoW with consequent livelihood impacts
- Reduction of areas available for agricultural activities

9.4.1.9.1 Mitigation measures

- Develop and implement a ESS5-compliant Resettlement Action Plan (RAP) based on the Resettlement Policy Framework (RPF)
- Identification of potential impacts and PAPs (land owners/users, land use, valuation, etc.)
- Effective participation of local stakeholders and PAPs and authorities in the entire process. Clearance and vegetation removal activities to be restricted to the minimum area
- Strictly follow procedures of the Resettlement Framework Policy (RFP) and the Resettlement Action Plan (RAP, to be conducted before the construction phase)
- Monitoring and updating the RAP/LRP: socio-economic baseline that screens and identifies PAPs, additional assistance for severely affected persons/ vulnerable groups, compensation at replacement value, reinstatement after construction.
- The borrower to ensure full compensation is paid to PAPs in compliance with the RPF and RAP.

9.4.1.10 Community Health and Safety

Potential impacts include:

- Risk of accidents and physical injuries involving residents from increased road traffic
- Trespass by unauthorised persons into construction work areas with consequent risk of accidents / injury and/or loss of livestock (e.g. local herders)
- Increased stress-related disturbances (noise, dust, light, and air pollution)
- Potential health risks due to limitations to access local healthcare facilities.
- Sexual Exploitation and Abuse/sexual harassment (SEA-SH) of seasonal workers and migrants
- The influx of project workers (and/or in-migration of opportunists) could lead to impacts on the community's health, safety and security, such as risky diseases, inappropriate conduct, and SEA-SH risks for women form the local communities.
- There are H&S and social risks related to worker accommodation / worker camps for project workers, including labor influx and in-migration

Pressure on local infrastructure (e.g. housing, health) from influx of project workers, including inflation in the cost of housing and food

9.4.1.10.1 Mitigation measures

- Require all Contractors and Subcontractors to comply with relevant STEG's health and safety requirements

- Prepare and implement an ESS2 and ESS4-compliant **Community Health and Safety Plan**
- Prepare and implement a **Traffic and Transport Plan** prior to the start of any transport activity to ensure that the transport process is properly and adequately managed
- Ensure that work sites are fenced off and that signs are posted around work faces and construction sites to inform people of the risks associated with trespassing
- Fluorescent strips to delimit other areas of the construction site prohibited to the public
- Installation of panels indicating and informing local population about the progress of the wor
- Undertake a programme of stakeholder engagement and consultation to raise awareness among local communities of the risks of trespassing on sites, the meaning of signs and the dangers of playing on or near equipment or entering fenced areas
- Notify landowners along the line route about the construction schedule and activities
- Emergency Response Plan (ERP) considers access to health care, major incidences, multiple casualty events and pandemics
- Develop and implement a **Code of Conduct for Project Workers throughout the Supply Chain**;
- Implement the SEA-SH Action Plan
- Development of training and awareness-raising activities on SEA-SH;
- Development of grievance mechanism for seasonal workers and migrants
- Prepare a **Supply Chain Management Plan** and ensure that contractors implement it
- Take all necessary precautions and make proactive and thorough investigations to ensure the origin and sourcing of equipment, components, materials and other supplies used in the construction of the converter stations, the underground line and the OHL so that they are not manufactured and supplied by firms (or subcontractors) that do not comply with the policies and standards of the donors
- Categorically prohibit and ban (i) the abusive employment of children or vulnerable persons and (ii) the practice of forced labour, human trafficking and slavery in line with the LMP
- Prepare and implement an **Influx Management Plan** in accordance with the World Bank Good Practice Note - "Assessing the Risk of Adverse Impacts on Communities from Project-related Labor Influx, June 2021"
- Monitor for influx and associated impacts (e.g. inflation, social conflict) in accordance with the Influx Management Plan
- Carry out culturally appropriate engagement with local communities to raise awareness of SEA-SH risks, including via separate women-only engagement forums
- Establish, communicate and implement a Project Hiring Policy, maximising local employment to minimize the risk of uncontrolled influx / in-migration and ensure that contractors abide by this policy
- To address the risk of an increase in prostitution and teenage pregnancies,
- carry out regular awareness-raising in the local communities of the project
- Contractor to induce workers to the Code of Conduct and strictly enforce the Code of Conduct to prevent unwanted behaviour
- Carry out regular training of contract workers on key social risks and issues, including SEA-SH
- Prohibit access by unauthorised personnel into the worker camps and work areas
- Carry out periodic sensitisation forums for employees on ethics, morals, general good behaviour and the need for the project to co-exist with the neighbors, in line with the Project Code of Conduct

- Establish a Project Accommodation Strategy and determine whether a camp-based or a distributed (community-based) accommodation approach will be followed (if workers f workers are accommodated in the communities then additional measures are needed)
- Engage with the communities on whether camp or distributed accommodation approach is preferable. If a camp-based strategy is followed, engage with the communities on the best siting for the camps
- **If a camp-based strategy is adopted, prepare and implement a Worker Accommodation Plan** following the applicable content of the IFC/EBRD publication entitled: "Workers' accommodation: processes and standards - A guidance note (2010)
- Inform all non-local temporary workers of the duration of contract and the expectation that they will leave the area when contract expires

9.4.1.11 Occupational Health and Safety

Potential impacts include:

- Working on construction sites involves generic H&S risks for workers, as it increases the risk of injury or death from accidents
- Discrimination and sexual violence or harassment within worker
- Risks of exposure to chemicals and electromagnetic fields

9.4.1.11.1 Mitigation measures

- **Prepare an ESS2-compliant Occupational Health and Safety Plan (OHSP), and ensure contractors adopt and implement the provisions of the OHSP**
- **Prepare an Emergency Preparedness and Response Plan that takes into account a series of organizational, operational and preventive measures in case of an emergency**
- Require all Contractors and Subcontractors to comply with relevant STEG's health and safety requirements.
- Deliver OHS trainings to direct and indirect workers;
- Implement trainings or awareness-raising activities on human rights and discrimination;
- Monitor discrimination, sexual violence or harassment within the SC;
- Use machinery and tools compliant with national standards;
- Regularly maintain Project machinery and tools;
- Only allow trained or supervised workers to operate the machinery and tools;
- Provide workers involved in the development or expansion of the conversion station with certified PPE;
- Only allow workers with experience or technical skills to perform activities on electrical systems or cables;
- Appoint supervisors monitoring the compliance with OHS procedures during activities on electrical systems or cables;
- Before starting excavation activities, carefully map the position of other underground service cables;
- Implement an Electromagnetic Fields Safety Program;
- Provide workers with personal exposure monitoring equipment and shielding materials;
- Train workers on hygiene practices concerning pesticides and provide adequate PPE;
- Analyze PCB levels around the existing conversion station and provide adequate PPE.
- Prepare a Framework H&S Plan for Workers and Communities
- Require Contractors to prepare a H&S Plan for Workers and Impacted Communities that meets the requirements of the STEG Plan and addresses issues including:

- Implement measures to prevent the spread of HIV/AIDS (e.g. through the provision of free condoms to workers), and other communicable diseases such as Covid-19
- Ensure compliance with ESS2 and Tunisian OHS legislation
- Carry out periodic sensitisation forums for employees on ethics, morals, general good behaviours and the need for the project to co-exist with the neighbours
- Adopt a Project Code of Conduct that covers key issues such as SEA-SH and related issues
- The camps' equipment includes sanitary facilities, septic tank, bins, dumpsters
- Installation in the camps of a rest area and a canteen equipped to be able to heat up food;
- Development of awareness-raising activities on sexual harassment for workers along SC

9.4.1.12 Employment, Income and Labor and Working Conditions (LWC)

Potential impacts include:

