TANZANIA ELECTRIC SUPPLY COMPANY LIMITED

Environmental and Social Impact Assessment Report

for

Submarine Cable to Zanzibar - Tanzania-Pemba, Unguja, Mafia Interconnections: The proposed 132 kV Interconnection from Tanga to Pemba Island – Focus on Tanzania Mainland

Developer: TANZANIA ELECTRIC SUPPLY COMPANY LIMITED
P.O. Box 453
Dodoma, Tanzania
Tel: +255 0262323456/7
Fax: +255 22 2451206
Email address: info@tanesco.co.tz

Consultant: CESI-ELC-COLENCO
Via Rubattino 54
20134
Milan, Italy

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Client	Tanzania Electric Supply Company Limited (TANESCO) Contact person: Tluway Sappa - Ag. Manager Environment, Social and Governance Email: tluway.sappa@tanesco.co.tz
Subject	Submarine Cable to Zanzibar - Tanzania-Pemba, Unguja, Mafia Interconnections **Environmental and Social Impact Assessment (ESIA) for the proposed 132 kV** Contract No. PA/001/2022-23/HQ/C/024
Notes	This Environmental and Social Impact Assessment (ESIA) has been prepared by CESI-ELC-COLENCO for TANESCO and it addresses the environmental and social impacts of the Interconnection Project between Tanga and Pemba in compliance with the African Development Bank (AfDB) policies and guidelines. This report has been prepared in accordance with the legislation of Tanzania and Zanzibar, as applicable to their respective project sites. While the two sites are intrinsically connected within the context of the project, they are addressed as distinct entities in separate documents to ensure clarity and facilitate analysis.

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Prepared	Ettore Romagnoli		
Verified	Paola Chiodi, Dario Provenzano		
Approved	Bruno Cova		

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First and foremost, we extend our appreciation to the Tanzanian and Zanzibar governments and relevant regulatory bodies for their guidance, support, and collaboration throughout this process. Their commitment to environmental protection and sustainable development has been invaluable.

We would also like to thank the local communities in both mainland Tanzania and Zanzibar for their willingness to engage with us, share their insights, and provide valuable information regarding the socio-economic and environmental context of the project area. Their participation has been essential in ensuring that the ESIA reflects the realities and concerns of those most affected by the proposed activities.

Special thanks are due to our multidisciplinary team of experts who dedicated their time and expertise to conduct thorough assessments and analyses. Their professionalism and dedication have ensured the accuracy and comprehensiveness of this report.

Finally, we appreciate the contributions of various stakeholders, including non-governmental organizations, academic institutions, and local authorities, who provided data, resources, and perspectives that enriched our understanding of the environmental and social landscape.

Together, these collaborative efforts have helped us to create a robust and meaningful ESIA that not only complies with national and international standards but also prioritizes the well-being of the environment and local communities in both mainland Tanzania and Zanzibar. Thank you for your support and commitment to sustainable development in Tanzania.

GLOSSARY

Ad.CH.	(British) Admiralty Chart
AEWA	African-Eurasian Migratory Waterbirds
AfDB	African Development Bank
AoI	(Direct) Area of Influence
BMU	Beach Management Unit
CAE	Child sexual Abuse and Exploitation
CBD	Convention on Biological Diversity
CBFM	Community-Based Forest Management
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CFMA	Collaborative Fisheries Management Area
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species
DoE	Division of Environment
DoEM	Department of Energy and Minerals
DTS	Desktop Study
EBSA	Ecologically or Biologically Significant Marine Areas
EHSG	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EMF	Electromagnetic Field
ENS	Energy Not Supplied
ESA	Environmental and Social Assessment
ESAP	Environmental and Social Assessment Procedures
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FS	Feasibility Study
GBV	Gender-based Violence
GCA	Game Controlled Areas
GDP	Gross Domestic Product
GEBCO	General Bathymetric Chart of the Oceans
GIIP	Good International Industry Practice
HS	Health and Safety
HVTL	High Voltage Transmission Line
IAoI	Indirect Area of Influence
IBA	Important Bird and Biodiversity Area
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IFC	International Financing Corporation
ILO	International Labour Organization
IMMA	Important Marine Mammal Areas
IPPC	International Plant Protection Convention
ISS	Integrated Safeguards System
ISTS	Integrated Safeguards Tracking System
IUCN	International Union for the Conservation of Nature

KBA	Key Biodiversity Area
KoM	Kick-off Meeting
LGA	Local Government Authorities
LMMA	Locally Managed Marine Area
LP	Landing Point
MAB	Man and Biosphere Programme
MKUZA III	Zanzibar Growth and Poverty Reduction Strategy
MNRT	Ministry of Natural Resources and Tourism
MoWEM	Ministry of Water, Energy and Minerals
MPA	Marine Protected Area
MPRU	Marine Park and Reserves Unit
NCA	Nature Conservation Area
NCB	Non-Carbon Benefit
NCSSD	National Conservation Strategy for Sustainable Development
NEAC	National Environment Advisory Committee
NEMC	National Environmental Management Council
NFR	Nature Forest Reserve
NGO	Non-Governmental Organization
NHSDP	National Human Settlements Development Policy
NICEMS	National Integrated Coastal Environmental Management Strategy
NSGD	National Strategy for Gender Development
OHL	Overhead Line
OHTL	Overhead Transmission Line
OS	Operational Safeguard
OSHA	Occupational Health and Safety Authority
OUV	Outstanding Universal Value
PA	Protected Area
PAC	Potentially affected community
PIIM	Project Induced Immigration
PPC	Pollution Prevention and Control
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
REDD	Reducing Emissions from Deforestation and Forest Degradation
RGoZ	Revolutionary Government of Zanzibar
RMC	Regional Member Countries
RoW	Right of Way
RPF	Resettlement Policy Framework
RPL	Route Position List
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Management Plan
SH	Sexual Harassment
SOLAS	Safety of Life at Sea
SPC	Submarine Power Cable
SS	Substation
SWM	Sustainable Wildlife Management

TANAPA	Tanzania National Parks Authority
TANESCO	Tanzania Electric Supply Company Limited
TANROADS	Tanzania National Roads Agency
TAWA	Tanzania Wildlife Management Authority
TB	Tuberculosis
TBS	Tanzania Bureau of Standards
TFS	Tanzanian Forest Service Agency
TTCL	Tanzania Telecommunication Company
UGC	Underground Cable
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UWASA	Water Supply and Sanitation Authority
VCT	Voluntary Counselling & Testing
VLFR	Village Land Forest Reserve
VPO	Vice President's Office
VPSHR	Voluntary Principles on Security and Human Rights
WACC	Weighted Average Cost of Capital
WASH	Water, Sanitation and Hygiene
WB	World Bank
WCA	(Tanzanian) Wildlife Conservation Act
WCMC	(UNEP) World Conservation Monitoring Centre
WDPA	World Database on Protected Areas
WHO	World Health Organization
WMA	Wildlife Management Area
WWF	World Wide Fund for Nature
ZECO	Zanzibar Electricity Corporation
ZEMA	Zanzibar Environment Management Authority
ZURA	Zanzibar Utilities Regulatory Authority

REVISIONS HISTORY

Revision number	Date	Protocol	List of modifications and/or modified paragraphs
Rev. 00	1 August 2024	C4011041	First emission
Rev. 01	7 August 2024	C4011041	Revision after client's and NEMC's comments
Rev. 02	12 August 2024	C4011041	Revision after Technical Advisory Committee meeting
Rev. 03	27 August 2024	C4011041	Revision after AfDB comments
Rev. 04	16 September 2024	C4011041	2nd Revision after AfDB comments
Rev. 05	31 October 2024	C4011041	3rd Revision after AfDB comments

1 EXECUTIVE SUMMARY

This report has been prepared in accordance with the legislation of Tanzania and Zanzibar, as applicable to their respective project sites. While the two sites are intrinsically connected within the context of the project, they are addressed as distinct entities in separate documents to ensure clarity and facilitate analysis.

This document provides detailed information on the Tanzania Mainland portion of the interconnection project, specifically tailored for NEMC's reference.

1.1 Overview of the project

Tanzania Electric Supply Company Limited (TANESCO) owns most of the generation, transmission and distribution facilities in mainland Tanzania and sells bulk power to the Zanzibar Electricity Corporation (ZECO), which in turn sells it to the public on the islands of Unguja and Pemba. Power supply to Zanzibar is conveyed through No. 2 (two) existing 132 kV Transmission lines with submarine cable component from Dar es Salaam to Unguja and 33 kV distribution line with submarine cable component from Tanga to Pemba. Considering the existing power supply to Pemba Island, there is need to develop and implement another high voltage Transmission line with submarine cable from Tanzania Mainland to Zanzibar (Pemba) to be operated at 132 kV.

Hence, TANESCO with engagement of ZECO decided to initiate the Project of increasing power supply to Zanzibar to meet the increasing demand. Currently the Consultant CESI S.p.A. (Italy) in joint venture with ELC Electroconsult S.p.A. (Italy) and Colenco Consulting Ltd. (Nigeria) are undertaking the assignment under the financing of African Development Bank (AfDB), with the following proposed scope of work:

- 132 kV transmission line from Tanga (Tanzania mainland) to supply Pemba Island.

The ultimate goal of the project is to improve the livelihood of the people as well as the quality of the socioeconomic development environment for Tanzania mainland and Zanzibar, through increased availability and affordability of electricity supply.

The main features of the proposed submarine cable routes are:

- TANGA LP COORDINATES: 039° 7.94700' E, 05° 6.06300' S
- PEMBA LP COORDINATES: 039° 39.58800' E, 05° 12.50700' S
- Total Route Length: 69.747 km
- Number of Alter Courses: 9
- Maximum Water Depth (approx.): 830 m (GEBCO and Ad.CH.)
- Maximum Slope along the route (approx.): 13° at KP56.2
- Number of crossing points with IS systems: 0 (*)
- Crossed Protected Areas: Tanga Coelacanth Marine Park and Pemba Channel Conservation Area

Concerning terrestrial component of the interconnection project, two main technical alternatives have been considered, i.e. overhead line (OHL) and underground cable (UGC). Considering that the line routes pass in densely populated areas or in cultivated areas, the underground cable (UGC) is selected as the preferred solution for all the connections. The underground cable allows to minimize the land acquisition and resettlement issues.

The terrestrial components of the Tanga - Pemba Island interconnection project are:

- on Tanzania mainland, 132 kV underground cable from Mnyanjani landing point (existing) to the existing 132/33/11 kV Majani Mapana substation length approx. 8 km;
- on Pemba Island, 132 kV underground cable from Ras Mkumbuu landing point (existing) to the existing 132/33 kV Wesha substation (upgrade), length approximately 9 km.

The main elements of a submarine-crossing transmission system are as follows:

1. *sea cable/land cable joints and submarine cable*

   Cables are usually buried within the seafloor by different techniques including trenching with a cutting wheel in rocky sediments and ploughing or water jetting in soft sediments. Ploughing generally allows trenching, laying the cable and burying it with the extracted sediment in a single operation. Special backfill materials can be required when burial is technically complicated. In the case of hard seabed, the cable can simply be laid on the seafloor and protected with suitable covers, as an alternative to mechanical trenching of the rocky seabed. When trenching is not possible, other methods exist for surface laid cables, such as rock-mattress covering, cable anchoring, ducting, cast-iron shells, concrete slabs, steel plates or dumped rocks

2. *terrestrial cables or overhead lines which connect the stations to the land/sea terminations*

   For what concerns terrestrial underground cables, special High voltage (HV) cables specifically designed for underground use are employed. The conductors in underground HV cables must be insulated to avoid a short circuit between the conductor and the ground around the cable. Cables are generally installed directly into the ground in an excavated trench. Cable laying depends on power transmission demand, in this project it is proposed a direct burial method for normal passing without any obstacles and in case of road crossing it is necessary to use protection. The permanent right of way may be approx. 1 m across, though temporary easements are needed for construction and to access splice vaults for maintenance.

1.2 Alternatives analysis and project description

The analysis of alternatives was carried out in Chapter 4, where the “no-go” alternative and the location of the landing points, the route of the transmission line routes and the new substation were analysed and compared. The most optimal alternative was then selected by analysing all technical considerations as well as environmental and socio-economic characteristics, i.e. the one with the least environmental, social, economic and technical impacts:

In Tanga, three different landing point locations have been analyzed and one was immediately discarded due to the presence of houses and graves in the proximity of the shore. The possible alternatives are therefore:

- landing point of the existing 33 kV interconnection in Mnyanjanito;
- alternative landing point, located approx. 1.5 km northwards of the existing, in the proximity of a fishermen camp and market.

The landing point will be connected to the existing 132/33 kV Majani Mapana substation by means of an underground cable (UGC) or an overhead transmission line (OHTL). The 8 km long line route will follow as much as possible the existing 33 kV distribution line route and the existing ring road alignment. Since the 132 kV transmission line will pass through a densely populated area, the underground cable solution is deemed preferable and allows to avoid land acquisition and resettlement. The overhead line indeed, requires at least 27 m of Right of Way, severely impacting on housing.

In Pemba Island, the landing point of the existing 33 kV interconnection at Ras Mkumbuu is connected to Wesha substation with an overhead 33 kV transmission line. The same landing point is proposed also for the new 132 kV interconnection. The connection to Wesha substation will be undertaken by means of an underground cable or an overhead line, following the Right of Way of the existing 33 kV distribution line. The line route is approximately 9 km long. An alternative solution would foresee to locate the new landing point in the proximity of Wesha substation, thus reducing as much as possible the length of terrestrial cable. However, this solution has been abandoned for technical reasons, due to the unfavourable bathymetry of the area.

This report presents the outcomes of the Environmental and Social Impact Assessment (ESIA) on the selected and approved transmission line for both terrestrial and submarine components and any necessary substation upgrade. The ESIA was prepared in accordance with international and national standards, with the aim of identifying potential adverse impacts of the project and identifying measures to avoid, minimize, mitigate or compensate these impacts.

1.2.1 Brief project description

The main elements of a submarine-crossing transmission system are as follows:

- sea cable with relevant accessories (joints);
- terrestrial cables or overhead lines which connect the electrical stations to the land/sea joints;
- ancillary services.

1. *Submarine Cable*

Cable installation

The process of laying submarine cables involves both on-land installations (such as Sea Land Joints) and pulling cables at landing locations. The contractor must install the cable in a continuous length, avoiding field joints, but field joints may become necessary in very shallow waters near the landfall. In such cases, using an additional barge or vessel may be required, subject to agreement with the Client.

Before laying cables, the route is determined based on factors like bathymetry, seabed characteristics, and local economic activities. The route may need to be cleared and prepared, including the removal of obstacles like abandoned ropes or nets through a pre-lay grapnel run. Specialized equipment is used for cable deployment, with techniques such as trenching, ploughing, or water jetting to bury the cable in the seabed (displayed in figures below). Trenching tools include cutting wheels for hard soils, while ploughing can lay and bury cables simultaneously. In some cases, cables may need special backfill materials or may simply be laid on the seafloor and protected with suitable covers. Jetting is used for soft or medium seabed soils by fluidizing the soil with water jets.

The contractor is responsible for creating customized cable laying procedures for each of the three systems, considering the cable specifications, vessels, and environmental conditions.

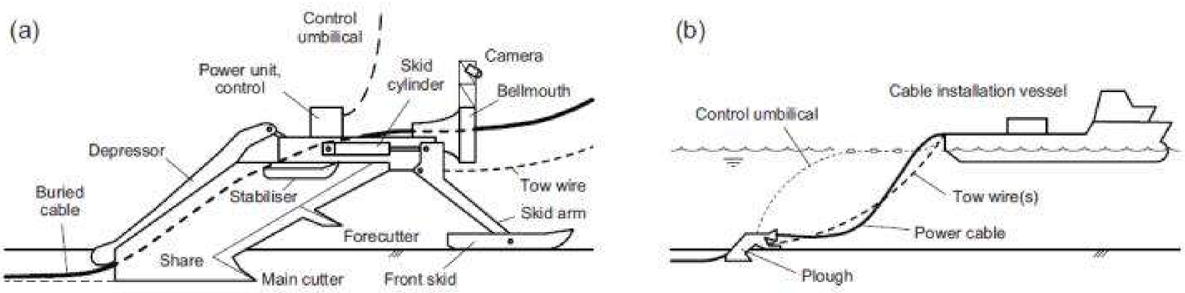


Figure 1- 1 – Subsea cable plough. (a) Principal components, (b) Simultaneous Lay and Bury operation

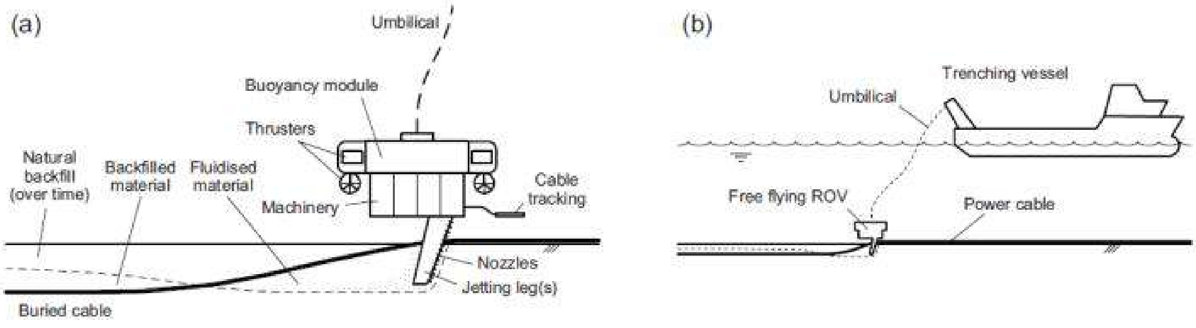


Figure 1- 2 – ROV jet trencher. (a) Principal components, (b) Post Lay Burial operation

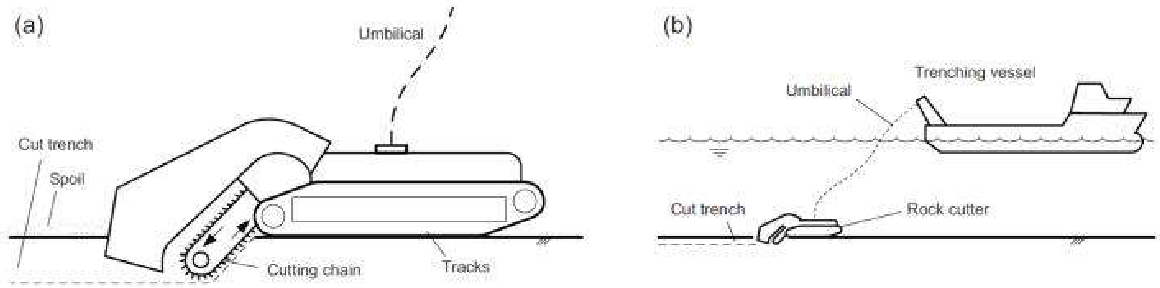


Figure 1- 3 – Trencher. (a) Principal components, (b) pre-lay rock cutting operation

Cable-lay vessel requirements

The vessel for laying cables must be suitable for continuous 24-hour operation, fully certified for safety and seaworthiness, and equipped with life-saving appliances and personal protective equipment. Key minimum characteristics include:

- DP 2 class notation or higher with interface to the DGPS geo-referencing system.
- Cable Handling Capabilities, including adequate cable tanks/turntables, capstan systems, and/or linear cable engines (LCE) compatible with the cable's bending radius, and equipment for cable retrieval/laying.
- Two Overboarding Chutes with appropriate cable bending radius and systems to measure overboarding angle.
- ROV with USBL Positioning for monitoring cable touchdown at depths of at least 1000 m.
- Lay Control System integrated with sensors, dynamometers, and positioning tools for accurate cable laying.
- Monitoring Software (e.g., Makai Lay) for managing the cable laying speed and tension.
- Temperature-controlled Jointing Space for cable connections.
- Client Accommodation: Additional space for at least two client representatives onboard.

In shallow waters, a cable lay barge may be necessary. If the barge is not self-propelled, an anchor/spud pattern based on marine survey data must be developed.

The cable laying vessel shall meet the following specifications:

- Length: 120-170 m, Accommodation for 100 persons.
- Equipped with 2/3 offshore cranes, helicopter platform (as an option), 1/2 basket carousels, 2 stern chutes, tensioners, winch package, dynamic positioning, and eco-friendly features like exhaust gas cleaning and garbage recycling.

Cable protection

Cables may need protection from fishing gear, anchors, and natural forces. When trenching is not possible, methods like rock mattresses, cast-iron shells, concrete slabs, or dumped rocks can protect surface laid cables. On uneven seafloors, gaps are filled with concrete bags to prevent damage from vibrations. Authorities often create protected areas around the cable route, restricting activities like fishing or anchoring.

2. Terrestrial Underground Cable

Terrestrial underground cables must use High Voltage (HV) cables specifically designed for underground use, with insulation to prevent short circuits with the surrounding ground. These cables are typically laid in trenches along public roads or open spaces and may occasionally cross private land. The cables are connected in sections using joints installed in underground concrete joint bays. Once installed, the surface is reinstated, with agricultural or grassland areas returned to their original use, and forested routes left without replanting to avoid tree root damage. Nevertheless, TANESCO and ZECO will forbid reinstatement of agricultural practice in the underground cable Right of Way.

For this project, a direct burial method is proposed for cable laying, with additional protection required when crossing roads. The right of way for underground cables is much narrower than for overhead lines (OHL), usually around 1 meter wide. Temporary easements are required for construction and maintenance. The routing of underground cables should consider stakeholder impact, future construction plans, and accessibility. Further details are included in Section 3.1.3.

3. Construction materials

The following main construction materials will be used during construction of the interconnection cables and substations:

- Concrete (cement, sand, aggregates, water)
- Steel bars for concrete reinforcement
- Formworks for concrete casting
- Submarine cable
- Underground cable
- Optical cables
- Carpentry
- Substation equipment (insulators, transformers, switchgears, etc.)

Other materials that will be used for construction purposes include fuel for vehicles and machinery and power from local power supply and/or diesel generators.

4. Waste

All the waste types are considered in the impact assessment. Wastes generated during construction include: possible leakages of oil and lubricants from servicing of equipment and vehicles, excavated soil, cleared vegetation during route clearance, packaging materials, broken conductors, damaged steel bars, expired batteries, concreting wastes, metal and wood scraps, domestic waste (food remains, etc.).

There will also be air emission (dust, exhaust gases) from operation or movement of vehicles mainly during construction stage and other equipment using fossil fuels.

During operation the wastes will be mainly domestic wastes in substations, worn-out parts, broken insulators, back up batteries, changed oils.

5. *Ancillary services*

It is important to note that specific details regarding the source and types of construction materials, as well as the precise number, location, and design of campsites, have not been determined at this stage of the project. These elements will be defined and specified by the successful contractor during the project's design and development phase. The project will utilize existing roads for access, minimizing the need for new road construction.

1.2.2 Brief description of the project site and the major environmental and social stakes/challenges

The project Area of Influence (AoI) is defined through consideration of the project footprint, biological and ecological factors, consultations and guidance from the relevant authorities. Distinct AoIs were defined including:

1) A specific AoI for Pemba Island;
2) A specific AoI for Tanga, on Tanzania mainland;
3) A deep-sea AoI for the marine interconnection.

Regarding points 1 and 2, the AoIs were identified including the marine landing points and the onshore parts of the project and was defined as:

- The project **Direct Areas of Influence** (AoIs) are defined based on the project footprint, including the landing point, transmission line corridor (Right of Way), substations and all ancillary project components.
- The **Indirect Area of Influence** (IAoI) for the project is primarily determined by **potential impacts on** biological, ecological and social factors. It has been identified as a 500-meter zone surrounding the project footprint for the terrestrial part and a 1-km buffer surrounding the project footprint from the coast and along the proposed marine route to a depth of 40 m. For the proposed substation, it was considered a 1-km buffer.

The project **footprint** has been calculated considering a width of 1.5 m for underground cable area and extra 3.5 m of temporary land occupation during construction phase for machinery movements**.** Submarine cable footprint was calculated for a width of 5 m.

Project footprint and temporary land occupation for machinery movements in hectares is reported below.

Table 1- 1 – Project footprint and temporary land occupation for machinery movements in hectares

	Project Footprint (ha)	Temporary Land (ha)
UGC	1.26	2.94
Submarine Cable	0.041	NA
Substation	0.35	NA
Total	1.65	2.94

Regarding point 3, the deep-sea area is the link between the two landing points and was designed as a polygon sufficiently wide to account for possible environmental constraints in seafloor morphology and biodiversity sensitivities:

- The project **Direct Areas of Influence** (AoI) is defined based on the project footprint (marine cable route).

- The **Indirect Area of Influence** (IAoI) for the project is primarily determined by **potential impacts on** biological and ecological factors. It has been identified as an area of 10 kilometres surrounding the project footprint. This area considers the high mobility of marine species and potential disruptions from noise and lights. For instance, marine mammals known to migrate and feed within the project area, due to their high mobility, may be affected by those impacts that may occur within a larger area (e.g., noise, lights).

Maps of the AoIs are presented in the following pages.

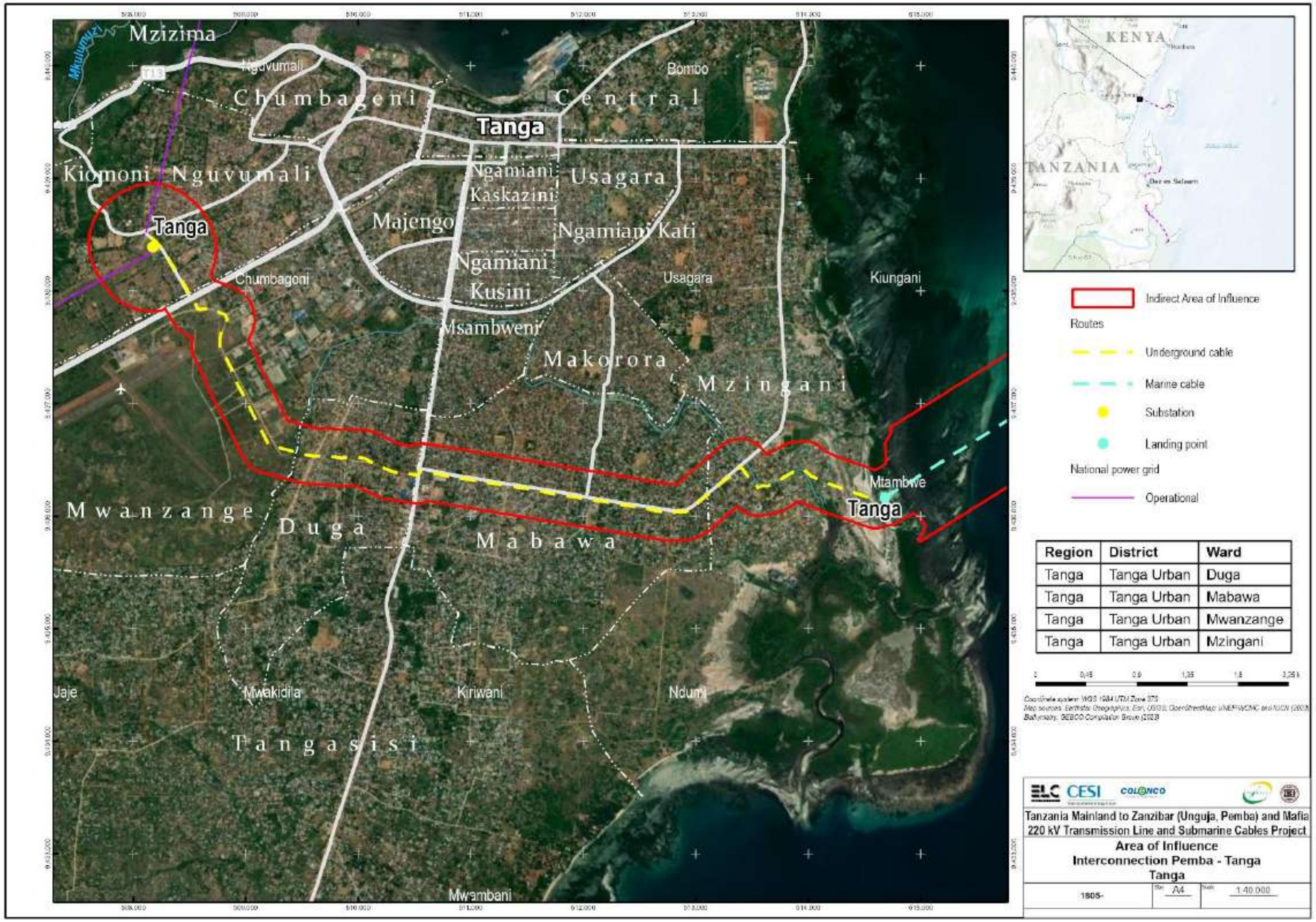


Figure 1- 4 – Tanga Area of Influence

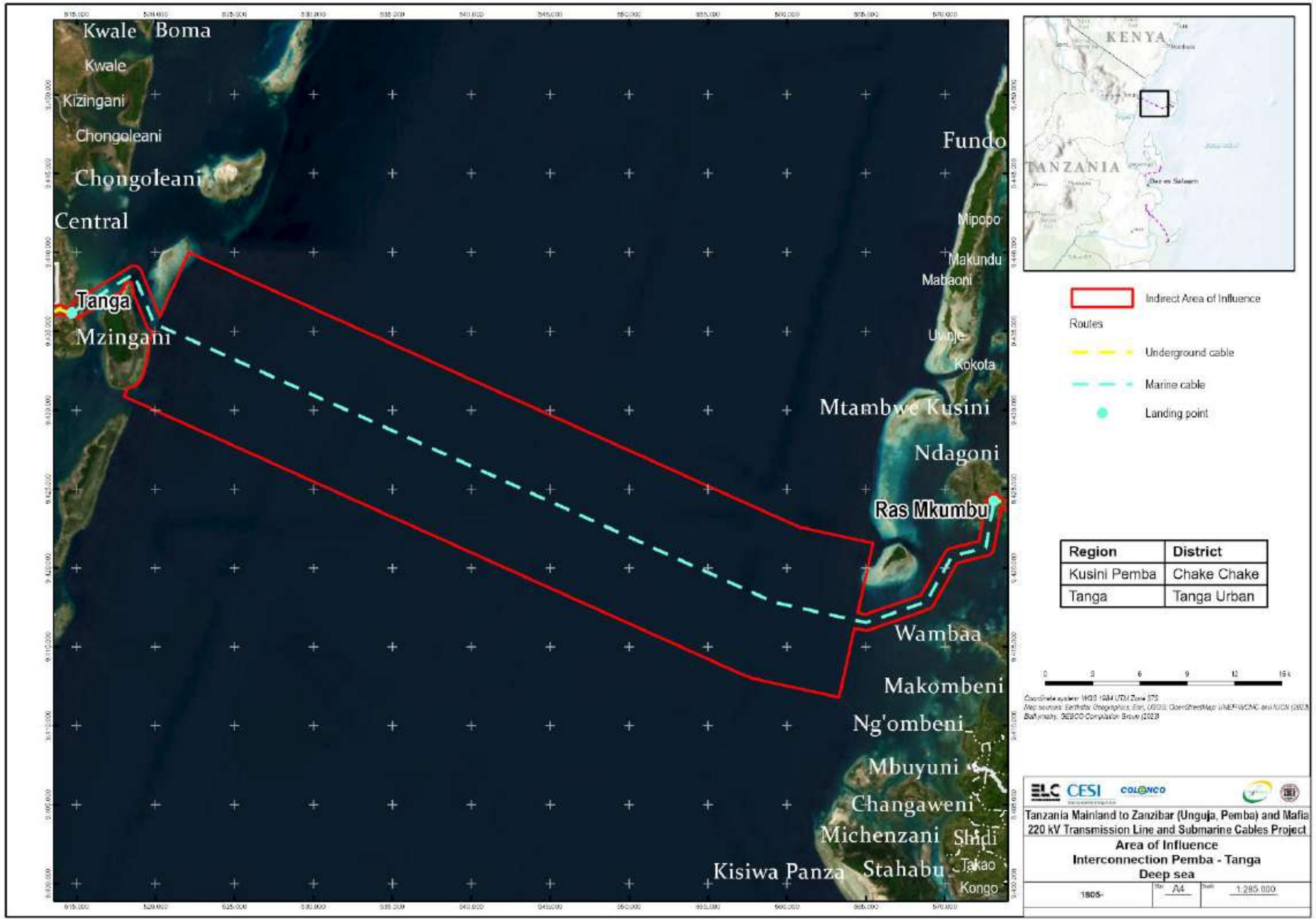


Figure 1- 5 – Deep-sea Area of Influence

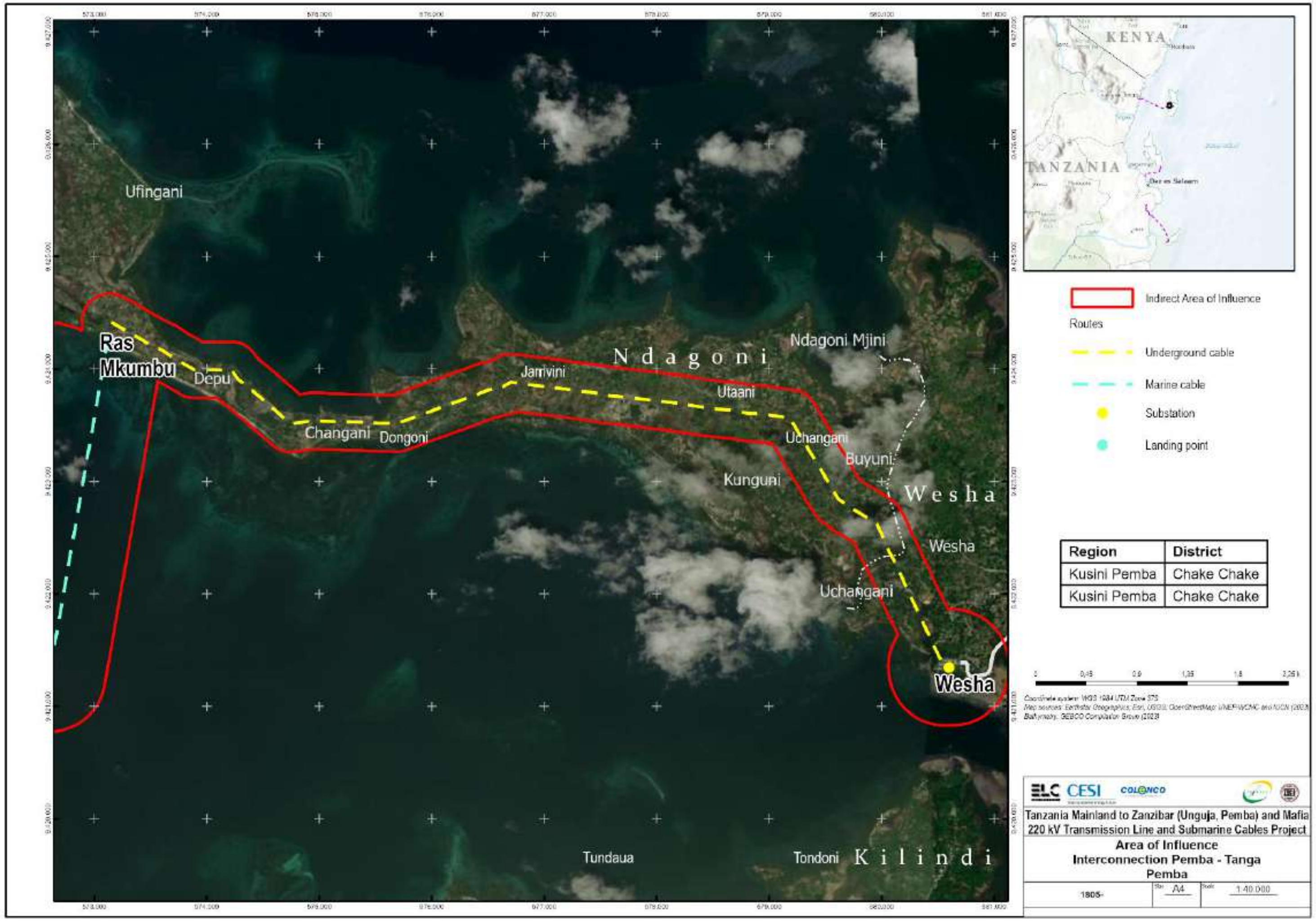


Figure 1- 6 – Pemba Island Area of Influenc

1.3 Environmental Baseline

1.3.1 Environmental Baseline (Terrestrial)

Climate

Tanzania has four main types of climates: hot, humid coastal plains; hot, arid central plateau; high, humid lake regions; and temperate highlands. The climate is strongly influenced by two monsoon seasons: the hot north-east monsoon (Nov-Feb) and the cooler south-east monsoon (Apr-Sep), which sometimes brings storms and cyclones.

Tanga has an average temperature of 26.0 °C and an annual rainfall of 982 mm, with the driest month in February (35 mm) and the wettest in May (175 mm). Pemba Island has consistently high humidity, temperatures rarely below 20°C, and warm seas. It experiences over 250 mm of rain in April and May, while the dry season (June to September) sees about 70 mm of rain per month. Pemba also enjoys 11.8 to 12.4 hours of daylight and around 9 hours of sunshine daily.