- Unfair working conditions (including unfair treatment, discrimination, including gender-based discrimination (e.g. unequal pay, SEA-SH), discrimination against vulnerable workers, child and forced labor, non-observance of basic rights such as freedom of association and collective bargaining)
- Corruption, lack of ethics and integrity from contractors and primary suppliers
- Unrealised opportunities for local employment (e.g. failure to give priority for unskilled work to local community members)
- Unrealised opportunities to train local workers (e.g. key vocational skills, good OHS practices
- Failure to provide local communities with timely information on work opportunities and requirements

9.4.1.12.1 Mitigation measure

- Adopt a **Human Resources Plan, in line with the Project Hiring Policy**
- Staff grievance policies and mechanisms for complaints about unfair treatment, unfair working conditions or sexual harassment
- Implementation of the Labor management procedure (LMP) and contractor LMPs (C-LMP) (Contractors and Primary Suppliers)
- Implement the Code of Conduct
- The Project contractor will develop and implement a transparent recruitment process and communicate the same through the project area via leaders and via the CLOs to manage expectations and opportunistic influx
- Priority for unskilled employment will be given to the local community to minimize in-migration
- Maximise local employment opportunities and provide training and upskilling

9.4.1.13 Infrastructure and Public Services

Potential impacts include:

- Increased traffic and disturbance of traffic flow
- Possible damage to infrastructure during construction activities;
- Temporary limitation in access to health facilities;
- Increased pressure and potential disruption to local utilities for households reliant on local services (e.g., electricity, water, waste);

- Temporary disruptions to local utilities.

9.4.1.13.1 Mitigation measures

- Adopt and implement a Corporate Social Responsibility (CSR) policy, with specific commitment to avoid, minimize, mitigate, offset and/or compensate all Project's potential adverse impacts on Infrastructures, Utilities and Services.
- Implement the Project Stakeholder Engagement Plan
- Waste management plan
- Grievance Policy and Procedure
- Prepare and implement a Transport and traffic management plan
- Notify landowners along the line route about the construction schedule and activities
- Geophysical survey to ascertain the presence of utilities services along terrestrial cable
- Engagement with utilities with underground cables or pipes along STEG's cables lines
- Development of grievance mechanism regarding disruption to utilities caused by Project activities

9.4.2 Operation phase

9.4.2.1 Air quality

The project operation phase will not cause any continuous release of airborne pollutants into the atmosphere. In particular, the Mlaâbi CS equipment do not produce channelled atmospheric emissions, moreover being the station remotely operated, there will not be daily traffic emissions associated to the transport of personnel to and from the site.
The only sources of discontinuous atmospheric emissions under normal operative conditions are attributable to the project regular maintenance, which involves the use engine driven vehicles and/or machinery with consequent exhaust emissions.
In addition potential fugitive emissions of SF6 contained in the transformers insulating oil can be expected during the lifetime of the plant.
In case of emergency (equipment failure, CS shut-down) engine driven emergency generator will be initiated, with consequent temporary release of exhaust emissions into the atmosphere.
The impact significance can be considered negligible.

9.4.2.1.1 Mitigation measures

In order to avoid fugitive emissions of SF6, best available technologies and equipment will be used to ensure fugitive and accidental releases are kept as low as feasible.
Moreover regular test and verifications will be carried out in order to identify potential leaks and maintenance procedure aimed at preventing accidental releases during maintenance will be developed and implemented.

9.4.2.2 Soil, subsoil and freshwater resources

During the operation phase, potential soil and freshwater (surface and underground water) contamination may occur at the Mlaâbi CS in case of accidental spills from equipment or from machinery used for maintenance activities.
During the operation phase of the OHL line, oil leaks from equipment breakdown or accidental spills from machinery used for maintenance activities could lead to soil contamination, as the case in the construction phase.

Considering the presence of systems and management measures described hereafter, soil, freshwater and subsoil pollution is considered unlikely by performing the correct routine and extraordinary maintenance operations. Therefore, the significance of impact can be considered negligible.

9.4.2.2.1 Mitigation measures

The operation of the Mlaâbi CS provides for appropriate management of water discharges, such as to exclude the accidental soil and freshwater pollution. In particular the CS will be equipped with the following drainage systems:

- Drainage system of the CS areas not occupied by installations, providing for the collection and subsequent treatment/separation of runoff water falling on waterproof surfaces, such as roofs, roads and yards, potentially contaminated by particulate matter and other substances;
- Drainage systems of the CS areas occupied by installations, providing for the collection and subsequent treatment/separation of oily waters. This system includes foundation tanks and underground collection tank equipped with oil detection sensors for each piece of machinery, oil separator and lifting pumps.

Both drainage systems will ensure the separation of contaminated waters which will be managed as waste and disposed in accordance with national regulations in force and international standards, whereas clear waters will be dispersed on soil. Civil discharges will be routed to a dedicated sewage system.
Regular maintenance of CS equipment will follow detailed protocols in order to prevent accidental spill of oil and/or other potential contaminated materials. In the event of equipment failure/CS shutdown, emergency procedure will be put in place such as to ensure no accidental soil and water pollution occurs.
All electrical waste and used batteries resulting from maintenance activities must be collected and eliminated/recycled, in compliance with national regulations and best waste management practices.

9.4.2.3 Noise

During the project operation phase, the only noise emissions are related to the operation of the Mlaâbi CS and the operation of the OHL line.

For the converter station noise is generated by the transformer units and the cooler systems.
However the closest settlements are located at a distance of more than 600 m from the station: numerical models indicate that the generated noise will be almost imperceptible at such distance.

For the OHL noise emission are related to:

- Wind effect: the effect occurs only under conditions of strong winds (10-15 m/s), thus with high background noise that results as prevailing.
- Corona effect: This effect is manifested around high-voltage lines by the production of electrical discharges in the air, which are generally visible in very wet weather conditions such as fog or rain or on humid nights through a faint luminescence around conductors. The noise associated with it is thus due to the ionization of air surrounding an electrically charged conductor in a thin tubular layer, which, once ionized, becomes plasma and conducts electricity.
  The cause of the phenomenon is the high potential difference: ionization is determined when the value of the electric field exceeds a threshold called the dielectric strength of air, and is manifested by a series of electric discharges, which affect only the ionized zone and are thus confined to the cylindrical corona in which the field value exceeds the dielectric strength.

For the OHL line, the generated noise is not expected to cause any impact to the potential sensitive receptors (local community and ecological receptor) because the noise would be mostly limited within the RoW of the line and noise levels will be very low as described above.
Given the above, the overall significance of the impact can be considered Low.

9.4.2.3.1 Mitigation measures

At the current stage of project design no noise mitigation measures are anticipated. The implementation of specific noise mitigation measures at the Mlaâbi CS will be carefully evaluated based on monitoring at the closest residential receptors. Monitoring will be carried out:

- prior to the start of the Mlaâbi CS operation, with the aim of gathering up to date information on existing background noise level;
- during the Mlaâbi operation in order to ensure the compliance of induced noise levels with in force regulations.

Noise monitoring/inspection will also be carried out in case of complaints local from communities.

9.4.2.4 Electromagnetic fields

Electromagnetic fields (EMF) are generated:

- in the area of the Converter Station;
- along the route of the HVDC underground cable;
- along the route of the OHL.

9.4.2.4.1 Increase in general public exposure to EMF associated to the Mlaâbi CS operation

The assessment of EMF associated to the operation of the Mlaâbi CS is based on field measurements performed by TERNA on existing facilities of the same kind in Italy.
Measurements have been recorded along the station fence line at a height of 1 m above ground, during the station operation under normal operative conditions. Monitored values of time-varying electric and magnetic fields resulted to be well below international and national exposure limits in force for general public. The table below shows monitored concentration maxima against international and national exposure limits in force.