Climate change

Tanzania is highly vulnerable to climate change, especially in its coastal regions facing rising sea levels. The country has experienced severe climate events, including extreme rainfall, floods, droughts, and rising temperatures, threatening the livelihoods of those unable to adapt. In 2023, Tanzania recorded its warmest year since 1970, with significant increases in nighttime temperatures, particularly in August, September, and October, where air temperature anomalies were 1.1°C to 1.2°C above normal. Average minimum temperatures were 1.4°C to 1.5°C higher, indicating that nighttime temperatures rose more sharply than daytime temperatures.

Winds

Tanga's daily mean wind speed was about 5.5 ms^{-1}. Monthly variations showed that the strongest wind speeds in Tanga occurred from June through September during the SE Monsoon, peaking at 3.7 ms^{-1} in July. Smaller peaks were observed in January at about 3.0 ms^{-1}. The months of March and November experienced minimum monthly mean wind speeds during the NE Monsoon.

Geology and geomorphology

Tanzania lies predominantly on the Great African Plateau, with elevations between 1,000 and 2,000 metres, except for a narrow coastal belt. The coastal plains consist of marine and terrestrial sediments from the Jurassic to the Quaternary periods. Much of the coast consists of Pleistocene and younger coral limestone, with inland belts of Cretaceous and Tertiary limestone, sand and gravel. The islands of Zanzibar, Pemba and Mafia contain Miocene to recent calcareous sediments, marine clays, sandstones and coral limestones. The underlying rocks of Tanzania are mainly igneous and metamorphic, part of the African Crystalline Complex. Zanzibar's geological history suggests that it was once part of the ancient Miocene Rufiji/Ruvu River delta and has undergone significant structural movement, suggesting that the sea may have covered the islands in the past.

Soil

In the coastal area of Tanzania and islands, the soils are predominantly sandy and coralline with poor moisture-holding capacity, extreme alkalinity and hard subsoil, resulting in poor drainage. Pemba’s soil is a combination of rock with granitic origin, from its association with mainland some 10 million years ago, and fossilized coral limestone.

Water resources

Tanzania's coast is heavily influenced by rivers that deliver water, sediment, nutrients, and pollutants. The Rufiji River, one of Africa's largest, provides 50% of the surface runoff with an annual discharge of 1133 m^3/s. River flow and moisture in Tanzania follow the general rainfall pattern, peaking from March to May. Pemba Island and Tanga face complex water resource challenges. Pemba relies on rainfall and supplementary groundwater, but its porous geology causes inconsistent water availability. Tanga benefits from rivers and groundwater but faces water scarcity due to population growth, industrialization, and climate change. Both regions need sustainable water management strategies, such as rainwater harvesting and efficient irrigation.

Air quality

An air quality assessment was conducted at six sampling points within the project area (two in Tanga and four on Pemba Island) to establish baseline conditions prior to project implementation. A field survey carried out in June 2024 measured Total Volatile Organic Compounds (TVOC), formaldehyde (HCHO), PM2.5, and PM10.

Gaseous emissions and particulate matter remained within established standards, indicating that the air quality is generally good, and there are no major sources of pollution. Overall, the air quality in the project area is good, indicating satisfactory conditions with little or no risk from air pollution.

Word Health Organization proposes four steps of emissions reductions and a final target called air quality guideline (AQG) for ultrafine particles: PM2.5 (15 µg/m3), PM10 (45 µg/m3). Both limits are fully respected by the measured samples with slightly higher values in Tanga due to the closer urban centre.

WHO sets formaldehyde (HCHO) exposure limits in its guidelines for indoor air quality (2010). These limits are 0.1 mg/m^3 to prevent short-term negative effects and 0.2 mg/m^3 to avoid long-term adverse effects. The measured values remain well below the recommended threshold.

The Environmental Management Regulations of 2007 fixes a maximum daily average of hourly values of 100 µg/m3 for PM10. No information about other air pollutants is reported in these documents.

Total Volatile Organic Compounds (TVOCs) are addressed in the WHO Guidelines for Indoor Air Quality and the WHO Air Quality Guidelines for Europe. Although the thresholds are specified for individual volatile compounds, the combined total should not exceed 230 mg/m^3. This is significantly higher than the 0.04 mg/m^3 peak measured in the field.

Noise quality

Noise assessments were conducted across the project area in June 2024, coinciding with the locations of five six air quality sampling points (two in Tanga, four on Pemba Island).

During the survey, baseline noise levels ranged from 31.3 to 72.8 dBA, primarily attributed to traffic on paved roads. The majority of recorded values and averages comply with the national daily limit for residential areas of 60 dBA. Traffic noise is also regulated by national legislation, with limits ranging from 78 to 83 dBA. Noise values taken in traffic roads comply with these limits. The noise limit of the IFC Guideline of 2007 of 55 dBA is not consistently respected. The exceedances of limits measured were caused by traffic noise and handicraft activities.

<u>Biological environment - Terrestrial wildlife survey</u>

Wildlife survey was carried out from June 3rd to June 9th, 2024, with the aim of evaluating the baseline conditions in the project area. Specifically, field studies were conducted to:

- Identify the presence of threatened fauna species (CR, EN, and VU according to the IUCN Red List) and endemic fauna species;
- Identify any species that are particularly vulnerable to the potential impacts of the proposed project;
- Identify current and potential threats to the wildlife and habitats within the project area.

Distinct methods were used to collect this information such as transects, vehicle-based survey and opportunistic observations.

During the Tanga survey, 14 bird species, two reptiles and 15 arthropods were observed and all species were classified as Least Concern on the IUCN Red List of Threatened Species and no threatened species were observed during the survey. *Milvus migrans* ssp. *parasitus, Apus affinis, Cecropis daurica, Ardea melanocephala, Egretta garzetta* and *Bubulcus ibis* are full migrant bird, while *Catopsilia florella*, *Vanessa cardui,* and *Junonia oenone* are migrant butterflies.

In Unguja Island, 28 species were observed during the wildlife survey. No threatened species were observed during the survey, but consultation with fishermen and Misali Island rangers confirmed the presence of the vulnerable, endangered and critically endangered species. The alien and invasive species *Corvus splendens* and *Rattus rattus* was recorded within the entire project area.

<u>Biological environment - flora and habitat survey</u>

The survey was carried out from June 3rd to June 9th, 2024, with the aim of evaluating the baseline conditions in the project area. Specifically, field studies were conducted to:

- Identify the presence of threatened flora species (CR, EN, and VU according to the IUCN Red List) and endemic flora species;
- Verify the habitats, with particular regard to natural habitats;
- Identify current and potential threats to the flora and habitats within the project area.

The flora and habitat survey involved transects and vegetation plot sampling.

The plots in Tanga were within areas with mangrove forest, grassland with scattered bushes and Built area. This was dominated by *Carex elata*, and had a total of 11 species including *Scoparia dulcis, Daphne alpina, Acanthospermum hiopum,* and *Cynodon dactylon.* Although this plot was surrounded by areas with mangrove forest, it was on a patch that does not get inundated and thus does not support mangrove trees. The plot on grassland with scattered bushes was predominantly covered by *Achyranthes aspera.* This plot included a total of 19 species including *Cynodon dactylon, Megathyrsus maximus, Mesosphaerum suaveolens* and *Heteropogon contortus.* The plot within the built area was close to the Majani mapana TANESCO substation at road side/TANESCO powerline/adjacent to farm dominated by *Cynodon dactylon*. This plot included a total of 23 species including *Asystasia gangetica, Megathyrsus maximus, Centrosema pubescens*, and *Richardia scabra.* The transect adjacent to the landing site in Tanga extended into Grassland with scattered bushes in addition to the mangrove forest that was covered by the plot. A total of 22 species were recorded for this transect. *Lumnitzera racemosa* (5.0%) was conspicuously dominant species at the section that is suitable habitat for mangrove species. The other species were scattered without clear pattern of dominance. The transect near the Majani mapana substation had 35 species.

The plots in Pemba were located at four distinct sites: ZECO powerline roadside with a water pipeline, a banana and cassava farm under the ZECO powerline, a mangrove forest, and another farm under the ZECO powerline. The roadside plot had 27 species, with *Desmodium triflorum* covering 40%. The mangrove forest plot featured only *Avicennia marina*. The farm under the ZECO powerline had 90% *Manihot esculenta* and 14 other species. The transect from the sea landing site through the ZECO landing facility to the roadside under the ZECO powerline was 90% modified and recorded 61 species. The transect near the Wesha ZECO substation varied from farmed areas to mangrove forests, under a ZECO powerline, and recorded 51 species, with notable species including *Oryza sativa, Xylocarpus granatum, Avicennia marina, Bruguiera gymnorhiza*, and *Rhizophora mucronata*.

Terrestrial habitat and biodiversity

Tanzania is ranked eleventh globally for the number of threatened species, according to the IUCN Red List, with 1,638 species classified as Critically Endangered, Endangered, or Vulnerable as of June 2024. This reflects Tanzania's high biodiversity and significant threats to endemic species. Tanzania has 360 reptile species (85 endemic) and 206 amphibian species (86 endemic). Since 2000, 27 reptile and 43 amphibian species have been discovered, indicating many more species may still be unidentified.

Terrestrial and freshwater fauna

In Tanga, as a result of a literature review, 904 species were identified as potentially occurring within the study area. According to the IUCN Red List, 29 of these potentially present species occur in terrestrial and freshwater biomes and are considered threatened. The breakdown is as follows:

- 14 species are Vulnerable (VU);
- 7 species are Endangered (EN);
- 6 species are Critically Endangered (CR).

Among these threatened species (in descending order of the number of threatened species per taxon):

- 14 are bird species (4 VU, 6 EN, and 4 CR);
- 6 are mammal species (4 VU, 1 EN, and 1 CR);
- one is an amphibian species (VU);
- one is a crustacean species (VU).

In Pemba Island, as a result of a literature review, 279 species were identified as potentially occurring within the study area. The breakdown is as follows:

- 3 species are Endangered (EN);
- 8 species are Vulnerable (VU).

Among these threatened species (in descending order of the number of threatened species per taxon):

- 7 are bird species (5 VU and 2 EN);
- 4 are mammal species (3 VU and 1 EN).

Terrestrial and freshwater flora

As a result of a literature review, 144 species were identified as potentially occurring within the study area. None of these potentially present species is listed as threatened on the IUCN Red List.

Terrestrial habitat and ecosystems

The Tanzanian coastline contains a variety of habitats typical of the tropical Indo-West Pacific region, with significant ecological importance and various threats:

- **Mangrove forests**: These legally protected government forest reserves cover about 158,100 hectares, about 14% of the total mangrove area in East Africa. They are found along tidal inlets, estuaries and creeks on the mainland and Zanzibar coastline, with the largest area in the Rufiji Delta. Tanzania's mangrove flora includes ten species such as *Avicennia marina* and *Rhizophora mucronata.*
- **Coastal forests**: Covering approximately 700 km², Tanzania's coastal forests are recognized as part of the “Coastal Forests of Eastern Africa” biodiversity hotspot. Despite being a high conservation priority, these forests have experienced a decline of over one-third since 1990, primarily due to agricultural expansion, charcoal production, and unsustainable logging practices. Management of these forests falls under the Tanzanian Forest Service Agency (TFS) within the Ministry of Natural Resources and Tourism (MNRT).

Terrestrial legally protected areas and important areas for biodiversity

The project area intersects with the Mangrove Forest Reserve, located along the beach of the landing point in Tanga. No other terrestrial protected areas and/or important biodiversity areas are located close (within a 15 km buffer) to the project area.

1.3.2 Environmental Baseline (Marine)

Surface water temperature

In Tanga, the warmest water temperature is in April with an average around 29.1°C. The coldest month is August with an average water temperature of 25.6°C. In Pemba, the warmest water temperature is in March with an average around 29.2°C. The coldest month is August with an average water temperature of 25.6°C.

Bathymetry

Tanzania’s continental shelf is generally narrow, typically less than 5 km wide, except near the Mafia and Zanzibar channels, where it reaches widths of around 40–60 km. The continental slope is steep (average gradient of 1.5-2.0°, locally exceeding 4.5°), particularly along the southern mainland coast, while it is less pronounced near the islands and along the northern coast.

The Tanga landing area features a 5 km wide continental shelf with shallow waters, including a wide sand bank and foul areas with depths from 2 m to 0.3 m. Surrounding Yambe Island and Fungu Niule Shoal are submerged fringing and patch reefs, with the sea extending 950 m to 1,750 m between Yambe Island’s outer reef and the foul area near Fungu Niule Shoal, where depths range from 5 m to 30 m. The shelf break occurs at roughly 50 m depth, dropping rapidly to around 200 m with a mean slope of 10°. The Pemba Channel, a probable result of graben faulting, is a 50 km wide, 800-850 m deep channel-oriented NNE–SSW, featuring gentle slopes. Seabed slopes in the area vary, with moderate to steep gradients, reaching up to 13° near the landing area.

Marine and coastal geomorphology

The Tanga coast is primarily characterized by a patchy reef coastline, often with fossil reef terraces, islands, or sand spits, and includes sheltered tidal inlets, estuaries, and creeks, many of which support mangrove forests and sometimes urban or port areas. In the Tanga coastal zone, coral islands, shoals, and partially sand-covered reefs extend up to 10 km offshore. Key features near Tanga include Yambe Island, a bush-covered, 8 m high reef limestone island with wave-eroded cliffs at its base, and the Tanga sandbank. The proposed project route passes through a variety of marine environments, including inner reef flat, terrestrial reef flat, shallow lagoon, deep lagoon, and sheltered reef slope.

Marine fauna

According to the IUCN Red List, 112 of these potentially present species occur only in marine biomes and are considered threatened. The breakdown is as follows:

- 73 species are Vulnerable (VU).
- 20 species are Endangered (EN).
- 12 species are Critically Endangered (CR).

Among these threatened species (in descending order of the number of threatened species per taxon):

- 63 are fish species (30 VU, 21 EN, and 12 CR);
- 43 are coral species, all classified as VU;
- 8 are echinoderm species (4 VU and 4 EN);
- 7 are mammal species (4 VU and 3 EN).

Marine flora

As a result of a literature review, 12 species were identified as potentially occurring within the study area. However, only one of these potentially present species, the *Zostera capensis* (VU), is listed as threatened on the IUCN Red List.

Marine survey

Five data collection techniques have been employed for the marine survey:

i. Surveys of planktons using towing standard plankton net,

ii. Surveys of marine benthos using Eckman grab through skin dives along line transect,

iii. Surveys of marine benthos (corals community including fish) through dives along line transect,

iv. Opportunistic recording of organisms,

v. Interview with key informants to determine familiar marine organisms in the study area.

The survey was carried out from 8rd to June 9th, 2024, in Tanga. Along the proposed submarine cable route in Tanga, 4 underwater transects were conducted. During the survey, the depth ranged from 1 to 25 m below sea level and the percentage cover of benthic categories was 75% sand, 8% seagrass and 17% soft coral. Coral reef was observed in the northern part of Yambe Island. The main macrofauna identified in the area were the fire urchins *Astropyga radiata*. No coral reefs with fish were visible along the proposed route. During interviews, local communities and fishermen reported the presence of sea turtles, bottlenose dolphins (*Tursiops aduncus*) and humpback dolphins (*Sousa* sp.) in the area, as well as the migration of humpback whales (*Megaptera novaeangliae*). With the exception of the sea turtle, all species of which are protected and threatened, no species observed during the fieldwork was considered to be of conservation concern. The project area in Pemba Island is dominated by mangrove stand mostly two species namely *Rhizhophora mucronata and Avicennia marina.*

Marine habitat and ecosystems

Tanzania's coastline is home to diverse marine ecosystems, including coral reefs, seagrass beds and seagrass meadows, each of which plays an important ecological role.

- **Coral reefs**: Located in shallow tropical waters, Tanzania's coral reefs are among the most biodiverse marine environments, supporting 150 species of coral, 8,000 invertebrates, 1,000 species of fish, sea turtles and seabirds. These reefs face significant threats from human activities, particularly in unprotected areas.
- **Seagrass beds**: These marine plants, found near Tanga and in the estuaries of rivers such as the Ruvu, Wami and Rufiji, stabilise sediments, sequester carbon and provide habitat for fish and food for marine megafauna. Although they cover less than 0.2% of the seabed, they play a critical role in coastal health and productivity.
- **Seaweed beds**: Essential primary producers in marine ecosystems, seaweeds provide shelter, nursery grounds and food for reef dwellers. Seaweed farming, particularly in Zanzibar, supports local economies and mitigates coastal erosion and ocean acidification.

<u>Marine protected areas and important areas for biodiversity</u>

In Tanga, the project area intersects with the following protected areas and important biodiversity areas:

- Tanga Coelacanth Marine Park
- Mangrove Forest Reserve

Additionally, other protected areas are located within a 15 km buffer of the project area:

- Ulenge Island and Kwale Island Marine Reserves, part of the Tanga Marine Reserves, located about 6.5 and 9 km north from the marine cable route, respectively.

Critical Habitat Assessment (CHA)

An assessment using available data was undertaken to identify the possible existence of Critical Habitats (CHs) within the project area and in the Indirect Area of Influence (IAoI) in accordance with the criteria outlined in the International Finance Corporation (IFC) Performance Standard 6 (PS6) and AfDB OS6 (2023) Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources. Detailed analysis is reported in paragraph 6.4. On the basis of available data, the results of the critical habitat assessment are reported as:

<u>Criterion 1</u>:

Deep-sea:

- *Distichodus petersii, Pseudoginglymostoma brevicaudatum, Kneria uluguru, Nothobranchius albimarginatus, Nothobranchius insularis, Nothobranchius korthausae, Nothobranchius luekei, Nothobranchius palmqvisti, Nothobranchius rubripinnis, Nothobranchius ruudwildekampi,* and *Aplocheilichthys lacustris*: Potential Critical Habitat

<u>Criterion 2</u>:

Deep-sea:

- *Nothobranchius albimarginatus, Nothobranchius insularis, Nothobranchius korthausae, Nothobranchius luekei, Nothobranchius palmqvisti, Nothobranchius rubripinnis, and Nothobranchius ruudwildekampi*: Potential Critical habitat

<u>Criterion 3:</u>

No species met the criteria for potentially triggering Critical Habitat under Criterion 3.

Criterion 4:

The project area and surrounding regions contain both mangrove forests and coral reefs, and each of these ecosystems triggers the designation of critical habitat under IFC Criterion 4.

Criterion 5:

The project area does not support critical evolutionary processes and, consequently, no Critical Habitat is expected to be present for criterion 5.

1.4 Socio-Economic Baseline

Demography

Demographic data for the Tanga region shows varying population densities, with Korogwe and Lushoto districts each exceeding 270,000 residents.

In the specific project area of Tanga City, the population data are reported in the following table.