Table 9-3: Time –varying EMF monitoring at the CS fenceline (Source: Terna)

Monitored variable	Maximum monitored value	ICNIRP and IFC limits
Electric Field (V/m)	≈ 3800	5000 V/m
Magnetic Field (µT)	1.39	100 µT

Static magnetic field measurements were performed in the proximity of direct current cables. Recorded values are slightly above the background value due to the earth's magnetic field (≈ 50 µT) and below ICNIRP and EU exposure limits (400·000 µT and 40·000 µT respectively).

9.4.2.4.2 Increase in general public exposure to EMF associated to the HVDC cable operation

The electric field generated by the HVDC cable during the project operation phase will be completely shielded by the cable metal shield.
The maximum static magnetic field value calculated is:

- ≈ 80 µT at ground level;
- ≈25 µT at 1 meter height above the ground;
- ≈12 µT at 2 meter height above the ground.

These values are all well below ICNIRP and EU exposure limits (400·000 µT and 40·000 µT respectively). Ground level values in correspondence of the cable are slightly above the background value due to the earth's magnetic field (≈ 50 µT).

9.4.2.4.3 Increase in general public exposure to EMF associated to the OHL line

For the 400 kV OHL Mlaâbi-Mornaguia, the evaluation of the generated EMF were made based on data collected from similar projects.
The electric field generated by the OHL line at 16 m, which is the minimum distance from residential settlements set by STEG for 400 kV power transmission lines, is around 1800 V/m.

The magnetic field generated by the OHL line during the Project operation phase will reach a maximum value of 19.10 µT in the axis of the transmission line and the value at 16 m (as fixed by STEG for the distance required for 400 kV lines) the value will be 12.8 µT which is below the limit value fixed by ICNIRP (100 µT), as shown by the following figure.

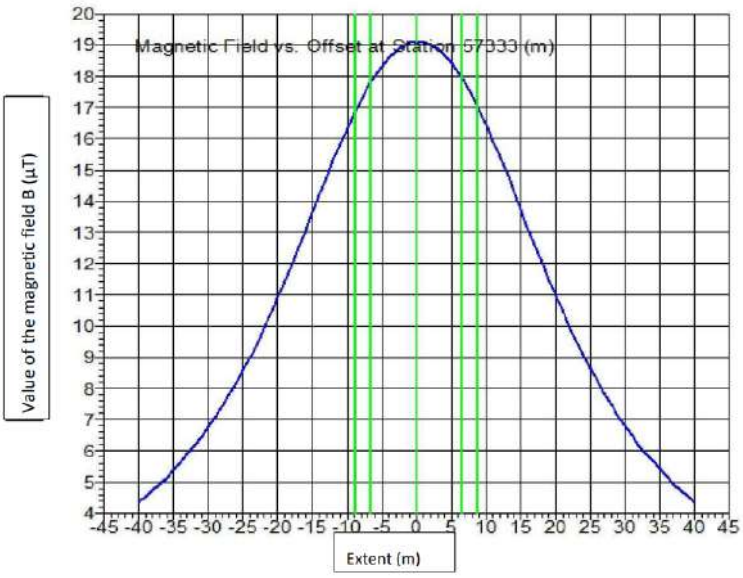

Figure 9-2: Magnetic field for a 400 kV power line (source EMS)

Given the above, the overall significance of EMF impact can be considered as negligible.

9.4.2.4.4 Mitigation measures

At the current stage of project design, the following design measures resulting in prevention of EMF impacts, are anticipated:

- HVDC underground cable metal shield, shielding completely EF;
- project layout definition and siting of new facilities aimed at ensuring that no direct impact on sensitive receptors occur;
- information and education of local communities regarding the effects of EMF.

Moreover, during the Mlaâbi CS and OHL operation, EMF will be periodically monitored to ensure compliance to regulations and absence of disturbance.

9.4.2.5 Landscape and visual amenities

The project will determine visual and physical changes to the landscape features due the presence of the Mlaâbi CS and the OHL line.
No impacts on landscape are associated to the presence of underground cable, developed on existing roads.

9.4.2.5.1 Mlaâbi Converter Station

The overall visual impact due to the presence of the Mlaâbi CS is likely to be negative for human receptors living near the project area: these include the isolated settlements near the industrial zone and the village located close to the Mlaâbi dam (at 1 km from the CS site).
The aesthetic effect of the CS could also be expected to be perceived by the users of the existing regional road C45.
The main landscape and visual impacts due to the presence of the CS are related to the following aspects:

- Morphological impact on landscape components: the technical characteristics of the CS and its location determine a significant alteration of the morphological and vegetation characteristics of the project area with the replacement of the vegetation with anthropic elements.
- Visual impact: the CS is expected to cause relevant visual interferences due to its technical characteristics (volumes and building's heights of about 20 m) and to the presence of sensitive landscape receptors within the range of visual influence of the project (4 km).
  The new CS is expected to become the dominant element of the landscape, in sharp contrast with the agricultural environment, which is impoverished by the direct interference of the project infrastructures with elements of landscape singularity (agricultural lands including both annual crops and olive tree, some eucalyptus tree near the Mlaâbi wetland).
- Symbology impact: the area is already affected by numerous landscape interferences, among all the presence of a wastewater treatment plant located towards the northern part of the project area and some MV powers lines. Therefore, in a context that has already absorbed landscape transformation elements, the new CS constitutes a moderate increase in the landscape impact.

9.4.2.5.2 Mlaâbi-Mornaguia Overhead Line

Visual impacts from the transmission line are highly variable and depend on several factors and criteria, such as: the perception of human receptors, location and type of visual receptor, topography, lines of sight, scenic vistas, the features of the environment crossed, etc.
Potential visual receptors in the region crossed by the line may include communities located near the line corridor (most common are isolated and scattered settlements), travellers using road network, visitors and tourists.
The overall visual impact of the transmission line is likely to be negative for rural communities, in particular for these living between EL Kabbouti and Jbel Ressas (Mornag Delegation, Ben Arous Governorate) where the area is mainly characterized by a landscape dominated by agricultural activities (cereal and olive plantations) and forest land (shrub).
The other areas crossed by the OHL transmission line, have many existing transmission lines and other telecommunication facilities. From Mlaâbi to Grombalia, the OHL 400 kV line will be located near two 90 kV power lines that connect Sidi Abdelmonam CS to Korba and Grombalia. The same occurs for sections located between Grombalia (Nabeul) and Jbel Ressas (Ben Arous) and sections between Bir Mchergua (Zaghouan) and Mornaguia (Manouba), where several power transmission lines exist as shown in the following figure.

Figure 9-3: Area crossed by TUNITA-OHL 400 kV Mlaâbi-Mornaguia OHL with existing power transmission lines

The insertion of new towers and conductors will have an intrusive effect on sensitive receptors present in the area. The towers could be visible over a long distance from the corridor (around 4 km) while the conductor is less visible.

Given the above, and taking into account the mitigation measures described hereafter, the overall significance of the impact on landscape can be considered as moderate.

9.4.2.5.3 Mitigation measures

A series of potential landscape mitigation measures in the CS and the OHL line areas have been identified.
These measures are aimed at reducing the interference on the landscape components and the visual disturbance induced by the project, improving its inclusion into the current landscape.

- *Design measures*

At the current stage of project design, the following design measures resulting in prevention of impacts on landscape, are anticipated:

- Project layout definition and siting of new facilities aimed at reducing negative impacts);
- Restore pre-construction conditions as much as possible (e.g. re-vegetation) in temporary construction yards and construction areas;
- With reference to the external finishes of the CS, materials in harmony with the dominant colours of the landscape context will be preferred, favouring soft and pastel colours (light sand-earth colour palette);
- The design of the CS includes a surrounding area to be used for soil re-profiling suitable to host shielding wooded areas.
- Positioning OHL towers carefully within the landscape by including tower visibility as a factor in final tower placement, taking advantage of existing structures.