Table 1- 2 – Population in the ward crossed by the project (National Census 2022)

Tanga City Council	Population			Sex Ratio	Number of Households	Average Household Size
	Both Sexes	Male	Female			
Nguvumali	17,249	8,675	8,574	101	4,556	3.8
Mzingani	15,621	7,453	8,168	91	4,033	3.9
Mwanzange	8,386	4,048	4,338	93	2,226	3.8
Mabawa	26,978	12,700	14,278	89	6,816	4.0
Duga	24,545	11,888	12,657	94	6,226	3.9

Land tenure system

Tanzania Mainland's land is categorized into three types:

- **Village Land (70%)**: Supports 80% of the population, mainly farmers and pastoralists. Managed by local government (Village Council, Assembly, and Land Adjudication Committee) with customary rights granted to occupiers.
- **Reserved Land (28%)**: Includes forests, national parks, game reserves, river basins, wetlands, and land for public infrastructure. Designated for conservation and public utilities, managed by various laws with ultimate control by the Commissioner for Land.
- **General Land (2%)**: Mainly urban and rural estates where rights of occupancy have been granted. Managed by the Commissioner for Land, open for various uses upon application.

The Land Act and the Village Land Act recognize two forms of tenure namely, (i) the granted right occupancy and, (ii) customary right of occupancy which includes the deemed right of occupancy. Individuals and groups may hold land in general and village land.

Zanzibar's land tenure system combines traditions and government legislation post-1964 Revolution. All land is state-owned, but several tenure systems exist:

- **Customary Tenure**: Land held communally by clans or villages, based on traditional customs.

- **Leasehold Tenure**: Established by the 1992 Zanzibar Land Tenure Act, allows long-term leases (33-99 years) for various uses.
- **Freehold Tenure**: Limited, usually in urban centers and investment zones, grants outright ownership.
- **Government-Owned Land**: Includes land for public infrastructure, conservation, and services, allocated through legal processes.

Economy and livelihood

Tanga's coastal location makes fishing a significant livelihood. Fishermen use traditional boats and modern vessels to catch fish, octopus, and other seafood. These catches are either sold in local markets or exported. Many residents are involved in fish processing, drying, and trading activities, adding value to the raw catch and enhancing income. The surveyors interviewed fishermen at the landing point. The area is used both by the fishermen from Tang and from Pemba. Fishing activities take place throughout the year. Boat ownership varies among the fishermen. Some own their vessels, while others rent them. Up to 18 people can share a single boat. Their primary catches consist of anchovies and red snappers. They also venture beyond the reefs to fish.

In Pemba Island the livelihood is similar to the one of the coasts of Tanzania mainland. Here In Zanzibar, livelihoods combine agriculture and fishing, with fishing providing essential protein and income. Men fish using traditional boats, while women collect fish, shellfish and crabs from the beaches. Families also grow crops such as cassava, rice, fruit and seasonal vegetables. In Pemba, households also keep livestock such as chickens, goats and cattle. Migratory fishers from villages such as Changani fish seasonally and work cooperatively around coral reefs. Their main catch is snappers, cuttlefish and octopus, with the best fishing season from October to April. Daily earnings range from 5,000 to 20,000 Tanzanian shillings. They use temporary beach huts during the fishing season, reusing or rebuilding them as needed.

The fishermen avoid cutting the mangroves, recognising their ecological importance. There is no seaweed farming at the proposed landing site. Subsistence farming, supported by the fertile soil and tropical climate, includes the cultivation of cassava, sweet potatoes, maize and vegetables.

Gender dimension

The team conducted consultations with affected women in the project area. Women selling food and beverages near the proposed Tanga landing point also provide money transfer services via Tigopesa and collect firewood for home use. They operate year-round and reported increased business during a previous submarine cable project due to worker patronage. Beach activity decreases during Ramadan and peaks in July. The women are optimistic that the new project will boost the economy and their sales, but they worry about potential cultural contamination from an influx of foreigners. Additionally, they collect wood near the beach and crabs and squid in the tidal area. At the landing point of Pemba, women primarily collect crabs, shells, oysters, octopus, and sea cucumbers, with sea cucumbers being sold for export to China while the other catches are used for food. They do not fish extensively in the landing point area, preferring other locations and fishing during low tide without boats. They collect wood from dead trees on the beach, avoiding mangroves due to their environmental importance. In the project area, women are also heavily involved in subsistence farming, growing crops like cassava, sweet potatoes, maize, and various vegetables, managing small plots and handling all aspects of crop production.

Tourism

Tanzania's tourism sector has grown significantly, driven by its natural attractions and government efforts to promote tourism. International visitors increased by 57.7% to 1,454,920 in 2022 from 922,692 in 2021, boosting tourism earnings to USD 2,527.8 million from USD 1,310.3 million. The interconnections project has been designed to avoid tourist spots and attractions, using underground cables to preserve the landscape. This project, mostly underground, ensures that both the coastal and terrestrial landscapes remain visually unaffected, and it does not encroach on touristic marine areas.

Terrestrial archaeology and cultural heritage

Tanzania has 7 World Heritage site in the Country. Two sites are set in the coastal areas, namely Ruins of Kilwa Kisiwani/Ruins of Songo Mnara and the Stone Town in Zanzibar. All the sites are outside the project area of interest.

Ecosystem services

In Tanzania, coastal and marine ecosystem services account for 30% of GDP. Sustainable management of these resources is crucial for poverty reduction and economic development.

Using the categories of the Millennium Ecosystem Assessment, the most important ecosystem services are resumed in the following table.

Table 1- 3 – Summary of ecosystem services in the project area

Category	**Ecosystem Services**	**Project Area (DAoI)**
Provisioning services	Fishing and fishing-related activities	Practiced
	Seaweed farming	Not Practiced
	Mangrove harvesting for fuel, timber, and other products	Not Practiced
Cultural and education services	Tourism and related activities	Not Practiced
	Education and research related to the marine environment	Not Practiced
Regulating services	Habitat provisioning for fisheries and other species	Present
	Waste water assimilation	Present
	Natural hazard protection: storm protection and beach control	Present

Despite its clear economic importance, the marine ecosystem faces serious degradation from both human and natural causes. These include uncontrolled tourism development, rapid population growth, overfishing and destructive fishing practices, over-harvesting of mangroves, dumping of untreated wastewater from urban areas, and periodic coral bleaching events.

Marine archaeology and cultural heritage

To date, no records of underwater cultural heritage have been found in the area surrounding the cable route. All the identified shipwrecks fall outside the AoI and will therefore not be impacted by the project activities.

Marine traffic

Traffic routes are detailed in the Admiralty Charts, which also indicate recommended tracks. The shipping density in central and northern Tanzania is illustrated in the charts, providing insight into maritime activity in the region.

The mainland of Tanzania maintains regular ferry connections to Pemba Island, primarily operated by Azam Marine and Zan Fast Ferries. The main ferry routes include:

- Dar es Salaam – Pemba
- Zanzibar (Unguja) – Pemba (Mkoani)
- Pemba – Tanga

1.5 Institutional and legal framework for implementation of the project

The Chapter 5 of the ESIA provided all the institutional and legal framework for implementation of the project in Tanzania. Key legislation governing the conduct of Environmental and Social Impact Assessment (ESIA) are the the Environmental Impact Assessment and Audit Regulations of 2005, as amended in 2018, and the Zanzibar Environmental Management Act No. 3 of 2015. Other Acts and Regulations of particular relevance to the proposed interconnection project are listed in Chapter 5.

In addition to compliance with national regulatory requirements, the Project will also adhere to the international conventions ratified by Tanzania and Zanzibar such as the International Labour Organization Conventions (ILO), United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), March 1973, Convention on Biological Diversity, (Rio Convention), June 1992, etc.

The Interconnection Project is financed by the African Development Bank (AfDB) and therefore must undergo environmental and social impacts screening as per the Bank's Environmental and Social Safeguards Policy. The AfDB's Environmental and Social (E&S) Operational Safeguards, set out in the current Integrated Safeguard System (ISS), that are triggered by the Project are the following:

- *E&S Operational Safeguard 1* (*OS1*): Assessment and Management of Environmental and Social Risks and Impacts;
- *E&S Operational Safeguard 2* (*OS2*): Labour and Working Conditions;
- *E&S Operational Safeguard 3* (*OS3*): Resource Efficiency and Pollution Prevention and Management;
- *E&S Operational Safeguard 4* (*OS4*): Community Health, Safety and Security;
- *E&S Operational Safeguard 5* (*OS5*): Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement;
- *E&S Operational Safeguard 6* (*OS6*): Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- *E&S Operational Safeguard 7 (OS7)*: Vulnerable Groups;
- *E&S Operational Safeguard 8 (OS8)*: Cultural Heritage;
- *E&S Operational Safeguard 10* (*OS10*): Stakeholder Engagement and Information Disclosure.

A gap analysis between the Tanzanian legislation and African Development Bank Operational Safeguards is presented in paragraph 5.2.3.

The relevant institutional actors of Tanzania in the project's environmental and social assessment are presented in the following table.

Table 1- 4 – Relevant institutional actors of Tanzania in the project's environmental and social assessment

Institutional actor	Roles
Tanzania Electric Supply Company Limited (TANESCO)	• Acts as the implementing agency for the project. • Oversees the project's environmental and social management. • Provides technical oversight, grid integration, and operational support.
National Environment Advisory Committee (NEAC)	• Provides strategic advice on environmental policy matters. • Reviews and endorses recommendations related to environmental impacts of the project.
Vice President's Office – Minister Responsible for Environment and Union Matters Minister Responsible for Environment	• Oversees environmental policy and regulations. • Ensures alignment of the project with national and international environmental standards.
Ministry of Lands, Housing and Human Settlements Development	• Responsible for land acquisition, resettlement planning, and management. • Facilitates land use planning to minimize socio-economic disruptions.
Vice President's Office (Division of Environment) and Director of Environment (DOE)	• Coordinates environmental assessments and approval processes. • Monitors the project's environmental compliance.
National Environmental Management Council (NEMC)	• Conducts the EIA review and approval. • Issues Environmental Certificates. • Monitors and audits the project for environmental compliance.
Ministry of Natural Resources and Tourism	• Protects natural habitats, biodiversity, and cultural heritage sites affected by

	the project. • Ensures alignment with conservation policies in marine and terrestrial areas.
Sector Ministries Environmental Sections	• Provide sector-specific guidance and oversight on environmental matters. • Ensure sectoral compliance with environmental regulations.
Regional Secretariats	• Coordinate project implementation at the regional level. • Address regional-level socio-economic and environmental concerns.
Local Government Authorities	• Facilitate community engagement and local consultations. • Support land acquisition and resettlement activities. • Address local grievances related to the project.
Standing Committee on Urban Planning and Environment	• Provides guidance on urban planning considerations, especially for transmission lines in urban areas.
Environment Management Officers, designated or appointed	• Act as liaisons for environmental compliance and monitoring at various levels. • Oversee local environmental management plans (EMPs).
Tanzania National Roads Agency	• Coordinates road crossings and access routes for transmission line construction and maintenance. • Ensures minimal disruption to road infrastructure.
The Occupational Health and Safety Authority (OSHA)	• Monitors workplace safety and health during project construction and operation. • Enforces compliance with occupational safety standards.
Marine Parks and Reserves Unit (part of the Ministry of Agriculture, Livestock and Fisheries)	• Ensures protection of marine ecosystems and fisheries affected by the submarine cable.

	• Approves and monitors mitigation measures for marine biodiversity.
Ministry of Finance	• Manages financial agreements and approvals for the project. • Oversees funding allocations and disbursement.

As the Project Developer, TANESCO will oversee the project's environmental and social management, ensuring compliance with national and international standards. This includes implementing mitigation measures, monitoring environmental impacts, engaging with stakeholders, and facilitating the disclosure and implementation of the ESIA.

Specific roles and responsibilities of TANESCO's Project Implementation Unit are outlined in paragraph 5.3.1.

1.6 Environmental and Social Impacts

Starting from the baseline conditions, the potential impacts on the different components (physical environment, biological environment, socio-economic and cultural environment) that could result from the project activities during the construction and operational phases have been identified. Detailed description of identified impacts and methodology of assessment are provided in Chapter 7.

Terrestrial domain

<u>Physical environment</u>

The potential negative impacts expected to arise from the project construction activities on the terrestrial physical environment are summarized in the following matrix.

Table 1- 5 – Matrix of negative impacts on terrestrial physical environment during the project construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Air Quality	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Geology, Geomorphology and Soil	Duration (D):	Medium-long	Medium	Short-mid-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Water Resources (Surface and Groundwater)	Duration (D):	Medium-long	Low	Short-mid-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Negligible					
Noise	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Landscape and Visual Amenities	Duration (D):	Medium-long	Medium-low	Irreversible	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Waste	Duration (D):	Medium-long	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

The major and moderate impact of this component is:

- Landscape and visual amenities

  Visual evidence of these projects cannot be completely avoided, reduced, or concealed. Visual impacts and physical changes to the landscape features may be induced by the following works:

  1. The construction of substations will require the removal of existing vegetation, earthmoving, levelling operations and excavation and back-filling with re-profiling of the ground.

  2. The construction of underground 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.

  The project construction activities will constitute an aesthetic impact of medium-long duration, continuous in time, with local spatial extension. Construction activities will be more visible, where carried out within an open landscape, e.g. flat ground with no dense vegetation cover.

The potential impacts expected to arise from the project operation phase on the terrestrial physical environment are summarized in the following matrix.

Table 1- 6 – Matrix of negative impacts on terrestrial physical environment during the project operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Air Quality	Duration (D):	Medium-long	Low	Long term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Beyond regional					
	Intensity (I):	Negligible					
Soil, Subsoil and Freshwater Resources	Duration (D):	Medium	Medium-low	Short-mid-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity (I):	Low					
Noise	Duration (D):	Long	Medium-low	Short-term	**Negligible**	None	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity (I):	Negligible					
Electromagnetic field	Duration (D):	Long	Medium	Irreversible	**High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity (I):	Low					
Landscape and Visual Amenities	Duration (D):	Long	Medium	Irreversible	**High**	Medium	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity (I):	Low					

The major and moderate impact of this component is:

- Landscape and visual amenities

  The main landscape and visual impact will be represented by the upgrading and extension of substations. The visual impact, however, is substantially reduced because the involved substations already exists and the upgrading works will consist in an extension of the current structure and installation of new equipment. Since substations and underground cables are located in populated areas, but the project envisages the upgrading and extension of existing substations, the sensitivity to this impact is judged medium.

- Electromagnetic fields

  Since underground cables passes through populated areas, but the cable route will follow the existing 33 kV distribution line route, the sensitivity to this impact is judged medium. The EMF field is rated as an impact of high importance. As previously stated, the expected levels of magnetic fields above ground are abundantly below the general public exposure limit of 200 µT. Therefore, the residual impact is rated low.

Biological environment

The potential negative impacts expected to arise from the project construction activities on the terrestrial biological environment are summarized in the following matrix.

Table 1- 7 – Matrix of negative impacts on biological environment during the construction phase (terrestrial environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat loss and degradation	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Habitat fragmentation, barrier to movement	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Introduction and spread of invasive alien species	Duration (D):	Long	Medium-high	Long term	**Very High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Road kill	Duration (D):	Long	Medium	Short-term	**Low**	High	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Disturbance, degradation and loss of mangroves	Duration (D):	Medium-short	High	Long term	**Very High**	High	**Low**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					

The major and moderate impact of this component are:

- Habitat loss and degradation

  Habitat loss occurs when a natural area is converted to a form that can no longer support the species originally residing there. This conversion can be complete, like forest land cleared for development, or partial, where fragmentation reduces the overall habitat quality. Underground cables can lead to habitat loss and degradation in two ways: 1) Construction disruption: installing underground cables involves trenching the earth, which can significantly disrupt the habitat during construction. This impact burrowing mammals, reptiles, amphibians, invertebrates, and plants. The noise and activity can also disturb wildlife in the surrounding area; 2) Habitat loss (though less than overhead): while less land is cleared compared to overhead lines, the trenching itself removes vegetation and disrupts the soil profile. This can lead to some habitat loss, especially for smaller animals that rely on the topsoil layer.

- Habitat fragmentation, barrier to movement

  Habitat fragmentation and creation of barriers to movement are significant concerns for underground cable in different ways: 1) Habitat fragmentation: while less land is cleared compared to OHTL, trenching for underground cables can still fragment habitat, especially for smaller, burrowing animals reliant on the topsoil layer; 2) Barrier effect (temporary): the trench itself acts as a temporary barrier for some less mobile animals like reptiles, amphibians, and small mammals. However, this impact is temporary and can be mitigated through proper restoration; 3) Construction disturbance: construction activities for underground cables create noise, vibration, and vehicle traffic, creating a zone of disturbance that animals may avoid, even if they could physically cross the barrier.

- Introduction and spread of invasive alien species

  The construction of underground cable infrastructure, along with associated substations, can significantly disrupt terrestrial ecosystems and act as a vector for the introduction and spread of invasive alien species (IAS). Construction activities can fragment previously contiguous habitats, creating smaller, isolated patches of native vegetation. These fragmented habitats are more vulnerable to IAS invasion due to several factors: 1) Increased edge habitat: the creation of linear corridors like trenches expands the habitat edge. Edge habitats tend to be more susceptible to invasion as they offer altered environmental conditions compared to the forest interior; 2) Reduced competition: fragmentation disrupts the existing plant community structure, often reducing competition from established native species. This creates open niches that invasive plants can readily exploit. These disruptions create opportune conditions for IAS establishment, potentially leading to decline and habitat disruption.

- Disturbance, degradation and loss of mangroves

  The construction of underground transmission lines can pose significant challenges to the ecological integrity of mangrove ecosystems. Key treats are: 1) Direct habitat loss: trenching for underground cable directly results in the destruction of mangrove habitat. This can lead to the fragmentation and degradation of the entire ecosystem, as remaining mangrove areas become isolated patches; 2) Habitat fragmentation and edge effects: construction activities can fragment existing contiguous mangrove stands, creating smaller, isolated patches of forest. These fragmented areas are more susceptible to "edge effects". These effects include increased wind and sun exposure, altered hydrology, and potential invasion by non-native plant species. This further degrades the remaining mangrove habitat and reduces its overall ecological value. 3) Disruption of ecological services: mangrove ecosystems provide a multitude of critical services that benefit both the environment and human populations. While utilizing the existing cleared corridor successfully minimized the need for direct mangrove clearing during the design phase, there is still a possibility of minimal impact on the root system of mangroves adjacent to the construction area.

The potential impacts expected to arise from the project operation phase on the terrestrial biological environment are summarized in the following matrix.

Table 1- 8 – Matrix of negative impacts on biological environment during the operation phase (terrestrial environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat Loss, Degradation and Frangmentation, Barrier to Movement	Duration (D):	Long	Medium	Short-mid-term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Introduction and Spread of Invasive Alien Species	Duration (D):	Long	Medium	Mid term	**High**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Human Disturbance	Duration (D):	Medium-long	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Electromagnetic Field	Duration (D):	Long	Low	Short-term	**Negligible**	Medium	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

The major and moderate impact of this component are:

- Habitat loss, degradation and fragmentation

  The presence of transmission lines and associated infrastructure can create a visual barrier and potentially fragment the habitat of some species. This could restrict their movement and access to resources. Maintenance activities such as vegetation removal along the HVTL RoW could result in habitat loss and disturbance to vegetation and wildlife. In addition, this could lead to an increase in the negative effects of fragmentation.

- Introduction and spread of invasive alien species

  Infestation of invasive species can also occur during periodic transmission RoW maintenance activities, especially if these activities include mowing and clearing of vegetation. Furthermore, regular vegetation clearing disrupt the habitat, often removing native plant species that compete with invasive species. Seeds can adhere to machinery, tires, and workers' clothing, facilitating their spread over large distances.

- Human disturbance

  The operation and maintenance of transmission lines inherently involve human activities that can disturb the surrounding environment. These disturbances include for example noise, pollution, and physical presence. While the frequency of these activities may be low, the disturbance could affect negatively wildlife and habitat. While the project is expected to bring benefits such as increased electricity access and improved livelihoods for local communities, it may also lead to an increase in tourism activities. This surge in tourism can have several negative impacts on the biological environment, primarily due to the increased human disturbance.

Social environment

The potential impacts expected to arise from the project construction activities on the social environment are summarized in the following matrices.

Table 1- 9 – Matrix of negative impacts on socio-economic environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Land Acquisition, Restrictions to Land Use and Involuntary Resettlement	Duration (D):	Medium-long	Medium-low	Long term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Physical and Cultural Resources	Duration (D):	Medium-long	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Communty Health and Safety	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Occupational Health and Safety	Duration (D):	Medium-long	Medium	Mid term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Employment, Income, Labor and Working conditions	Duration (D):	Medium-long	Medium-low	Short-mid-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Infrastructure and Public Services	Duration (D):	Medium-long	Medium-low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					

Table 1- 10 – Matrix of positive impacts on socio-economic environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Enhancement effectiveness
Opportunities for skilled and unskilled labor	Duration (D):	Short	Low	Short-term	**Negligible**	High
	Frequency (F):	Sporadic				
	Spatial extent (E):	Project footprint				
	Intensity(I):	Negligible				

The major and moderate impact of this component are:

- Land acquisition, restrictions to land use and involuntary resettlement

  Permanent loss of land: a 1,5 m-wide RoW will result in the permanent loss of land above the underground cable. This area must be free from any structures, crops, and trees.

  Temporary losses/agricultural damage due to the opening of the trench (1,5 m large) that will contain the underground cable.

  The underground cables solution will minimize the loss of land to 1,5 m of Right of Way. The cable will be located in the road reserve as much as possible, therefore the impacts on land acquisition is minimal. It is expected minimum impact, though if any structure will be impacted it will be duly compensated through the Resettlement Action Plan implementation.

The RAP provides compensation and support for various types of losses incurred by Project Affected Persons (PAPs):

- **Land Loss:** Landowners receive cash compensation, disturbance allowances, and support for livelihood restoration. Encroachers may be eligible for compensation for structures.
- **Structure Loss:** Structure owners receive cash compensation, relocation allowances, and support for livelihood restoration.
- **Tree and Crop Loss:** Owners receive cash compensation and support for replanting.
- **Business Loss:** Business owners receive compensation for lost profits and disturbance allowances.
- **Vulnerable PAPs:** Vulnerable groups receive targeted support, such as seedlings, food baskets, and financial literacy training.

The table below shows the summary of data on project affected persons and related losses and impacts due to the project.

Table 1- 11 – Summary of data on project affected persons and related losses and impacts

#	Variables	Data
	A. General	
1	Region/Province/Department	Tanga
2	Municipality/District	Tanga City
3	Village/Mtaa	Majani Mapana A, Majani Mapana B, Mwakizaro, Magomeni A, Magomeni B, Majengo A, Duga Barabarani, Duga Mpya, Makokondumi and Magaoni.
4	Activity(ies) that trigger resettlement	Installation of underground cable to Pemba (132 kV) from Majani Mapana Substation to Land point at Myanjani with other components as follows: • Miyanjani landing point: ocean buffer zone and ocean floor will be used hence no displacement. • Wayleave for the underground cables laying 1.5 m wide and 8.2 km long: 0.101 ha of land will be required whereby five individual PAPs will be

		paid compensation. While remain of 1.129 ha is reserved land for the existing TANESCO wayleave and road reserves under TARURA. • Upgrading of existing Majani Mapana substation; 0.594 ha of land in the existing substation. The land belongs to TANESCO. Hence no resettlement for this piece of land.
5	Project overall cost	TZS 243,776,856.90
6	Overall resettlement cost	TZS 131,771,274.00
7	Applied cut-off date (s)	23rd July 2024
8	Dates of consultation with the people affected by the project (PAP)	22nd to 25th July 2024
9	Dates of the negotiations of the compensation rates / prices	22nd to 25th July 2024
#	**B. Specific information**	
10	Number of people affected by the project (PAP)	44
11.	Number of institutions affected by the project (PAP)	3
12	Number of Physically displaced	7
13	Number of economically displaced	44
14	Number of affected households	44
15	Number of females affected	23
16	Number of vulnerable affected	15
17	Number of major PAP	4 (affected land and house)
18	Number of minor PAP	40 (only affected kiosks, fence, tree, and crops)

19	Number of total right-owners and beneficiaries	4
20	Number of households losing their shelters	1
21	Number of households losing their crops and/or revenues	43 expect 1 PAP who loss fence only
22	Total areas of farmlands lost	1.824 ha
23	Estimation of agricultural revenue lost (TShs)	28,680,951.00
24	Number of buildings to demolish totally	1
25	Number of buildings to demolish totally at 50%	0
26	Number of buildings to demolish totally at 25%	2 (Only fence affected)
27	Number of tree-crops lost	1,073
28	Number of commercial kiosks to demolish	6
29	Number of ambulant/street sailors affected	0
30	Number of community-level service infrastructures disrupted or dismantled	0
31	Number of households whose livelihood restoration is at risk	43 expect 1 PAP who loss fence only

- Community health and safety

a) Risk of accidents and physical injuries involving residents from increased road traffic.
b) Trespass by unauthorized persons into construction work areas with consequent risk of accidents/ injury and/or loss of livestock (e.g. local herders).

c) Increased stress-related disturbances (noise, dust, light, and air pollution).
d) Increased of STD among local population.
e) Sexual Exploitation and Abuse/sexual harassment (SEA-SH) of seasonal workers and migrants.
f) 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 from the local communities.

- Infrastructure and public services

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

The potential negative and positive impacts expected to arise from the project operation on the socio-economic environment are summarized in the following matrices.

Table 1- 12 – Matrix of negative impacts on socio-economic environment during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Occupational Health and Safety	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Economy, Employment, Labor and Working Conditions	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Community Health and Safety	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

Table 1- 13 – Matrix of positive impacts on socio-economic environment during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Enhancement effectiveness
Increased power supply	Duration (D):	Long	Medium-high	Short-mid-term	**High**	High
	Frequency (F):	Continuous				
	Spatial extent (E):	Global				
	Intensity(I):	High				
Economic growth	Duration (D):	Long	Medium-high	Short-mid-term	**Medium**	High
	Frequency (F):	Continuous				
	Spatial extent (E):	Regional				
	Intensity(I):	High				

Marine domain

Physical environment

The potential negative impacts expected to arise from the project construction activities on the marine physical environment are summarized in the following matrix.

Table 1- 14 – Matrix of negative impacts on marine physical environment during the project construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Seabed Disturbance and Degradation	Duration (D):	Short	Low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Underwater Noise	Duration (D):	Short	High	Short-term	**Low**	Low	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Very high					
Seabed Contamination	Duration (D):	Medium-short	Low	Mid term	**Negligible**	Medium	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Waste	Duration (D):	Short	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	Low					

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. Considering the narrowness of the corridor and the expected weakness of thermal radiation, impacts are not considered to be significant.

Biological environment

The potential negative impacts expected to arise from the project construction activities on the marine biological environment are summarized in the following matrix.

Table 1- 15 – Matrix of negative impacts on biological environment during the construction phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat loss, degradation, fragmentation and barrier effect	Duration (D):	Medium-short	Medium	Short-mid-term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Introduction and spreading of Invasive Alien Species	Duration (D):	Medium	Medium-low	Long term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Disturbance, degradation and loss of coral reefs	Duration (D):	Medium-short	High	Long term	**Very High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	High					
Fauna collision	Duration (D):	Medium-short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Noise pollution	Duration (D):	Medium-short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Chemical Contamination	Duration (D):	Medium-short	Medium-high	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					

The major and moderate impact of this component are:

- Habitat loss, degradation, fragmentation and barrier effect

  Operations employed for cable placement disturb the seabed, impacting intertidal and benthic (bottom-dwelling) organisms and their habitats. This can range from sessile (immobile) invertebrates to fish species that rely on the seabed for shelter and food acquisition. The impact is typically localized to the direct AoI; however, it can be significant in ecologically sensitive areas like coral reefs or spawning grounds for fish populations. The installation of the cable will require excavation of sediment for the cable trench and an additional working corridor adjacent to the excavated area will be required for the movement of people and machinery. These works will therefore result in the disturbance of habitats and species, potentially including sea turtles, shorebirds, flora and marine fauna.

  The project area provides potential habitat for sea turtle nesting, although this is expected to be at a low level. The presence and migratory routes of humpback whales (*Megaptera novaeangliae*) and other threatened cetaceans have also been reported in the project area. The periods of the year when cetaceans are more abundant and migrate are from August to January, while the nesting period of sea turtles is from March to May/June.

- Introduction and spreading of invasive alien species

  Construction activities involve a significant increase in vessel traffic, with ships carrying personnel, equipment, and materials to the project site. These vessels can act as unintentional vectors for transporting and introducing IAS.

- Disturbance, degradation and loss of coral reefs

  Physical damage, sedimentation, increased turbidity due to the construction activities could affect sensitive ecosystems such as coral reefs. The installation of submarine cables across coral reefs can lead to physical damage to corals due to trenching activities, anchoring and other mechanical activities that can break or crush coral structures. Anchoring ships and equipment during installation can create scars on the seabed, directly damaging corals and other benthic organisms. Construction activities disturb the seabed, causing an increase in sedimentation that can smother corals, blocking sunlight and hindering photosynthesis, which is crucial for the survival of zooxanthellae (symbiotic algae living within coral tissues).

The potential impacts expected to arise from the project operation phase on the marine biological environment are summarized in the following matrices.

Table 1- 16 – Matrix of negative impacts on biological environment during the operation phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Reef Effect for alien species	Duration (D):	Long	Medium-high	Mid term	**High**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Electromagnetic Field	Duration (D):	Long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Heat Emission	Duration (D):	Long	Low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

Table 1- 17 – Matrix of positive impacts on biological environment during the operation phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Reef effect	Duration (D):	Medium-long	Medium	Short-term	**Negligible**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

Cumulative impacts

The detailed cumulative impact assessment is in Chapter 8. There is little information about reasonably defined future developments in the AoI project, but by reviewing the sources, general projects and developments have been identified and described:

- Construction and rehabilitation of Tanga Airport to improved air transport, National Security and Economic activities such as Tourism, Trade investment, etc.
- Construction of new terminal building, extension of runway and other facilities at Pemba.
- East African Crude Oil Pipeline (EACOP).
- Construction of road Pangani - Tanga (50 km) and Pangani - Mkange - Makurunge (124.5 km) to bitumen standard.
- Improvement of railway infrastructure of TAZARA, Central, Eastern and Southern railway lines and rehabilitate existing rolling stocks: 1,223 Km of Standard Gauge Railway Line Construction of standard gauge railway line of Tanga-Arusha - Musoma with branches to Minjingu and Engaruka.
- Expand Sea ports of Dar es Salaam, Tanga and Mtwara.
- Procure and rehabilitate marine vessels.
- Development of tourism infrastructure in tourism areas in Pemba and Unguja.
- Submarine cables from Dar es Salaam to Unguja and from Tanga to Pemba (already existing).
- Proposed transmission lines and submarine cables connecting Dar es Salaam and Unguja Island and from Kisiju to Mafia Island.

The potential environmental and social cumulative impacts caused by the proposed project in combination with these projects and development activities were identified as:

- Local and regional economic growth and enhancement of tourism;
- Increase of human disturbance;
- Impact on air quality and increase in GHG emissions;
- Increase in underwater and terrestrial noise generation;
- Habitat fragmentation, barrier to movement;
- Deterioration of marine water quality.

The implementation of the mitigation measures identified for the proposed project will ensure that impacts are mitigated.

1.7 Consultation and Stakeholder Engagement

The affected parties are identified as follow:

1) Villages located near the landing point and the routing of underground cables;
2) People with land ownership rights along the routing of underground cables;
3) People whose livelihood depends on marine ecosystem service;
4) Village Leaders and Local Authorities.

Besides TANESCO and ZECO, several institutions can play a role in the approval process of the project design. The Chapter 5 list the main parties that are part of this process.

- Ministry of Natural Resources and Tourism

- National Environment Management Council (NEMC)
- Ministry of Housing, Land and Human Settlement Development
- Ministry of Livestock and Fisheries
- Marine Parks and Reserve Unit (MPRU)
- District Authorities/Town Authorities
- Villages Authorities

Three rounds of stakeholder consultations were conducted during the project's feasibility phase. These meetings involved key institutional stakeholders, community leaders, and project affected people. The objective was to thoroughly assess the project's potential impacts on natural areas, understand local development plans, and ensure that the project was aligned with regulatory requirements. The consultations and engagements were conducted between from April to August 2024. The engagements were conducted in three rounds as shown in the sections below.

A summary of the different views and issues raised by stakeholders is presented below.

- PAPs in Tanga expressed concerns about the timeliness and equity of compensation for their land and properties. They demanded that compensation should be fair and follow government regulations.

- Local employment opportunities were a priority for PAPs in Tanga. They sought assurances from TANESCO and the contractor that local residents would be given preference for available jobs, especially those requiring minimal skills.

- Recognizing the potential challenges of managing large sums of compensation, stakeholders in Tanga requested education and sensitization programs to help PAPs effectively utilize their funds. This would not only benefit the individuals but also contribute to minimizing family conflicts.

Overall, the stakeholders’ views and concerns across the different locations were consistent in their focus on fair compensation, local employment opportunities, and support for affected communities. The responses from TANESCO and other relevant agencies indicated a commitment to addressing these concerns and ensuring a positive outcome for all stakeholders involved.

In particular, alongside land compensation, TANESCO proposed three initial livelihood restoration programmes, as outlined in the RAP, which include:

- Training on non-farming income-generating activities and related business support (e.g., entrepreneurship and vocational training);
- Employment opportunities within the project;
- Agricultural incentives, such as introducing innovative approaches to agriculture (e.g., horticultural farming).

Using insights from the monitoring and evaluation of these initial livelihood programmes, as well as feedback from additional stakeholder engagements, TANESCO plans to implement a range of supplementary livelihood improvement programmes. These supplementary programmes will aim to build upon the livelihood activities initiated by PAPs post-displacement and address any ongoing displacement-induced impacts. The programmes will complement the initial restoration efforts and further support PAPs in achieving sustainable livelihoods after compensation and relocation.

Further information regarding questions raised by involved stakeholders, responses from the Consultant and the Project Developers, as well as minutes of meetings and signatures, is available in

Annex 6 (First Round of Consultations), Annex 7 (Second Round of Consultations), and Annex 8 (Third Round of Consultations).

1.7.1 1st ROUND of CONSULTATIONS

On April 23rd, 2024, on the occasion of the inception phase workshop held in Zanzibar, the Consultant and Project Developers conducted the first round of consultations with institutional stakeholders. The meeting was followed by the National television which broadcasted part of the event. Following the workshop, the Consultant held meetings with other key institutional stakeholders on the Tanzania mainland. The consultation aimed to inform the decision-makers about the project's scope of work, the project design process, and the methods for the Environmental and Social Impact Assessment study. Potential critical issues were described to gain feedback from stakeholders and an understanding of the work context, which was essential for planning the field surveys and design. The stakeholders responded positively and made themselves available for field inspection during the survey phases. The following table lists the participants from the first round of consultations.

Table 1- 18 – First round of consultations

TOPICS	PARTICIPANTS	DATE	MOM
Project scope of work presentation, clarification of permits, protected areas regulations and stakeholders to be involved	Marine Parks and Reserve Unit (MPRU)	April 29, 2024	MOM_TZ_01
Project scope of work presentation, clarification of land acquisition for cables and buffer zones in the landing points	Ministry of Housing, Land and Human Settlement Development (Land Commission in Dar es Salaam)	April 29, 2024	MOM_TZ_02
Project scope of work presentation, clarification of permits, protected areas regulations	National Environment Management Council (NEMC)	June 12, 2024	MOM_TZ_03

1.7.2 2nd ROUND OF CONSULTATIONS

From June 3rd to 8th, 2024, on the occasion of the environmental survey conducted in Tanga and Pemba Island, the Consultant and Project Developers held the second round of consultations with the affected wards and village authorities near the landing points. A series of Key Informant

Interviews and Focus Group Discussions were held with the communities living or conducting activities near the landing points and along the new underground cable route. The consultation aimed to share information about the possible project components and their footprints, collect feedback, understand fishing and other livelihood activities linked to the use of natural resources, and inform the affected wards about the main impacts expected during construction, particularly in terms of disturbances. The following table lists the participants from the second round of consultations.

Table 1- 19 – Second round of consultations

TOPICS	PARTICIPANTS	DATE	MOM
Share of the possible project components footprints and collection of feedback and understand the fishing and other livelihood activities linked to the use of natural resources	Communities living or having activities in the proximity of the landing points and along the new underground cable	June 8, 2024	MOM_PT_04 (Tanga)
Share of the possible project components footprints and collection of feedback and understand the role of women in the use of natural resources	Women living or having livelihood activities in the proximity of the landing points and along the new underground cable	June 8, 2024	MOM_PT_04 (Tanga)

1.7.3 3rd ROUND OF CONSULTATIONS

In July 2024, the project team conducted the third round of consultations for the RAP study. Meetings with local communities and stakeholders along the transmission corridor were held to gather information on resettlement, socio-economic conditions, and grievance mechanisms. Local government officials were involved to support the process. The following table lists the participants from the third round of consultations.