➢ *Additional specific mitigation measures*

In addition to the design measures listed above, the project will implament the following landscape mitigations:

- Within the RoW of the OHL, smaller trees and vegetation (not exceeding 4 m) shall be preserved in order to reduce the visual impact due to the presence of towers;
- Replacement planting of native trees, in particular for areas strongly affected by vegetation removal operations (forest and shrub areas between Grombalia and Zaghouan and near Beni Ayech);
- Shielding wooded area (pluri-specific natural system of autochthonous tree-tall-shrubby and shrubby species). This measure will allow a reduction of visibility from sensitive receptors by creating a stratified vegetation visual screen. The reintegration of autochthonous species of high ecological and landscape value will be preferred as well as composite vegetation systems which, in addition to the creation of an effective visual screen, are also functional to the trophic support for the avifauna and useful entomofauna;
- Consolidation of the perimeter slopes with naturalistic engineering works and planting of native shrubs. This measure has a stabilizing effect and allows to reduce erosion on the slopes affected by soil excavation re-profiling.

9.4.2.6 Biological environment

The potential impacts in the area of the Converter Station are described hereafter:

- The physical barrier due to presence of the electrical equipment might affect the movement of wildlife within the territory, and may affect the access of some waterbirds to Mlaâbi dam, considered as key biodiversity area for many migratory and nesting birds. The presence of the plant could also affect other fauna groups potentially present near Tafekhsite watercourse and Mlaâbi dam.
- Use of artificial lighting for the illumination of CS during night-time, is likely to disrupt natural biological cycle of many species.

During operational phase, the main environmental risk is anyhow that of collision of avifauna species, in particular migratory birds. Other animal species may also be negatively affected, such as bats (in particular species with critical conservation status).
On the other hand, the distance between conductors (minimum 5 m) allows to exclude the risk of electrocution: this would in fact require contact with two conductors at the same time.

The Cap Bon peninsula, including part from Ben Arous and Zaghouane governorates, is considered as an important feeding area and essential stopover for many migratory birds on their seasonal journeys between Europe and Africa across the Strait of Sicily .
Bird migration season at Cap Bon region can be divided into 3 periods:

- Spring migration (from March to June, direction Africa to Europe): considered as rapid compared to the autumn migration, during this migration birds return to their breeding areas;
- Autumn migration (from September to November, direction Europe to Africa), species migrating during this period are much more dispersed compared to the spring migration with several stopovers along the migration way;
- Waterbirds migration (ducks, geese) which begins in late November for Europe-Tunisia direction and at the end of February for the Tunisia-Europe direction.

Problems that power lines can cause to birds are described hereafter:

- Loss and disturbance/fragmentation of bird habitats due to vegetation removal along the RoW of the OHL: this is not the case for the Mlaâbi-Mornaguia transmission line since all vegetation under the OHL conductors will be preserved.
- Disturbance due to increased human activities during operation and maintenance activities (noise, pollution, etc.): maintenance activities will have low frequency and thus a very low impact on avifauna species present along the RoW of the OHL.
- Barrier effect: OHL power transmission projects are considered as a physical barrier to the daily and seasonal movement of birds. Lines may alter the migratory behaviour and flight patterns of some bird species and some species are very sensitive to the introduction of vertical artificial elements in the landscape.
- Direct Mortality by collision.

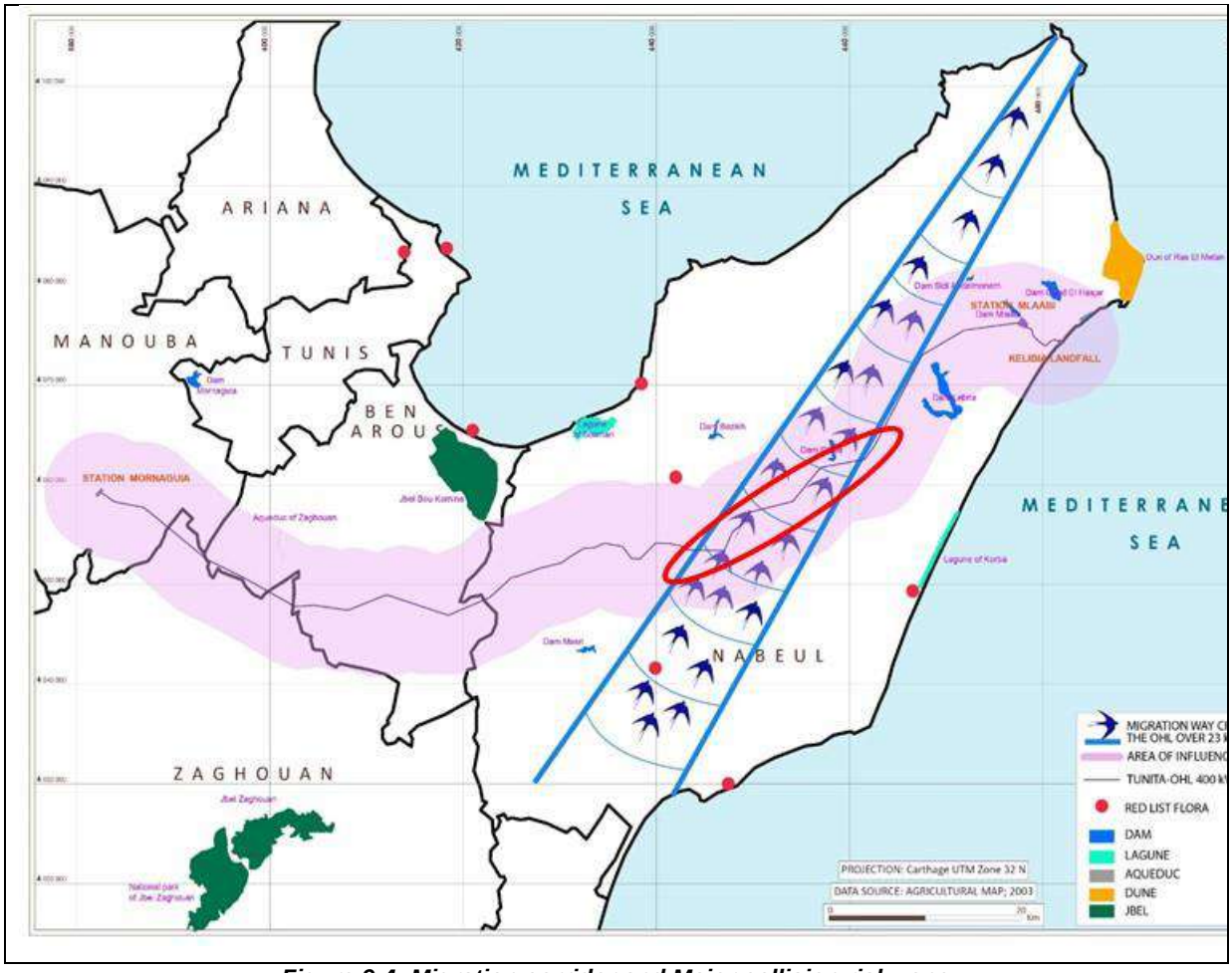

Figure 9-4: Migration corridor and Major collision risk zone

The birds likely to be observed along the OHL are listed in the following table.