Table 1- 20 – Third round of consultations

TOPICS	PARTICIPANTS	DATE
To introduce the project and establish key areas of concern, and possible areas of cooperation with local government during RAP activities.	Tanga City Council	23.07.2024
Introducing project and seeking for assistance during field works by helping in identifying individual PAPs along the project area	Wards offices; (Nguvumali and others)	23.07.2024
To ensure their participation and cooperation during valuation activities and collection of social economic baseline	Affected PAPs within Mitaa	24.07.2024
Introducing the project and identifying the possible highway and its infrastructure to be affected during project	TANROADS	24.07.2024

implementation		
Introducing the project and identifying their roads networks to be crossed by underground power	TARURA	24.07.2024
Introducing the project and identifying their underground telecommunication fibers along the project area	TTCL	24.07.2024
Introducing the project and identifying their underground supply and transmission water networks along the project area	TANGA-UWASA	25.07.2024
Introducing the project and identifying how they could collaborate with TANESCO and local community during RAP implementation such as in handling GBV issues	NGO (BRAC MAENDELEO and TAYOTA)	26.07.2024

1.8 Grievances Redress Mechanism

As outlined in the Stakeholder Engagement Plan, TANESCO is committed to implementing a robust grievance redress mechanism (GRM) to ensure that all concerns and complaints related to their project activities are addressed promptly, fairly, and transparently. The GRM will provide a clear and accessible process for individuals and communities to raise grievances and seek resolution.

The GRM procedure will consist of several key stages:

1. <u>Disclosure and Awareness:</u> The GRM will be widely publicized through community meetings, public announcements, and other appropriate channels to ensure that all stakeholders are aware of their rights and the process for filing grievances.
2. <u>Grievance Submission:</u> Individuals and communities can submit grievances through designated channels, including dedicated channels for gender-based violence (GBV) grievances. Grievances can be submitted in writing, verbally, or through other means that are accessible to the complainant.
3. <u>Categorization and Assessment:</u> Grievances will be categorized based on their severity and nature. A thorough assessment will be conducted to determine the eligibility of the grievance and to identify the appropriate course of action.
4. <u>Investigation:</u> Complaints will be thoroughly investigated, with relevant evidence collected and analyzed. Investigators will interview complainants, witnesses, and other relevant parties to gather information and determine the facts of the case.
5. <u>Resolution Development:</u> Based on the investigation findings, proposed resolutions will be developed. These resolutions may include compensation, apologies, corrective actions, or other appropriate measures to address the grievance.
6. <u>Negotiation and Mediation:</u> In many cases, grievances can be resolved through negotiation or mediation between the complainant and the project representatives. Mediators will facilitate discussions and help the parties reach a mutually agreeable solution.
7. <u>Implementation of Resolutions:</u> Once a resolution is agreed upon, it will be implemented promptly and effectively. The project will monitor compliance with the agreed-upon actions and ensure that the complainant is satisfied with the outcome.

8. Closure and Reporting: Grievance cases will be closed once the resolution has been implemented and the complainant is satisfied. Detailed records will be maintained for each grievance, including the initial complaint, investigation findings, resolution, and outcome. This information will be used to monitor the effectiveness of the GRM and to identify areas for improvement.

TANESCO has put in place grievance redress structures to manage the grievance process from the village level to the high court.

The GRM will ensure that all grievances are addressed fairly and efficiently, and that affected individuals have access to both formal and informal channels for appealing decisions. By implementing this mechanism, TANESCO aims to foster trust and cooperation with local communities and ensure the projects' sustainability.

More information on GRM can be found in Chapter 10 and the Stakeholder Engagement Plan.

1.9 Environmental and Social Management Plan (ESMP)

The purpose of the Environmental and Social Management Plan (ESMP) is to identify and describe in detail the mitigation measures that must be taken to minimize the environmental and social impacts of a project. TANESCO will have overall responsibility for compliance during the construction and operation phases and for implementing the mitigation measures outlined in the ESMP.

TANESCO will ensure that the agreements legally oblige the Contractor to comply with this ESMP using the Good International Industry Practices (GIIP) and enforcing the principle that the stricter of national and international standards applies.

TANESCO will monitor the performance of the Contractor and all subcontractors on a regular basis and will undertake the following throughout the construction period:

- Review the effectiveness and comprehensiveness of the Contractor's documents (e.g., associated sub-management plans, procedures, and mechanisms for reporting, record keeping, and auditing) against the requirements of this ESMP;
- Undertake regular audits;
- Set up a contractor reporting structure; and
- Conduct meetings at a sufficient frequency to ensure E&S is a priority agenda item.

Mitigation measures described for the operational phase will be implemented by TANESCO. The Environmental and Social Management Plan (ESMP) will be updated and revised for both construction and operation phases to adapt the measures to prevailing conditions and/or additional monitored impacts during the construction period. Additionally, to strictly prevent and reduce the impacts or mitigate their effects, the Contractor's Environmental Management Plan (Contractor's EMP) shall be developed, incorporating both the Environmental and Social Management and Monitoring Plan and the Site Specific Environmental and Social Management and Monitoring Plan, to comply with AfDB's guidelines and requirements.

TANESCO will adopt the following approaches in the implementation of Environmental and Social Management Plan (ESMP):

- Partnership Approach
- Involving Community-Based Organizations
- Information Sharing

The ESMD will have three sections namely Environmental Section, Grievance Section and Social Section.

The detailed description of all the mitigation (and enhancement) measures envisaged in the Environmental and Social Management Plan (ESMP) is provided in Chapter 0 and in the following matrices, subdivided for physical, biological and social environment.

Table 1- 21 – Mitigation and management measures on physical environment (terrestrial domain)

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
Air quality	- Earthworks - Opening of access roads for excavation of cable trenches - Vehicle movement and other equipment. - Exhaust gases from engine driven vehicles and machinery - Increase of traffic for transport of raw material, personnel and wastes	- Routine watering program of all unpaved surfaces including roads and construction areas, to ensure sufficient moisture content and suppress dust generation; - 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; - Covering/humidifying of materials that can be transported by wind (e.g. topsoil, aggregate) where possible; - All stockpile materials with high risk to produce airborne dust will be covered, particularly during windy periods. - Use of best available technologies for equipment and machinery; - Regular maintenance and inspection of machinery performed in accordance with manufacturer instructions; - Vehicles and machinery will be turned off when not in use.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
Climate, Air quality	Potential fugitive emissions of SF_6 contained in the transformers insulating oil can be expected during the lifetime of	- Establish a lifecycle approach for SF_6 management through company policies, protocols, and standard operating procedures; - Establish procedures for gas inventory, accounting, and tracking. Including labelling, inventory and storage of gas cylinders, using log sheets for warehouse cylinders, and inventorying all SF_6 equipment;	Throughout operation phase Implementation and Control: Contractor and	5,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	the substations	- Train employees annually in SF_6 handling and in using the necessary equipment; - Recycle SF_6 gas at equipment servicing or disposal; - Track leak history of equipment to identify priorities for repairs and replacement; - Implement leak detection and repair strategies. Leak detection with leak pointer/sniffer, bagging or thermal imaging to detect minor, chronic leaks without taking equipment out of service. Leak detection teams regularly inspect equipment to identify SF_6 leaks and prioritize repair or replacement; - Upgrade equipment to reduce SF_6 use and leaks. New equipment designs use less SF_6 and tighter seals to reduce leaks; - Evaluate alternatives to SF_6, like vacuum-based technology with CO_2, or "Clean Air" as a base gas; - Implement proper decommissioning using SF_6 recovery systems to prevent emissions.	TANESCO	
Geology, Geomorphology and Soil	- Accidental spills of hydrocarbons or other contaminants on soil. - Occupation of soil by equipment and machinery, increase of waterproof surface and soil loss.	- Prepare a general Water and Soil Pollution Management Plan including conceptual design of pollution control to be implemented on-site in accordance with project's specific requirements; - Provide emergency response kits; - Strip and store contaminated soil on suitable impermeable surfaces; - Prepare a Waste Management Plan; - Implement waste management procedure (segregation	Before construction activities starts. During construction activities. Implementation: Contractor	50,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	- Soil disturbance and degradation.	of hazardous and non- hazardous waste); - Ensure regular surveillance of any spillage on nearby properties: land filling must be restricted within the boundary of project's activities (trench excavation, substation expansion) - Ensure periodic maintenance of the equipment; - Prepare a general Erosion and Sediment Control Management Plan including conceptual design of erosion and sediment controls to be implemented onsite in accordance with project's specific requirements; - Conduct land clearing activities during dry periods to help minimize erosion impacts; - Implement erosion and sediment protection works prior to the commencement of any construction works; - Minimize, wherever possible, land clearing and vegetation removal, to maintain as much as possible the original ground cover; - Landscape construction areas to reflect natural contours; - Restore suitable drainage paths in all areas disturbed by construction activities, - Stockpile and stabilize soil and spoil removed during the construction process separately and far away from the drainage lines; - Minimize and completely avoid any soil compaction outside of construction sites and access roads;	Control: TANESCO	

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs

		- Construction sites shall be stabilized and rehabilitated during and after construction;
		- Spread mulch generated from cleared vegetation across exposed soils after construction;
		- Restrict land acquisition, clearing and grubbing to what is necessary;
		- Replant cleared areas and slopes vulnerable to erosion such as cut-and-fill slopes with autochthonous plant species (grasses, shrubs and/or trees) which can:
		  - armour the surface against erosion;
		  - support the slope by propping from the base (tree and shrub boles and roots).
		- All soil that is disturbed during trench digging will be restored to approximate original depths as the trenches are backfilled (sandy beach, rock armour with a new geotextile and the backshore)		

Water resources	- Soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams, drainage channels and wetlands/swamps. - Increased water turbidity and	- Prepare a general Water and Soil Pollution Management Plan including conceptual design of pollution control to be implemented on-site in accordance with project's specific requirements; - While preparing the sub-plan, the Contractor must consult the Energy and Water Utilities Regulatory Authority (EWURA) and the Basin Water Boards; - Avoid water pollution by spillages of oil, fuel or lubricants by proper storage and handling; - Provide spill control kits to contain and clean small spills and leaks;	Throughout construction phase Implementation: Contractor Control: TANESCO	100,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	sedimentation in the affected rivers and seasonal streams. - Potential ground water contamination. - Alteration of ground water level caused by the reduction of groundwater supply.	- Prepare a Waste Management Plan; - Provide satisfactory disposal of solid and liquid waste; - Ensure periodic maintenance of the equipment; - Ensure the proper sealing of all pipelines, valves, and vessels to avoid water loss; - Avoid any dumping of excavated material in drainage pattern; - Prepare a Hazardous Material Management Plan; - Register all potentially hazardous materials to track type, quantities stored, quantities used or generated; - Allow only trained personnel to handle hazardous materials; - Seal well chemicals after use; - Record movements from storage and to waste disposal sites; - Develop and display at each construction site emergency response procedures; - Establish and include in the workers training program handling and use of hazardous materials safety procedures; - Locate workshop facilities at least 100 m away from the water sources; - Provide workshops with spilled oil and grease trapping systems; - Implement an effective water management system; - Construct sufficient cross and longitudinal drainage structures to allow for the proper passage of runoff or		

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		flood water under or along access roads; - Treat through proper wastewater treatment systems all the waters coming out from the construction site; - Adequate sanitary facilities (toilets, showers); - Construction wastes will not be allowed to accumulate on the construction site but will be collected promptly and removed regularly from the site.		
Noise	- Earth movement, aggregate material handling, excavation, mechanical works and vehicle movements. - Use of engine driven vehicles and machinery (i.e. excavators, bulldozers, trucks, cars). - Increase of traffic and related noise. - Improvement of access roads.	- Prepare a general Noise and Vibration Management Plan including conceptual design of noise and vibration controls to be implemented on-site in accordance with project's specific requirements; - Provide all workers with proper Personal Protective Equipment (PPE) for noise protection; - Provide all noise generating construction equipment with effective sound-control devices (exhaust mufflers); - Limit during daytime all construction activities that may generate harmful noise, to minimize community disturbance; - Install noise barriers near villages along access roads if noise levels are found to exceed standards during monitoring; - Switch off equipment when not in use; - Perform regular maintenance of equipment and machinery to ensure noise emissions in accordance with technical specifications; - Prepare, before the beginning of any construction activity, a detailed Noise Management Plan to reduce	Throughout construction phase Implementation: Contractor Control: TANESCO	50,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		noise impact from Project activities according to the final localization of the potential noise sources in relation to the existing noise vulnerable receptors (settlements, houses, etc.); - Notify local community/public located within 500 m from the worksites before starting noise activities (residents must be informed at least 24 hours in advance); - Regularly monitor noise intensity level.		
TOTAL COST				**205,000**

Table 1- 22 – Mitigation and management measures on biological environment (terrestrial domain)

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
Flora and Fauna	- All potential impacts	- Develop a Biodiversity Action Plan (BAP) that incorporates conceptual designs for on-site biodiversity management controls. This BAP should be informed by the results and findings of the baseline data collection and pre-construction surveys.	Pre-construction phase Implementation: Contractor Control: TANESCO	30,000
	- Habitat loss and degradation	- Prepare a Vegetation Clearing Management Plan including conceptual design of vegetation clearing and controls to be	Throughout construction	70,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	- Habitat fragmentation and barrier to movement	implemented on-site in accordance with project's specific requirements. - Carefully select the trees that need to be cut to implement the project activities. - Avoid any useless cutting of trees with particular attention to protected species. - Minimize as much as possible the construction areas and clearing width: reduce the width of the cleared corridor and trench to the minimum required for cable installation, safe operation, and maintenance. - Vegetation clearing: carry out clearing outside the breeding season and periods of high wildlife activity, minimize the width of the cleared corridor and replant with native species. - Dust and pollution control: implement dust suppression measures (watering, covered stockpiles), proper waste management, and spill prevention plans. - Noise management and control: limit night work, use quieter equipment, and maintain equipment properly. - Vegetation and habitat restoration: restore the trench promptly after cable installation, including re-grading and replanting native vegetation, to enhance habitat connectivity. Forbidden any use of alien and invasive species. - Avoid any fire risk caused by activities within the project area; - Wildlife crossings, if necessary: implement wildlife crossing structures like rope bridges for arboreal animals and properly designed culverts for terrestrial species to maintain connectivity between fragmented habitats.	phase Implementation: Contractor Control: TANESCO	

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques. - Promote the growth of low-height native plants that do not interfere with underground cable but provide habitat value. - Use the data collected during the monitoring activities to adaptively manage and refine mitigation measures as needed.	Throughout operation phase Implementation: Contractor Control: TANESCO	Included in the project costs
	- Introduction and spread of invasive alien species	- Develop an Invasive Species Management Plan to identify risks and control methods. - Cleaning protocols for vehicles and equipment: brushing down vehicles and equipment before they leave an infested area can help remove seeds and plant parts that could be spread elsewhere. - Use of local materials: sourcing construction materials like gravel and sand from local, weed-free sources reduces the risk of introducing new IAS propagules. - Worker training: educating construction workers on how to identify IAS and the importance of preventing their spread can be a critical step in mitigating the risks. - Control measures (e.g. eradication) to prevent them from becoming established.	Throughout construction phase Implementation: Contractor Control: TANESCO	30,000
		- Update of the Invasive Species Management Plan (ISMP) to identify risks and control methods. - Use of clean equipment: ensure all equipment and vehicles are cleaned before entering and leaving maintenance sites to prevent the spread of invasive species seeds.	Throughout operation phase Implementation: Contractor	30,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		- Control: take prompt action to control their spread (e.g. eradication). - Revegetation with native species: after maintenance activities, revegetate disturbed areas with native plant species to restore the habitat and reduce the opportunity for invasive species to establish. - Train workers on invasive species identification and control.	Control: TANESCO	
	- Road kill	- Speed limit enforcement: implementing and enforcing lower speed limits on construction roads allows wildlife more time to react to approaching vehicles. - Wildlife fencing: utilizing temporary fencing can guide wildlife away from construction areas and direct them towards designated crossing points. - Night lighting management: implementing shielded lighting or minimizing nighttime construction activities can reduce the attraction of wildlife to construction zones - All vehicles' drivers involved in the project must attend at least one wildlife safety training before they start working - Strictly forbid to construction workers to hunt and/or poach wildlife and to fish as well as to buy and/or sell wild animals; - Strictly forbid workers to supply food from hunting or fishing; - Implement adequate practices of food waste management to avoid any attraction of wildlife scavengers;	Throughout construction phase Implementation: Contractor Control: TANESCO	10,000
	- Disturbance, degradation and	- Trenchless technologies: for underground cable, utilizing trenchless technologies like microtunnelling or Horizontal Directional Drilling (HDD) can significantly reduce the need for	Throughout construction phase	40,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	loss of mangroves	extensive trenching. This minimizes the disruption of the intricate mangrove root system and associated ecological functions. - Minimized clearing: limiting the clearing of mangrove vegetation to the absolute minimum required for construction is crucial. - Mangrove restoration and rehabilitation: developing and implementing a comprehensive mangrove restoration plan is essential to compensate for any unavoidable habitat loss. This may involve planting native mangrove species in degraded areas to restore ecological functions and promote the recovery of the ecosystem. - Monitoring and adaptive management: regularly monitoring the impacts of construction on mangroves and surrounding ecosystems is crucial. Implementing adaptive management strategies allows for addressing any unforeseen issues and ensures the effectiveness of mitigation measures. This ongoing process can be further strengthened through collaboration with ecological experts.	Implementation: Contractor Control: TANESCO	
		- Minimized clearing for maintenance activity: limiting the clearing of mangrove vegetation to the absolute minimum required for maintenance is crucial.	Throughout operation phase Implementation: Contractor Control: TANESCO	Included in the project costs

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	- Human disturbance	- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques. - Train workers on minimizing noise and disturbance. - Sustainable tourism practices and community involvement: Involve local communities to promote eco-friendly tourism practices that minimize environmental impact, such as reducing waste, conserving water, and using renewable energy sources. This includes also specific training to increase awareness about the importance of protecting the environment, biodiversity and local cultures.	Throughout construction phase Implementation: Contractor Control: TANESCO	10,000
TOTAL COST				**220,000**