Table 9-4: Ecological status, risks and flight height ranges for common birds in the area of the OHL

Species	Ecological status: M: Migratory, N: Nesting, S: Sedentary	Flight height (m)	Collision risk for flights in flocks
Raptors			

Species	Ecological status: M: Migratory, N: Nesting, S: Sedentary	Flight height (m)	Collision risk for flights in flocks
Sparrowhawk Accipiter nisus	M : Raptor	20- 30	moderate
Short-toed Eagle Circaetus gallicus	N : Raptor, rare and protected species	20- 50	moderate
Milan black *Milvus migran*	M : Raptor, protected species	20-40	moderate
Long-legged buzzard *Buteo rufinus*	S : Raptor, vulnerable and protected species	20- 40	moderate
Common Buzzard *Buteo buteo*	M : Raptor		
Western marsh harrier *Circus aeruginosus*	SN : Raptor	40	negligible
Montagu's Harrier *Circus pygargus*	M : Raptor	50	negligible
Honey buzzard *Pernis apivorus*	M : Raptor, protected species	30-100	moderate
Black-winged kite *Elanus caeruleus*	N : Small raptor	15- 40	moderate
Booted eagle *Hieraaetus pennatus*	M : Raptor	200	negligible
Egyptian vulture *Neophron percnopterus*	M : Raptor	100	negligible
Peregrine Falcon *Falco peregrinus*	S: diurnal raptor threatened, rare and protected	30- 50	moderate
Common kestrel *Falco tinnunculus*	S: diurnal Raptor, expanding and protected	30 - 40	moderate
Raven *Corvus corax*	N : Raptor	20- 40	moderate
Passerine, waders, water and domestic birds			
Cattle Egret *Bulbucus ibis*	S : Wader, endemic species	15- 20	negligible
Little Egret *Egretta garzetta*	S ; Wader, vulnerable and protected species	15- 30	moderate
Gray Heron *Ardea cinerea*	NM : Wader	20- 25	low
Turtle Dove *Streptopelia turtur*	N : passerine	15- 30	moderate
Mesh Dove *Spilopelia senegalensis*	NS : passerine	50- 300	negligible
European bee-eater *Merops apiaster*	M : Passerine	30-150	low
Hoopoe *Upupa epops*	NS : Passerine	30	moderate
Starling *Sturnus sp*	NS : Passerine	30	moderate
BlueBird *Monticola solitarius*	NS : Passerine	10	negligible

Species	Ecological status: M: Migratory, N: Nesting, S: Sedentary	Flight height (m)	Collision risk for flights in flocks
Window swallow *Delichon urbicum*	M : passerine	20	negligible
Crested Lark Galerida cristata	NS : passerine	15- 20	negligible
Rock Pigeon Columba livia	NS : Domestic	20- 30	moderate
White Stork Ciconia ciconia	M : Grand voilier	30	
Black Stork *Ciconia nigra*	M : Grand voilier	100-150	Negligible
Blossy ibis *Plegadis falcinellus*	M : Water bird	30-150	low

The high priority species for OHL project's area and the level of risk generated by the project are presented in the following table.

Table 9-5: Bird species of conservation importance present in the project area and risks generated by the project

Species	IUCN status	Distribution	Presence in Project area	Risk of significant impacts from the Project
White-headed Duck (*Oxyura leucocephala*)	EN	This bird is known to be resident in Northern Africa, where 400-600 individuals are estimated in Algeria and Tunisia. It is known from the Mlâabi dam and other areas nearby the OHL route	Confirmed	Medium
Egyptian Vulture (*Neophron percnopterus*)	EN	It is known to breed in Tunisia. An important part of the breeding population of Eurasia passes through the Strait of Gibraltar and the Red Sea Flyway, but individuals also cross Cap Bon in Tunisia.	Reported but not confirmed	High
Saker Falcon (*Falco cherrug*)	EN	Within the Mediterranean region it is only thought to breed in North Macedonia.	Reported but not confirmed	High
Red-footed Falcon (*Falco vespertinus*)	VU	In the Mediterranean the species only breeds in Northern Italy and Turkey.	Reported but not confirmed	High

The overhead line is located nearby several man-made water reservoirs, considered as a high importance for several waterbirds species, including threatened species (White-headed Duck)

and the corridor overlap with an important migratory bird corridor in Cap Bon peninsula. Risks of collision and electrocution with the new OHL line is thus considered very high.

Tunisian's bat fauna is considered as poorly known among North African faunas with only 19 species recorded to date. Some of these species are identified in the study area in particular in mountain forest areas between Jebel Ressas (Ben Arous), Jebel Sidi Abderrahman (Nabeul) and Zaghouane (near the aqueduct and the national park).
Power transmission line impacts on bat species may include the following:

- Habitat alteration and disturbance, with a relatively low impact compared to construction phase due to the absence of large-scale disturbance factors.
- Direct mortality by collision
- Possible interaction between bat and EMF generated by OHL operation: bats use echolocation or bio sonar to navigate and find prey at night by emitting short ultrasonic calls and analyze the reflected echoes.

Given the above, and taking into consideration the mitigation measures described hereafter, the significance of the impact on the biological environment is estimated as moderate.

9.4.2.6.1 Mitigation measures

The following mitigation measures will be applied to reduce impacts generated by OHL and Converter Station.

Flora and vegetation

- No chemical products to be used during vegetation maintenance under the RoW

Terrestrial fauna

- Vehicle movements shall be limited in forest areas and near wetlands sites

Avifauna

- Conduct an annual monitoring of avifauna
- Assessment of mitigation measure effectiveness
- Increase the visibility of the OHL line by installing line markers: spirals or other forms of suspended devices, to prevent collision of birds
- Reduce artificial lighting in the CS area

Bats

- Maintenance activities should be planned outside breeding season for most resident species including bats

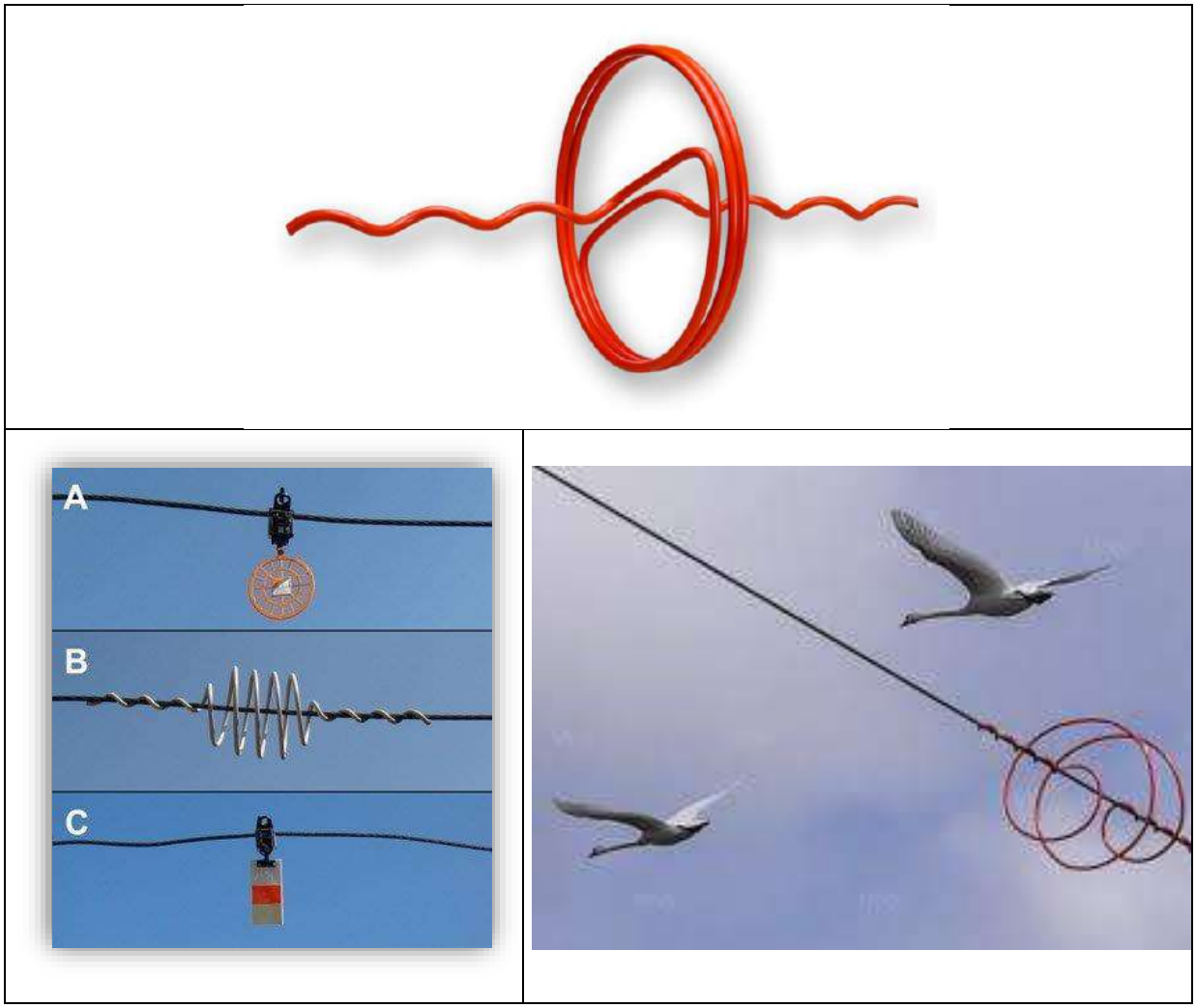

Figure 9-5: Signalling devices

9.4.2.7 Occupational Health and Safety

There will be some generic risks to workers health and safety from working on operational sites, as it increases the risk to injury or death due to accidents

9.4.2.7.1 Mitigation measures

- Prepare an OHSP and adopt and implement its recommendations/provisions of the OHSP. Training specific to plant and site
- Carry out regular audits
- Install signs on transmission towers with information on public safety risks and emergency contact information in Arabic and French.

9.4.2.8 Economy, Employment and Labor and Working Conditions (LWC)

Potential impacts include:

- Unfair working conditions (including fair treatment, non-discrimination, vulnerable workers, gender pay gaps and sexual harassment, child and juvenile labor, freedom of association and collective bargaining)
- Corruption, ethics, integrity, sustainability of contractors and primary suppliers

9.4.2.8.1 Mitigation measures

- Human Resources Policy and Procedures
- Staff grievance policies and mechanisms for complaints about unfair treatment or unfair working conditions
- Worker Code of Conduct
- Labor management procedures (Contractors and Primary Suppliers)
- Code of Ethics

9.4.2.9 Community Health and Safety

Potential impacts include:

- Safety risk to the local communities once the project is operational
- Risks of electrocution

9.4.2.9.1 Mitigation measures

- Stakeholder Engagement Plan
- Grievance Policy and Procedure
- Corporate Social Responsibility (CSR) policy
- Community education programme on safety to alleviate concerns.

STEG operational policies and procedures (safety)Installation of warning and awareness panels against the dangers of high voltage at the various sites and along the transmission line

10.STAKEHOLDER ENGAGEMENT

10.1 Introduction

Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure (ESS10) applies to ongoing stakeholder engagement activities to be carried out by the borrower throughout the project life-cycle. In addition, as part of actions to be completed prior to project appraisal, a Stakeholder Engagement Plan (SEP) is being prepared so that it can be consulted upon and disclosed in the country and by the World Bank. The SEP will be carried out throughout project implementation and updated regularly to reflect possible changes in the stakeholder environment. The preparation of the SEP will be supported by an engagement process that includes stakeholder identification, analysis and mapping, alongside engagement planning, and disclosure of information to interested and affected stakeholders. It consists of meaningful consultation that is conducted in a culturally appropriate and gender and inter-generationally inclusive manner. Borrowers will ensure that a grievance redress mechanism (GRM) is established for the project, as described in ESS10, which is culturally appropriate and accessible to project-affected persons and takes into account the availability of judicial recourse and customary dispute settlement mechanisms.

10.2 Consultations carried-out

The first public consultation related to the Project was held on 8 June 2021 in the Governorate of Nabeul with the presence of the authorities, public administration representatives, ELMED, the ESIA Consultants (IDEACONSULT) and other stakeholders. This meeting collected their concerns and introduced the relevance of this strategic project for the region and the country.
After this first contact, the Consultant initiated interviews with the regional and local authorities during July through December 2021. These interviews focused primarily on providing information about the project's landing points and underground part (the cable and the substation of Mlaâbi).
During these public consultations, the Consultant met with the Municipality of Menzel Temime (The Delegates and its Omdas), the Municipality of Menzel Horr and other public services in Nabeul (Agriculture, STEG, Forest, AFI Agency, Regional Development Agency, etc.).
The subject of these interviews was to present alternatives for the landing point of the project and collect their suggestion and comments, and present the other options for the underground cable between the proposed landing point in each delegation (Kélibia, Menzel Temime and Menzel Horr) and the location of the Mlaâbi sub-station.

Consultations carried out to date and issues raised are listed in the Table below.

Table 10-1: Record of stakeholder engagement activities

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
8 June 2021	Governorate of Nabeul ○ Local Authorities ○ Governor	ELMED IDEA-CONSULT	Governorate of Nabeul	Local authorities and administration expressed their concerns regarding the project, notably as regards: - The need to present the plans and technical data of the Project to the competent authorities before the start of the works in order to obtain the necessary authorisations/permits; - The consultants in charge of the technical and environmental studies must consult the local and regional authorities, in particular: the Regional Directorate for Equipment and Housing, the Coastal Protection and Planning Agency and any other service deemed important for the realization of the Project; - Presentation of a technical file of the boat to be used by the marine consultant with the characteristics of the equipment to be used during the investigation work on the submarine cable; - The possibility of creating a management unit at the regional level to ensure the progress of the studies and the realization of the Project; this unit could be chaired by the Delegate of Menzel Temime (location of the Mlaâbi converter station and the underground cable).
12 August 2021	Local authorities, representative of Menzel Temime, local sectoral Chiefs (Omdas) and community representatives	IDEACONSULT	Menzel Temime	- To discuss the route of the underground cable in the Menzel Temime area (see Map 1), from the landfall of the cable to the converter station, specifically the two landfall options on the table. Key points on options are as follows: ✓ **Kélibia Landing Site (Option 1):** - No constraints for the rural section of the underground cable - Problems in urban part of Menzel Temime: works envisaged will have a significant impact on the existing infrastructure, street furniture, economic activities and traffic. - It would be better to avoid the urban center of Menzel Temime to avoid this problem. The Urban Development Plan of Menzel Temime includes a planned ring road which could be a solution for laying the cable between the underwater part and the Mlaâbi converter station. This option will avoid residential areas. However, the planned ring road is unlikely to be built before 2027 at the earliest.