Table 1- 23 – Mitigation and management measures on socio-economic environment

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
Labor	- Unfair working conditions, including unfair treatment, gender-based discrimination, discrimination against vulnerable workers, child and forced labour - Corruption, lack of ethics and integrity from contractors and primary suppliers - Opportunities for skilled and unskilled labour with a positive impact on local communities. - Unrealized opportunities for local employment - Unrealized opportunities to train local workers - Failure to provide	Develop a Project Human Resource Policy which consider at least the following aspect: - Freedom of association and collective bargaining; - Prohibit the hiring of underage workers, as defined in relevant ILO Conventions; - Prohibit recruitment, use and practices of forced labour and child labour; - Prohibit discrimination in hiring practices or pay; - Provide fair and favourable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; - Avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; - Guarantee freedom of movement in and out of the workplace and workforce accommodation; - Guarantee wages as per industry standards/minimum wage; - Guarantee access to workforce grievance mechanisms; - Guarantee provision of sufficient rest periods and rest days to avoid fatigue; - Guarantee safe and healthy workplace conditions; - Guarantee provision of food and water for drinking and sanitation;	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	50,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	local communities with timely information on work opportunities and requirements	- Guarantee working conditions and accommodation standards, as per guidance note by IFC and AfDB Operational Safeguard; - Guarantee provision of appropriate personal protective equipment (PPE). These requirements shall also be reflected in subcontractors' employment policy. Develop Project Grievances Mechanism for labour: - Complaint from worker about unfair treatment or unsafe living or working condition; - Grievance policies and mechanism must be developed and disclosed.		
Occupational health and safety	- 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	Develop a Project Occupational Health and Safety Management Plan, including at least the following provisions: - Contractor's personnel will be required to wear suitable Personal Protective Equipment (PPE), including hard hats, high-visibility vests, safety boots and gloves and life vests as appropriate, in accordance with the Health and Safety Plan (EHSP). - All construction and cable repair workers will be sufficiently trained in the safe methods of working to	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	50,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	worker - Risks of exposure to chemicals and electromagnetic fields	avoid injuries. - Worker's accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC and AfDB Operational Safeguard on Workers' accommodation. - Systematically plan participatory hygiene promotion campaigns can reduce water, sanitation, and hygiene (WASH)-related diseases in camps. - Hence, hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing, and reduction of household drinking water contamination. While preparing the sub-plan, the Contractor must consult the Occupational Safety and Health Authority (OSHA).		
Occupational and community health and safety	- Risk of accidents and physical injuries involving residents from increased road traffic. - Trespass by unauthorized persons into construction work areas - Increased stress-	Develop a Project Implement Traffic Management Plan, including at least: - Road safety plans/maximum speed limits for site and access routes. - Contractor's program to monitor and enforce safety plans, accident reporting and statistics, establishing penalties for violations. Develop a Community Health and Safety Management Plan including at least:	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	100,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	related disturbances (noise, dust, light, and air pollution). - 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 increase of diseases, inappropriate conduct, and SEA-SH risks for women from the local communities.	- Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. - provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; - training of workers; - documentation and reporting of occupational accidents, diseases, and incidents; - Emergency prevention, preparedness, and response arrangements. - Appropriate fencing/signage at site entrance. - Appointment of site security personnel. - Road safety measures. - First aid and medical assistance. - HS measure at community level. - Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities. - Provision of awareness and prevention briefings. - Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling &		

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		Testing (VCT) targeting PACs. Implement and evaluate quarterly. - Prevent spread of respiratory disease, including the production of epidemics that can pass back and forth between the project and the community. - Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. - Distribute of mask to prevent from dust in the villages most impacted by the air pollution. Implement Community Grievances Redress Mechanism to address complains related to direct and indirect project impacts. Prepare a Security Management Plan with provisions for respect of Voluntary Principles on Security and Human Rights (VPSHR) and manage the influx of workers and followers through a Labor Influx Management Plan. Harmonize the above plans with: - Local Employment Plan - Workers Code of Conduct - GBV/CAE/SEA plan, Occupational and Community Health and Safety plan - Establish continuous communication with Key		

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		stakeholders and traditional leaders. - Train foreign workers on local culture and traditions While preparing the sub-plans, the Contractor must consult the Prime Minister's Office - Department of Coordination of Disaster Operations, the Fire and Rescue Force.		
Vulnerable Groups	- Risk of sexual abuse - Risk of child labour	GBV and CAE: - Contractors are required to have sexual harassment policies and Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. - Worker Code of Conduct shall be translated in local language(s) - The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV) and child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. - Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	90,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. - Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site.		
Cultural heritage	Potential encountering of archaeological sites, burial grounds, sacred sites and local shrines	- Establish a Chance Finding Procedure; - Inventory of any archaeological finding and unmarked graves.	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	10,000
TOTAL COST				**300,000**

Table 1- 24 – Mitigation and management measures on marine environment

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
Marine fauna, flora and habitats	- Habitat loss and degradation - Habitat fragmentation, barrier to movement	- Marine biologists (x2) to monitor construction activities. - Timing of construction activities: schedule outside sensitive seasons. the best period for construction activities is from June to July and from the end of January to the beginning of March. With regard to construction activities in the coastal area, the period to avoid is during the sea turtle nesting season, from March to May/June. - Bury cables deep to minimize barriers effect. - Habitat restoration for severely impacted areas, if feasible. - Habitats that are temporarily disturbed during installation activities will be rehabilitated as soon as possible after the cable has been installed. - The project will ensure that measures are adopted to avoid incursion into areas adjacent to the work site (especially the coral areas) or any secondary affects from pollution, sedimentation or accidental spills. - The project will also require that marine vessels have a similarly comprehensive plan for storage and handling of hazardous materials as well as a plan for containment and cleanup of accidental spills into the marine environment - Contractors will implement a suitable system for spotting marine mammals and turtle whilst pre-installation and installation vessels are at sea. Should any fauna be observed in the vicinity of the work area, the vessels will execute measures to avoid	Throughout construction phase Implementation: Contractor Control: TANESCO	35,000

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		collision or disturbance. Vessel operators will maintain a distance of 100 m or greater and will travel 10 knots or less when safety permits, until animals are more than 500 m away. Any abrupt changes in direction will be avoided. - Vessel crews must report sightings of any injured or dead marine mammal and sea turtle immediately, regardless of whether the injury or death is caused by a project vessel. The report should include the date and location (latitude/longitude) of the animal/strike, the name of the vessel involved and the species identification or a description of the animal. The report should be made to a designated ecology organization. - Security lighting will be beamed on the area of operation and at an adequate level of illumination only, to avoid impacts on sensitive fauna. Illumination of areas outside the direct work area will be avoided.		
	- Disturbance, degradation and loss of coral reefs	- Avoidance: adjust routing that completely avoids coral reefs. - Conduct detailed ecological surveys to map coral reefs along the final route before the construction. - Specific cable installation techniques: during the construction activities, diver-assisted installation should be implemented to manually guide the cable around sensitive areas. - Temporary coral translocation: temporarily relocate corals from the cable path to safe areas before installation. Ensure proper handling and reattachment techniques to minimize stress and mortality rates. - Post-installation monitoring and restoration: implement regular	Throughout construction phase Implementation: Contractor Control: TANESCO	120,000

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		monitoring programs to assess the reef's health and recovery post-installation. Conduct active restoration efforts, such as coral gardening and reef rehabilitation projects, to support recovery. - Community engagement and education.		
	- Fauna collision	- Apply reduced speed limits (<14 knots) to minimize and/or avoid any risk of collision. - Keep on board a qualified cetacean observer as crew member responsible for the promptly detection of marine mammals on a collision course.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in the costs of the previously mentioned mitigation measures
	- Noise pollution	- Schedule noisy construction activities outside of critical seasons for marine animals. The best period for construction activities is from June to July. With regard to construction activities in the coastal area, the period to avoid is during the sea turtle nesting season, from March to May/June.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
	- Chemical	- Develop a Spill Prevention, Control, and Countermeasure Plan	Throughout	Included in

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
	contamination	(SPCC) with prevention, containment, and clean-up procedures. - Use low-impact dredging techniques and silt curtains to control sediment re-suspension. Dispose of dredged material properly. - Educate personnel on spill prevention and response protocols	construction phase Implementation: Contractor Control: TANESCO	construction costs
	- Control invasive alien species	- Eradication action if needed.	Throughout operation phase Implementation: Contractor Control: TANESCO	Costs to evaluate based on the severity of the invasion
Water quality	- Chemical contamination - sediment dispersion and increased water turbidity	- Marine vessels will be required to always comply fully with the requirements of the MARPOL Protocol (1978). - Marine vessel anchors will not be dragged along the seabed, and they will be retrieved vertically to avoid unnecessary sediment disturbance. - The maximum speed of the cable laying will not exceed 5 knots per hour so that the amount of seabed sediment disturbed and dispersed during the cable laying process can be kept to a	Throughout construction phase Implementation: Contractor	Included in construction costs

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		minimum.	Control: TANESCO	
Maritime traffic	- Risk of collision or damage to equipment	- Contact the other vessel to avoid collision or damage to equipment - Vessels will increase visive attention when navigating in areas that are kwon to be used by fishermen and other vessels	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
Socio-economic activities: fisheries, tourism (diving sites, recreational activities), shipping and anchorage, etc.		- All stakeholders will be informed on activities well in advance and signage will be put in place where appropriate. Prepare a notice for community and fishermen with full description of construction activities. - All open trenches and excavated areas will be backfilled as soon as possible after the construction has been completed. Access to open trenches and excavated areas will be secured to prevent pedestrians or vehicles from falling in. - Vessels will increase visive attention when navigating in areas that are known to be used by fishermen and other vessels. If other vessels are observed within the near vicinity, the project vessel will stop moving, contact the other vessel if possible, and wait until it has been confirmed that the course of both vessels will not result in collision or damage to equipment. - While a ship is laying cable, its manoeuvrability will be restricted;	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs
		as such it will display the day signals and lights of a hampered vessel to avoid collision with other vessels at sea. - Fishing representatives to be informed of cable laying schedule and exclusion zones - Community stakeholders to be informed of cable laying schedule and exclusion zones - Local fishermen and other sea users will be informed about the presence of the cable vessel and location of the cables. - To engage with local fishermen, the Contractor must consult the Beach Management Unit (BMU).		
TOTAL COST				**155,000**

1.10 Environmental and Social Monitoring Plan

Monitoring will be done throughout the project life. The environmental monitoring for this project will be undertaken to meet the following objectives:

- to fully comprehend the physical, social and environmental conditions in the project area prior to the implementation of the project;
- to understand the compliance status of the implementation of mitigation measures and other regulatory standards;
- to ensure effectiveness of mitigation measures implemented by contractors as per contractual clauses and obligations;
- to check the effectiveness of mitigation and enhancement measures, implemented by the project, and
- to verify the accuracy of ESIA predictions and assess the emerging and cumulative environmental problems, which could provide timely warning of potential environmental damage.

The detailed description of all the envisaged monitoring actions is provided in Chapter 12, subdivided for physical, biological and social environment.

Table 1- 25 – Environmental monitoring actions on physical environment

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Disposal of septic water	Physical and chemical parameters according to national standards (if not available, international standards shall apply) including: - pH; - Turbidity; - COD; - BOD; - Total suspended solids (TSS); - Total phosphorus; - Total nitrogen; - Total Coliform bacteria; - Oil and grease.	National (TBS) and World Health Organization (WHO) standards	Substation and offices	Continuous control, monthly analysis and reporting	ESMD / Main Contractor	10,000
	Rehabilitation of borrow areas and temporarily acquired land	Success of revegetation and erosion status/vulnerability	Revegetation and minimal erosion Reinstatement of the previous status of exploited area	All borrow/pit areas and temporarily acquired land	Continuous	ESMD / Main Contractor	20,000
	Soil erosion and siltation	Erosion status/vulnerability	Minimal erosion and siltation	All construction sites and access roads	Continuous	ESMD / Main Contractor	20,000

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Management of hazardous and non-hazardous waste, hazardous materials	Ensure waste and materials are treated in accordance with national standards (if not available international standards according to IFC shall apply).	National standards IFC standards TANESCO' s site waste management standards	Construction site	Continuous	ESMD / Main Contractor	20,000
	Impacts on air quality	Visual observation of dust generated during construction activities	Minimum dust emission.	All construction sites, access roads and nearby settlements	Continuous	ESMD / Main Contractor	-
		Measuring concentration of air quality parameters (if not available international standards shall apply) including: - Particulate matter (PM10 and PM2.5); - CO; - VOC; - SO_2; - CO_2; - NO_2.	- Environmental Management (Air Quality Standards) Regulations, 2007 - International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines - World Health Organization's Air Quality Guidelines	All construction sites, access roads and nearby settlements	Monthly	ESMD / Main Contractor	10,000

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
			(AQG)				
		Visual inspections to ensure good standard machinery, equipment and trucks are in place	Proper functioning and maintenance of vehicles and machinery	All construction sites, access roads and nearby settlements	Occasionally throughout the construction period and upon complaints	ESMD / Main Contractor	-
	Exceedance of noise levels	Noise level measured using a portable noise meter	- Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015 - International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines - World Health Organization's Environmental Noise Guidelines	In and around construction sites and nearby settlement areas	Monthly and upon complaints by nearby settlements	ESMD / Main Contractor	10,000

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	TOTAL COST						**90,000**

Table 1- 26 – Environmental monitoring actions on biological environment

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Terrestrial domain	Conduct pre-construction surveys of wildlife and vegetation with focus on invasive alien species in the construction area	Avoid habitat loss and disturbance No (or minimal) change in average density of species recorded from baseline	Construction area	Single survey before construction	ESMD / Main Contractor	10,000
		Monitoring of wildlife and vegetation with focus also on alien invasive species, to assess effectiveness of mitigation measures	Avoid habitat loss and disturbance No (or minimal) change in average density of species recorded from baseline	Entire Project area	Twice per Year	ESMD / Main Contractor	20,000 per year

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Marine domain	Conduct detailed ecological surveys to map coral reefs along the final route before the construction	Avoid coral reef degradation, habitat loss and disturbance	Entire Project area	Single survey before construction	ESMD / Main Contractor	15,000
		Number of wild animals and birds affected by traffic accidents involving	Avoid or reduce to the minimum accidents	Entire Project area	Monthly	ESMD / Main Contractor	Include d in the operati onal costs of ESMD
Operation	Terrestrial domain	Monitoring of wildlife and vegetation with focus also on alien invasive species, to assess effectiveness of mitigation measures	No (or minimal) change in average density of species recorded from baseline	Entire Project area	Twice per year for five years, after project construction	ESMD / Main Contractor	100,000
	Marine domain	Conduct post-construction monitoring of marine communities	No (or minimal) change in average density of species recorded from baseline	Entire Project area	Once per year for five years, after project construction	ESMD / ESMU	50,000
	TOTAL COST						**215,000**

Table 1- 27 – Social monitoring actions

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Equity in local employment benefits / minimize social conflicts.	– Disclosure of contractor recruitment plan at Site offices and to Chiefs of Affected Villages; – Percentage of workers hired from all nearby communities; – Percentage of workers belonging to disadvantaged groups; – Grievances; – Records of specialized training for local staff provided by contractor; – Certificates from contractor issued to employees (copied to TANESCO and ZECO) detailing training received/new skills acquired while employed.	Most of low skill workers are recruited locally General perception of project is positive	Project area and affected villages	Quarterly Basis	TANESCO	Included in the operational costs of ESMD
	Labor grievance mechanism	– Established of grievance mechanism shall be documented; – Complaints log and resolution action must be recorded.	Zero or minimal complaints.		On monthly basis	TANESCO	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Protecting the workforce	– Regular weekly work hours, rest periods, lunch, etc.; – Overtime limits and exceptions; – Hour averaging minimum wage; – Overtime requirements and conditions; – Labour contract provisions; – Social system payment liability; – Annual leave; – Laws to protect disadvantaged workers; – Severance pays; – Number and frequency of accidents; – Number and frequency of near misses; – Cases of illness due to working conditions; – Copy of training certificates.	Zero or minimal complaints. Zero or minimal accidents.	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Labor and Community Health and Safety – Sexual Transmittable Diseases	– Number of STIs treated; – Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures;	No propagation of STD and VBD caused by the project	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	– Vector Borne Diseases – Respiratory Disease	– Number of TBs treated.					
	Community Grievance Mechanism	– Documented grievance mechanism established; – Maintenance of complaints log and resolution process.	Zero or minimal complaints.	Project area	On monthly basis	TANESCO	Include d in the operati onal costs of ESMD
	Occupational and community Health and Safety	– Contractor HS internal audits and statistics; – Records of accidents and near misses; – Record of illness, diseases; – Record of grievances; – Record of emergencies; – Informal feedback on effectiveness of Occupational and Community HS plan.	No accident/injuries in workers and local population	Project area	On monthly basis	TANESCO	Include d in the operati onal costs of ESMD
	Restrict access to sites, especially hazardous areas	Provision/review of the following documentation: – Description/photographs of fencing/signage around site	-	Project area	On monthly basis	TANESCO	Include d in the operati onal

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
		perimeter; – Contractors to provide TANESCO with CV and training certification of security personnel proposed as per contract requirements; – Site registry identification system;					costs of ESMD
	Occupational and community Health and Safety Minimize traffic hazard within community	– Road Safety Plan documentation including identification of maximum speed limits for site and access routes; – Requirement for contractor program of monitoring; – Reporting of accidents and statistics inclusive in HS performance records; – Community training on safety; – Signs for local communities; – Document traffic safety sessions and maintain session schedule; – Maintain attendance register-	No accident / injuries in workers and local population	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Local Market distortion Avoid distortion	– Pre-project and project local market prices for food, services and entertainment; – No. of vulnerable groups in comparison to the pre-project	Low impact on local market prices	Local Markets	On monthly basis	TANESCO	Included in the operational costs of

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	of local food prices and necessities due to influx of workers and followers	level; – Income level and living standard conditions in comparison to pre-project level.					ESMD
	Vulnerable Groups GBV	– Safety Audits through key informant interviews, FGD; – No. and records of the awareness trainings; – Men & boys self-assessment form – awareness raising; – No. of qualified experts involved in the management and follow up of issues related to GBV; – GRM log; – No. of cases registered or reported by health care providers.		Project Area	On monthly basis	TANESCO	Include d in the operati onal costs of ESMD
	Cultural Heritage	Reporting/notification of finds to the Archaeological Heritage Office	-	Project area	On monthly basis	Contractor	-
	Cultural Heritage/tombs	– Records from Chance Finding Procedures; – Photographs of findings; – Remediation measures adopted; – Payment completion;	Avoidance or relocation of physical cultural resources identified along	Construction site/excavation sites	Pre displacement and post displacement	TANESCO	Include d in the operati onal costs of

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
		– Relocation completion; – Records of meetings.	the ROW				ESMD
	Stakeholder Engagement	– Records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information.	-	Project area	Quarterly Basis	Contractor / TANESCO	Included in the operational costs of ESMD
	Security Social Conflicts	– No. of accidents, violence, strikes, brutal death; – Way of dispute solution; – Interviews with key informants; – Evidence of training of security staff on Voluntary Principles on Security and Human Rights (VPSHR).	No accidents and social conflicts	Project area	On monthly basis	Contractor / TANESCO	Included in the operational costs of ESMD
	TOTAL COST						-

In the following table the overall summary of the environmental and social costs to mitigate, manage and monitor all the impacts considered in this study is given. In this table also 10% contingency costs are also considered.