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
				✓ **Sidi Jameledine Landing Site (Option 2)** - No specific environmental constraints to report for this variant. - The width of the track leading from the landing point to the RR27 and the roads RR27 and RR45 is sufficient and does not pose any access problem. - Like variant 1, the Sidi Jameledine option crosses the urban area of Menzel Temime and Sidi Jameledine and the installation work will have a significant impact on these two agglomerations (traffic disruption, damage to street furniture , contamination, etc.). - It would be appropriate to modify the route of this variant is to follow the existing tracks outside the urban areas mentioned. The planned ring road option (described in the Urban Plan) is also possible for variant 2. ✓ **Menzel Horr Landing Site (Option 3)** - Presence of a RAMSAR site (No. 1707) on the cable crossing line (at the level of the landing point). - The urban part affected by the passage of the cable is the largest among the three variants proposed. This option will cause more damage to existing homes and infrastructure and disrupt traffic in the town of Menzel Horr and Menzel Temime. - This option seems to be the most restrictive from a terrestrial point of view, the variant passes through two very populated agglomerations and the costs related to the compensation of people affected by the works during the construction phase may amount to very high sums . It would be preferable to avoid the urban task of the two cities in question by following the tracks that are outside the agglomeration or the planned ring road (proposed in the Plan d'Aménagement et d'Urbanisme PAU de Menzel Temime). ✓ **Mlaâbi Converter Station** - Presence of the Mlaâbi dam: environmental constraint given the importance of this site for migratory birds (IBA site). - We must not forget another important impact on birds of all Ramsar-classified ecosystems, which risk flying over the station and the HV

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
				overhead lines. This is data to be taken into consideration by the appropriate measures in the ESIA. - A potential risk of pollution for Oued Tafekhsite - Absence of another alternative for setting up this station. - The AFI has still not started development work on the industrial zone in question. - The project will have an impact on the agricultural activity practiced with the need to put in place compensation or compensation measures for the people affected.
30 November 2021	Delegation of Grombalia, Town hall of Grombalia and its technical services, Town Hall of Fondouk Jedidi, Head of sector/Imada Grombalia Est, Head of sector/Imada Niano, Head of sector/Imada Chammes, directorate of equipment and housing, representative of SONEDE, representative of STEG, agricultural services).	IDEACONSULT	Délégation de Grombalia	- For the administrations it is necessary to target state lands (public) to install this new project. This approach will make it possible to reduce/avoid conflicts with the populations in the event of passage on private land. - The route proposed by STEG for the 400 kV HV line is outside the area covered by the urban development plan of the municipality of Grombalia. The representatives of the town hall recommended the passage through state lands in order to reduce the impact of the line on private properties and to avoid conflicts with local populations, in particular in areas of arboriculture. - The representative of the equipment management thinks that it is more appropriate to propose an underground cable instead of an aerial component. A buried alternative following the existing roads: the C43 road linking Menzel Temime to Menzel Bouzelfa and then the one leading to Borj Cedria. According to him, this alternative will minimize the impact on the landscape and the damage to private properties (agricultural land); an idea not shared by the STEG services which justify their choice (overhead line) by the high costs associated with the installation of an underground cable. - Fondouk Jedidi town hall: the municipal area encompasses 3 sectors or imadas (Fondouk Jedidi, Khanguet El Hojej and Chammes). The area of Khonguet El Hojej is dominated by state land (belonging to the state) unlike Chammes where the majority of land belongs to individuals (private land). According to the town hall and heads of sectors, the proposed OHL will cause more problems in the Chammes area.

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
29 November 2021	Local Authorities of the Delegation of Menzel Bouzelfa	IDEACONSULT	Délégation de Menzel Bouzelfa	- According to the representatives of the delegation, the southern part of the delegation (ERRAHMA) is dominated by land owned by the State (state land) but illegally occupied by farmers (field crops: cereals) . - As for the bordering area with Beni Khalled (AITHA): arboriculture is the main occupation (citrus and olive groves) with several orchards and irrigated perimeters (having a status of safeguard and protection by Tunisian law). The lands in this part of the delegation are mostly private lands. - According to the delegate, the social impact of the HT line will be greater in the second part of the delegation (bordering with Beni Khalled) than in the southern part (Errahma) because of the land. Farmers located in the border area with Beni Khalled often ask to be compensated differently by claiming new land equivalent to that impacted by the project instead of receiving a sum of money.
1 December 2021	Local Authorities of the Delegation d'El Mida (Representatives, Maire's Office, Heads of Services of d'El Mida and Oum Dhouil).	IDEACONSULT	Délégation d'EL MIDA	- The delegation comprises six sectors or imadas and a single commune (El Mida). The total population of El Mida is 28,000 with approximately 8,000 households. - The main activities: agriculture (rainfed cereals, livestock) with some industries (textiles and agri-food). - The proposed route of the line is outside the area covered by the urban development plan of the municipality of El Mida and crosses agricultural land (rainfed cereals). - The authorities request the consultation of the populations who will be impacted by the Project and to define an indemnity and compensation process that meets their expectations. - In order to guarantee the acceptability of the project by the local populations, the representatives of the town hall asked for the improvement of the existing electricity network (transition to the three-phase system).
10 December 2021	Representatives of Beni Khalled including: o Maire's Office, o Maire's office of Zaouiet Jedidi	IDEACONSULT	Délégation de Beni Khalled Délégation de	- The delegation of Beni Khalled is made up of two municipalities: Beni Khalled and Zaouiet Jedidi. - Stakeholders have expressed some concerns about the implementation of the Project according to the configuration proposed in the delegation of Beni Khalled:

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
	○ Sectoral Chiefs of Beni Khalled, Sidi Toumi and Kobba Kebira ○ Local Infrastricture and Habitat Services ○ Agricultural Services Water Distribution Services (SONEDE) ○ STEG ○ Sanitation Services ''ONAS''		Zaouiet Jedidi	- Towards the southern part of the delegation, the town hall of Beni Khalled plans to develop an industrial zone and a residential subdivision (procedures in progress according to the town hall) over 50 ha and the 400 kV overhead line risks having a negative impact on the completion of the this project. They ask to move the route to the northern part of the delegation or even go directly through the delegation of Soliman. This point was widely discussed between the STEG services and the mayor, each party defended its project (residential development vs 400 kV power line). - The main concern of the town hall is to protect homes (populations) and agricultural land (citrus orchards). - Representative of CRDA (agricultural services): according to him, the indemnification/compensation procedure practiced by STEG for electricity transmission lines does not meet the expectations of populations and farmers. They consider that the sum granted to the affected people (270 Tunisian dinars or about 85 euros for each pylon installed). - The Beni Khalled area is crossed by a HT line (90 kV), this line since its installation has blocked the phytosanitary treatment operations, applied by plane, from the northern part of the region (Soliman). Citrus orchards located behind the line (southern part of Beni Khalled) are no longer treated automatically (by plane) but manually by supplying phytosanitary products to farmers to apply them directly to the trees. According to the agricultural services, the manual treatment did not achieve the expected results. The installation of a new HV line, along the route proposed by STEG, risks aggravating the situation by depriving other orchards of the aerial spraying operations of phytosanitary products. Given this, they recommend making changes to the preliminary route by placing it further south behind the existing line.
10 December 2021	Local Authorities of the Delegation of Korba	IDEACONSULT	Délégation de Korba	- Urban planning and passage of the overhead line in the delegation (towards the Beni Ayech area, northern limit of the delegation): the municipality of Korba has an urban development plan and the municipal area currently covers 18,436 ha. The sector/Imada of Beni Ayech (administrative division in Tunisia, the country is divided into governorates, each governorate is divided into delegations, which are in turn divided into sectors or imada), has

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
				a very old and not updated development plan (only available in paper format). - The people met, in particular from the town hall of Korba, mentioned the problems encountered during the construction of the trans-med project (gas pipeline) between Algeria and Italy. The compensation process has been the subject of several complaints and disputes from the people affected by this project. - The area/sector of Beni Ayech is an agricultural area and the populations cultivate annual crops. - A recommendation expressed by the delegation and shared by the town hall is the improvement of electrification in the Beni Ayech area. According to the delegation, this area is poorly served by electricity with many cuts, especially in summer. Improving household electrification (switching to the three-phase system) could ensure the acceptability of the Project among local populations.
30 December 2021	Local authorities of Kélibia Commune (Representatives of the Maire's Office)	IDEACONSULT	Délégation de Kélibia	- The main activities present in the delegation: fishing, agriculture (arboriculture and cereal growing), tourism, industry, etc. - The industrial zone of Menzel Yahia houses certain industrial units (packaging of sardines, tobacco, etc.). - The area chosen for the landing is located outside the area covered by the urban development plan of Kélibia but inside the plan of the industrial zone of Menzel Yahia. - The Delegate of Kélibia pointed out that the site chosen by ELMED for the landing of the submarine cable (near the industrial zone of Menzel Yahia) is an area which could contain certain archaeological and historical monuments. He asks that STEG/ELMED must consult the competent administrations, in particular the National Heritage Institute (INP), and recommends carrying out investigations in order to ensure that the project will have no impact on heritage. culture of the area. This information was transmitted to ELMED (meetings were organized between the INP, ELMED and IDEACONSULT and georadar investigations have since been conducted by the Technical Consultant COLENCO, the results of which are available in the archaeological study).

Date	Stakeholder(s)	Project Representatives	Location	Issues Raised
				- The representatives of the commune of Kélibia recommended that the impact of the project on the port of Kélibia, on the wetlands of the region and on the avifauna be carefully studied, in particular for the aerial component (although this part is not does not directly impact delegation).
10 October 2022	Representatives of : ○ Industrial Property Agency (AFI) ○ STEG	ELMED	AFI Nabeul	The main decisions were : - The agency agrees to the granting of a subdivision for the station in the Mlaabi's in the industrial Zone - The plot boundaries for the station have been determined - The lines should not cross the allotments in the industrial estate
19 October 2022	Governorate of Manouba ○ Governor ○ General Secretary Manouba's Governorate ○ Delegate of Mornaguia ○ Maire of Bassatine ○ Maire of Mornaguia ○ Head of District STEG (Manouba) ○ Regional Director (Ministry of Equipment) ○ Representatives of the Regional Directorate of : - Agricultural development - State Domains - Ministry of Energy	ELMED	Governorate of Manouba	The local and regional authorities and the regional administration have expressed comments and recommendations on the project, including: - The project is very important for Tunisia, as it will strengthen the national electricity network in a challenging global energy context. - The local and regional authorities will support the implementation of the project by facilitating administrative procedures and obtaining the necessary permits; - The need to present the technical details of the Project components to the competent authorities at local and regional Levels; - The main stakeholders must be consulted by the consultants in charge of the technical and environmental studies; - In order to reduce/avoid possible conflicts with local communities and individuals, it will better to target "State Owned Land";

10.3 Planned consultations

To strengthen the participatory process, the Consultant will organize, in coordination with ELMED, public consultations in each of the concerned Governorates, expected in February 2023. To this end, ELMED sent correspondences to the four Governors concerned by the project inviting them to organize public consultation sessions with the concerned stakeholders.

- Specific objectives:
  - i. To present the main results of the ESIA;
  - ii. To collect opinions, comments and recommendations from stakeholders;
  - iii. To describe and take into account the different feedbacks;
  - iv. Inform which alternatives to choose.
- Target audience:
  - v. Representatives of the Regional Authorities: Governorates (Nabeul, Ben Arous, Zaghouan and Manouba),
  - vi. Representatives of the Regional Directorates of Agriculture (+ Forests), Equipment, Energy, State Domains, Environment, ANPE, APAL, Culture and Heritage ...
  - vii. Representatives of Local Authorities: the Municipalities concerned
  - viii. Representatives of Civil Society: NGOs and other associations active in the field of environment and local development
  - ix. Representatives of the local populations/communities.

In addition, the Consultant started a consultation process with the representatives of the civil society in the project's areas (Governorates of Ben Arous, Manouba, Zaghouan and Nabeul (see below). This process began by a working session with the Association les Amis des Oiseaux (AAO), an NGO that is specialized in observing bird migration and counting and proposing measures to limit the impact on birdlife, mainly in the project area. The head of the association insisted on the need to carry out a series of observations to identify mortality hot-spots on existing HV lines and to involve the AAO in the design of the line.

The civil society consultation process has continued with two steps:

1. **In a first step**, the Consultant identified the associations active in the fields of environment, nature protection, ecology and local development, to establish a mailing list. Nine NGOs have been consulted on the impacts of the project: (1) Ecologistes Sans Frontières ESF; (2) Association Internationale pour la Coopération et le Développement Durable AICD; (3) Association de Développement et Citoyenneté ADC ; (4) Green Heart Tunisia ; (5) Association Jebel Abderrahman pour l'Environnement et le Développement Durable AJAEDD; (6) Association de l'Environnement et du Développement de Soliman AEDS ; (7) Association culturelle et Environnementale de Kélibia ACEK; (8) Association Tunisienne de Protection de la Nature et de l'Environnement ATPNE – Korba; (9) Association pour la Sauvegarde de Patrimoine Ecologique et Naturel du Cap Bon ASPEN.
2. **In a second step**, the Consultant designed a survey form and sent it to the identified NGOs. The survey questionnaire includes:
   - General presentation of the project (with a map of the route of the lines and the stations),
   - A table with information about the NGO and
   - Five open-ended questions about the project's impacts and the mitigation measures to be implemented.
     - Question 1: Briefly present your Association: Name, Date of creation, field of intervention, main actions

- Question 2: Are you familiar with the Project: ENVIRONMENTAL AND SOCIAL IMPACT STUDY AND RESETTING ACTION PLAN FOR THE TUNISIA - ITALY INTERCONNECTION?
- Question 3: To what extent do you think the project will have negative impacts and risks on biodiversity in the areas crossed by the HV lines, in particular on birdlife? by the HV lines, in particular on birdlife? (Specify the intensity and type of impact).
- Question 4: What measures and/or actions do you recommend, as an association, to reduce the risks and negative impacts on negative impacts on biodiversity (birdlife)?
- Question 5: Do you have any additions, remarks or additional observations? If so, please list them below ?

10.4 Information disclosure

At this stage of the project, information on the project was limited to the meetings held with the regional authorities (Governorates and delegations) as well as the notice of inquiry displayed in the headquarters of the delegations. This is established by the Ministry of Industry, Mines and Energy (Ministry supervising STEG) pursuant to the decree of May 30, 1922 (see Figures below).

The Notice of Inquiry posted in Arabic and in French provides some information about the ELMED Project and states that:

- The technical file relating to the project, including the list of private owners concerned by the passage of the line will be made available to the public, at the headquarters of the governorate of Nabeul, from the publication of this notice of inquiry and until at the end of a period of three days from its insertion in the Official Journal of the Republic of Tunisia.
- The interested parties will be able to read this file and submit their observations or possible complaints to the governorate concerned.

At present, ELMED has received responses from the stakeholders involved in the project to the correspondence sent by the Ministry of Industry, Energy and Mines. The synthesis of the different opinions is presented in the following table.

Table 10-2: Synthesis of the different opinions of consulted stakeholders

Date	Stakeholder(s)	Opinion
September 22, 2022	Regional Director of State Domains and Lands Affairs (Nabeul)	- Assign a representative from STEG to participate in the necessary topographic survey - Provide the plans of the project's perimeter of intervention
October 06, 2022	Minister of Interior	- The need to meet international safety standards - Carry out the work at a distance of 25 m from the axis of regional road 27 and 20 m from the axis of other roads - Take into account the irrigation channels around the Mlaabi dam - Coordinate with competent administrations for the installation of the water chambers
October 10, 2022	Representatives of Industrial Property Agency (AFI)	The agency agrees to the granting of a subdivision for the station in the Mlaabi's in the industrial Zone - The plot boundaries for the station have been determined - The lines should not cross the allotments in the industrial estate
24 October 2022	Minister of National Defense	- The Ministry has no objections to the implementation of the Project - Send the details of the project components to the Consultative Commission for Maritime Activities in accordance with Decree No. 1836 of 15 September 1997