Table 1- 28 – Summary of the environmental and social costs

ITEM	US$
Terrestrial Physical environment management measures	205,000
Terrestrial Biological environment management measures	220,000
Social environment management measures	300,000
Marine environment management measures	155,000
Overall management measures	**880,000**
Physical environment monitoring measures	90,000
Biological environment monitoring measures	215,000
Social monitoring measures (included in operational cost of ESMD)	-
Overall monitoring measures	**305,000**
Operational Cost of ESMD	**200,000**
Total	**1,385,000**
Contingencies (10%)	138,500
GRAND TOTAL	**1,523,500**

The overall environmental and social cost of project implementation represent the 2.1% of the development costs of Tanzania – Pemba Interconnection Project (73,500,000 US$).

2 INTRODUCTION

2.1 Overview

Project Justification

Tanzania Electric Supply Company Limited (TANESCO) owns most of the electricity generating, transmitting and distributing facilities in Tanzania mainland, with an estimated population of over 60 million. The Company generates, purchases, transmits, distributes and sells electricity to Tanzania mainland and sells bulk power to the Zanzibar Electricity Corporation (ZECO), which in turns sells it to the public in islands of Unguja and Pemba.

Power supply to Zanzibar is conveyed through No. 2 (two) existing 132 kV Transmission lines with submarine cable component from Dar es Salaam to Unguja, approximately 64 km long, and 33 kV distribution line with submarine cable component from Tanga to Pemba, approximately 92 km long. Electricity demand growth in Zanzibar is increasing due to increase in various social and economic activities.

Project Objective

Considering the existing power supply to Pemba Island, the objective of this project is to implement another high voltage transmission line with submarine cable from Tanzania Mainland (Tanga) to Zanzibar (Pemba) to be operated at 132 kV.

Project proponents

TANESCO with engagement of ZECO decided to initiate the Project of increasing power supply to Zanzibar to meet the increasing demand. Currently the Consultant CESI S.p.A. (Italy) in joint venture with ELC Electroconsult S.p.A. (Italy) and Colenco Consulting Ltd. (Nigeria) has undertaken the feasibility study.

The Consultant has undertaken the Technical Feasibility Study, Conceptual Design, Preparation of Tendering Documents and Environmental and Social Impact Assessment (ESIA).
The study has been carried out for both overhead and submarine components and any necessary substation upgrade which may be required in Tanzania mainland and Zanzibar.

Project financiers

The African Development Bank (AfDB) is the primary known financier of this project.

2.1.1 Purpose of the document

In the Framework of this assignment, the Consultant has also undertaken an Environmental and Social Impact Assessment (ESIA) of the project in compliance with international and national standards, aimed to identify potential adverse impacts of the project and determine measures to prevent, minimize, mitigate or compensate these impacts.

In Tanzanian legislation, Section 81 of the Environmental Management Act (EMA, Act No. 20 of 2004) requires all developers of projects identified in the Third Schedule of the Act and furtherly detailed in the First Schedule of the Environmental Impact Assessment and Audit Regulations (2005), to undertake an Environmental Impact Assessment (EIA). Both public and private sector development activities are subjected to EIA.

Electrical transmission and distribution lines are included among the project types requiring a mandatory EIA (3rd Schedule of EMA 2004; 1st Schedule of EIA and Audit Regulations 2005; 1st Schedule of The Environmental Management (Environmental Impact Assessment and Audit) (Amendment)

Regulations, 2018) and therefore the Project of this assignment is subject to presentation of an Environmental (and Social) Impact Assessment.

Likewise, EIA/ESIA is a legal requirement also in Zanzibar, which is applicable to "*any activity which is likely to have significant impact on the environment and society…*", based on Section 39 of the Zanzibar Environmental Management Act (ZEMA, Act No. 3 of 2015).

The competent regulatory authorities for the Environmental Impact Assessment process are the National Environment Management Council (NEMC) in Tanzania and the Zanzibar Environmental Management Authority (ZEMA) in Zanzibar.

The Environmental Impact Assessment is a process for orderly and systematic valuation of a proposed Project including its alternatives and objectives and its effects on the environment including the mitigation and management of those effects. The process extends from the initial concept of the proposal through implementation to completion and, where appropriate, decommissioning. Environmental impact assessment in the wider context also includes social assessment, risk assessment and health assessments.

The objective of the present **ESIA Report** is to systematically identify, predict, and evaluate the potential environmental and social impacts of a proposed project, plan, or program. It aims to inform decision-making by providing a comprehensive assessment of the project's sustainability, ensuring compliance with relevant regulations, and recommending appropriate mitigation measures to minimize adverse impacts while maximizing benefits.

2.1.2 Objectives of the ESIA study

The Environmental and Social Impact Assessment (ESIA) is a procedure for establishing which impacts a proposed project is likely to have on the environment and for recommending changes to the project to minimize any predicted negative impact. The goal of the Environmental Impact Assessment activity is to evaluate the temporary and permanent impact of the project on the natural and human environment and to propose mitigation measures.

The specific objectives of the ESIA are:

- To characterize the project area using scientific methods of environmental and social analysis and undertake baseline studies on the environmental, social, economic and cultural conditions in the project area;
- To identify, analyse and evaluate the type and extent of likely potential environmental and social impacts of the proposed project with emphasis on duration, significance, magnitude and distribution of beneficial/adverse effects of the planned project on the existing biophysical, socio-economic and cultural components, and assess the capacity of the institutions responsible for management of these impacts;
- To provide mitigation measures for the identified environmental and social impacts and where residual impacts are predicted, a plan for their management including but not restricted to offsets, action plans etc should be included;
- Evaluate the social and socio-economic aspects of proposed project, identify stakeholders, carry out public consultations, including potentially project affected persons (PAPs), analyse their views regarding the environmental and social impacts, design social provisions and measures, formulate strategies for participatory implementation, and recommend the incorporation of the findings into the project design;
- To assess the best alternative project option with most benefits and least costs in terms of financial, social, and environmental considerations;

- To develop the Environmental and Social Management Plan (ESMP). The ESMP shall outline the mitigation/enhancement, monitoring, consultative and institutional strengthening measures to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and to enhance beneficial impacts, costs of the measures and monitoring requirements.

2.1.3 Structure of the Report

Chapter	Title	Description
1	Executive Summary	Summary of entire ESIA report
2	Introduction	This chapter introduces the project to supply power to Pemba Island via a 132 kV submarine cable. It outlines the project's need, the consultant's role, and the purpose of the ESIA, which is to identify, assess, and mitigate potential environmental and social impacts.
3	Project Description	Project description dives into the technical details of connecting Pemba Island to Tanzania's mainland for power. It covers submarine cable route selection, laying techniques (trenching, ploughing), and protection methods (rock mattresses, designated areas). Underground cables are chosen for land sections due to populated areas.
4	Analysis of Alternatives	This chapter presents a comparative assessment of alternative project designs and a "no-project" scenario. It evaluates the potential environmental and social impacts associated with each option, enabling a comprehensive analysis to inform the selection of the most suitable and sustainable option.
5	Policy, Legal and Institutional Framework	This chapter delineates the policy, legal, and institutional framework underpinning the ESIA study. It provides a comprehensive overview of relevant national regulations, international agreements, and globally recognized best practices and standards.
6	Environmental and Social Baseline	This chapter presents a comprehensive baseline assessment of the project area's biological, physical, socio-economic, and environmental characteristics. It synthesizes primary and secondary data while considering potential project-induced changes to existing conditions.
7	Impact Assessment	This chapter presents a comprehensive assessment of the project's potential impacts, outlines proposed mitigation measures, and evaluates the residual effects following the implementation of these measures.

Chapter	Title	Description
8	Cumulative Impact Assessment	This chapter analyses the combined effects of the proposed project with other past, present, and reasonably foreseeable future actions in the region. It identifies potential cumulative impacts on the environment and social conditions, assesses their significance, and proposes mitigation measures to address these combined effects.
9	Stakeholders Engagement	This chapter outlines the feedback received from stakeholders and explains how these concerns have been addressed.
10	Environmental and Social Management Plan (ESMP)	The ESMP consolidates potential solutions to reduce negative impacts, specifies the necessary actions, and assigns responsibilities for implementing these actions.
11	Environmental and Social Monitoring Plan	This chapter outlines a monitoring program and provides cost estimates for the proposed measures.
12	Decommissioning Phase	This chapter describes the reasons for non-applicability of decommissioning for submarine and underground cable.
13	Project Budget	This chapter provides a detailed budget breakdown for project implementation, including costs associated with mitigation measures and monitoring.
-	Annexes	-

2.1.4 ESIA Team

An interdisciplinary team of International and National experts has contributed to the Environmental and Social Impact Assessment Report. Their names are listed below.

- Lusako Raphael – Environmental Expert (NEMC/PC/EIA/2021/0098, NEMC/PC/EIA/2021/0065)
- Anamary Philemon – Social Expert (NEMC/PC/EIA/2021/0138, NEMC/PC/EA/2021/0089)
- Ettore Romagnoli – Environmental and Social Expert
- Paola Chiodi – Social Expert
- Federica Fonda – Lead ESIA Surveyor, Wildlife Expert
- Arianna Longarini – Environmental Scientist
- Nsajigwa Emmanuel Mbije – Marine Scientist
- Emmanuel Nzunda – Botanist/Forestry Expert

3 PROJECT DESCRIPTION

The scope of work of the assignment of the Interconnection Project comprehends the 132 kV from Tanga (Tanzania Mainland) to supply Pemba Island.

The study has been carried out for both terrestrial and submarine components and any necessary substation upgrade or construction.

For the planning of the preliminary submarine cable routes, a Desktop Study (DTS) has been carried out focusing on the characteristics of the study area, i.e. climatology, oceanography, bathymetry, bottom materials and morphology, seabed habitats, protected natural spaces, areas of nursery, fishing grounds, existing infrastructures (including cables, artificial reefs, anchorages, etc.) and maritime traffic. The DTS permitted to determine preliminary routes that minimize as far as possible the environmental and social impact of the project, implying at the same time a more secure settlement for the cables. The routes have been chosen based on:

- avoiding/minimizing cable geo-hazards such as rock outcrop, coral reefs, hard seabed or high relief areas, shoals, sandbanks;
- minimizing potential impacts on sensitive coral and near-shore environments;
- maintaining an adequate separation distance from the existing cables;
- minimizing cable length and number of cable route alter courses;

The proposed cable route should be used as route corridor center lines for future marine geophysical surveys. The main features of the proposed submarine cable routes are provided in Table 3- 1 and an overview map is presented in Figure 3- 1.

Table 3- 1 – Main features of the 132 kV submarine cable route from Tanzania mainland (Tanga) to Pemba Island

RPL	**DTS_TANGA-PEMBA_RPL-0-040624.xls**	
TANGA LP COORDINATES	039° 7.94700' E	05° 6.06300' S
PEMBA LP COORDINATES	039° 39.58800' E	05° 12.50700' S
Total Route Length	69.747 km	
Number of Alter Courses	9	
Maximum Water Depth (approx.)	830 m (GEBCO and Ad.CH.)	
Maximum Slope along the route (approx.)	13° at KP56.2	
Number of crossing points with IS systems	0 (*)	
Crossed Protected Areas	Tanga Coelacanth Marine Park Pemba Channel Conservation Area	

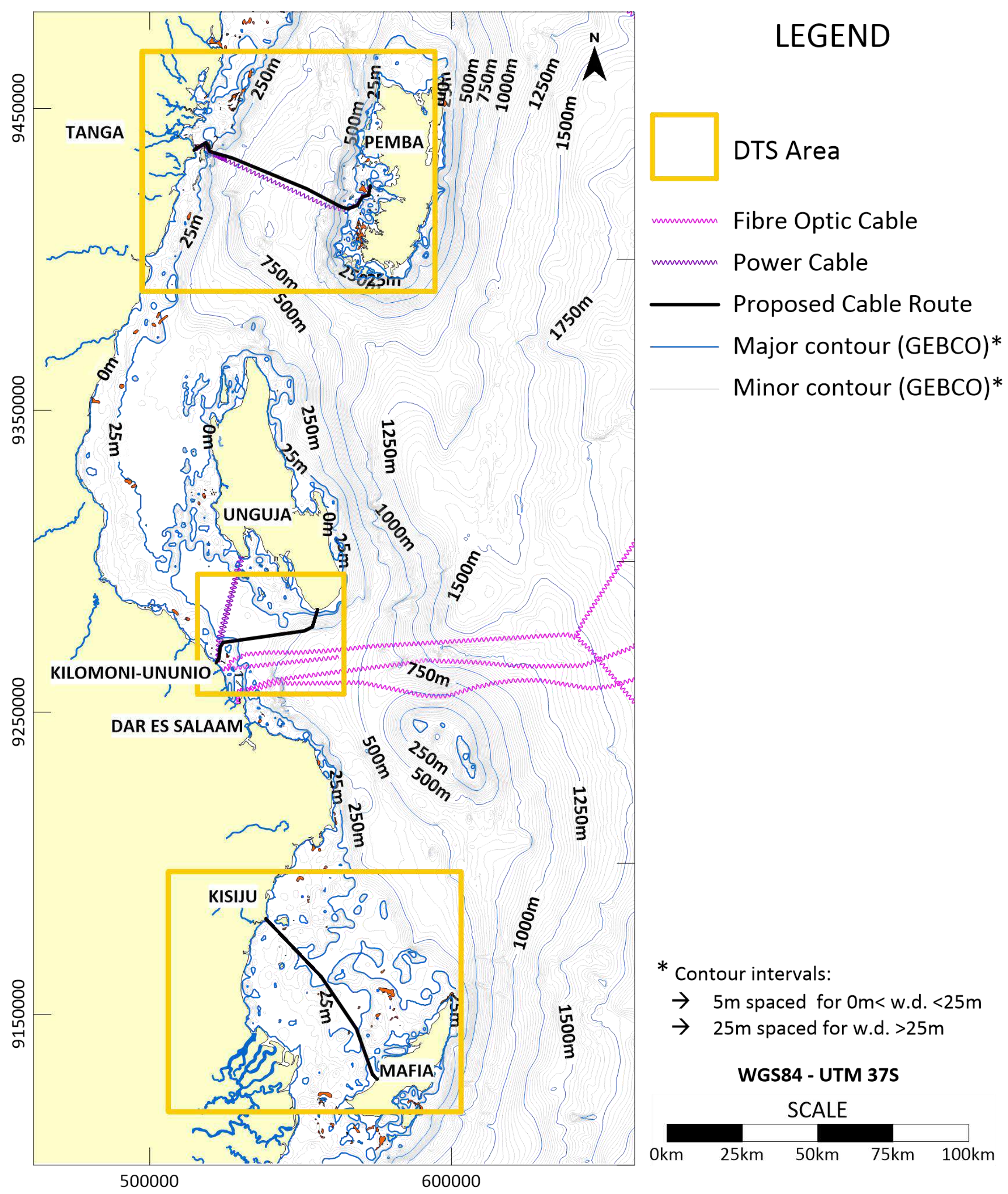


Figure 3- 1 – Overview of the submarine cable route (extracted from Submarine Cable Study). This map includes the proposed submarine cable for the current scoping as well as those planned for other interconnections.

Concerning terrestrial component of the interconnection project, two main technical alternatives have been considered, i.e. overhead line (OHL) and underground cable (UGC). Considering that the line routes pass in densely populated areas (especially in Tanzania mainland) or in cultivated areas (Pemba), the underground cable (UGC) is selected as the preferred solution. The underground cable allows to minimize the land acquisition and resettlement issues.

The terrestrial components of the interconnection project are:

- on Tanzania mainland, 132 kV underground cable from Mnyanjani landing point (existing) to the existing 132/33/11kV Majani Mapana substation length approx. 8 km;
- on Pemba Island, 132 kV underground cable from Ras Mkumbuu landing point (existing) to the existing 132/33 kV Wesha substation (upgrade), length approx. 9 km.

3.1 Project Components

The main elements of a submarine-crossing transmission system are as follows:

1. sea cable with relevant accessories (joints);
2. terrestrial cables or overhead lines which connect the electrical stations to the land/sea joints;
3. ancillary services.

3.1.1 Submarine Cable

Cable installation

The lay of the alternating current (AC) submarine cables includes the installation of the Sea Land Joint's on land and the pulling of the cables at the cable landing locations. Since the submarine cable is for alternating current, no electrodes are present, eliminating concerns associated with electrode-induced impacts.

The Contractor shall install the submarine cable in one single length avoiding the use of field joints.

However, subject to the results of the marine survey, the employment of a separate barge/vessel could be necessary to lay the cable on the landfall approaches characterized by very shallow water, forcing the necessity of a field joint to connect the cable onboard the cable lay vessel with the one loaded on the barge. Such solution shall be agreed with the Client.

Before any deployment, the detailed cable route must be chosen, depending on the bathymetry, seabed characteristics and economic activities of an area. The route must first be prepared, sometimes with adjustment of the slope or removal of obstacles before the passage of the cable-laying spread. An example of an established method is the pre-lay grapnel run, consisting of dragging a hooking device at low speed along the planned route to remove any material, such as abandoned ropes or fishing nets. Cable deployment is a complex process requiring highly specialized equipment. Cables are usually buried within the seafloor by different techniques including trenching with a cutting wheel in rocky sediments and ploughing or water jetting in soft sediments. Ploughing generally allows trenching, laying the cable and burying it with the extracted sediment in a single operation. Special backfill materials can be required when burial is technically complicated. In the case of hard seabed, the cable can simply be laid on the seafloor and protected with suitable covers, as an alternative to mechanical trenching of the rocky seabed.

The seabed contains boulders, debris, and various irregularities, making it essential to perform Pre-Lay Grapnel Run (PLGR) just before the cable laying operation. During this process, the vessel tows a grapnel along the designated cable route to remove any potential obstructions, such as fishing nets, ropes, or lines, that could interfere with the plough. The grapnel penetrates the seabed to a depth of 40-80 cm, and its forward movement and design effectively clear the path by catching any linear obstacles. The grapnel is retrieved onto the ship's deck every 20 km or sooner if the vessel registers significant tension, which suggests an obstacle has been hooked. Any collected debris is retained on board for safe disposal upon reaching port.

Cable burial depth is established by Cable Burial Risk Assessment (CBRA) study to be performed after marine survey. Generally speaking, a burial depth of around 1 m (where needed) can be assumed.

Cable landing will be performed by trenching and not by HDD (Horizontal Directional Drilling), so no need for drill units, fluids, or pumps.

A remotely operated vehicle (ROV) can install submarine cables along a planned route accurately. ROV-assisted installation is feasible in water depths exceeding a few dozens of meters. Near the shoreline, the cable is deployed from the vessel, with divers providing on-site supervision. ROV should also be used in maintenance activities that will be described in Section 3.1.7.

Ploughing is a submarine cable protection method that foresees the use of a plough simultaneously to the cable laying (Figure 3- 2).

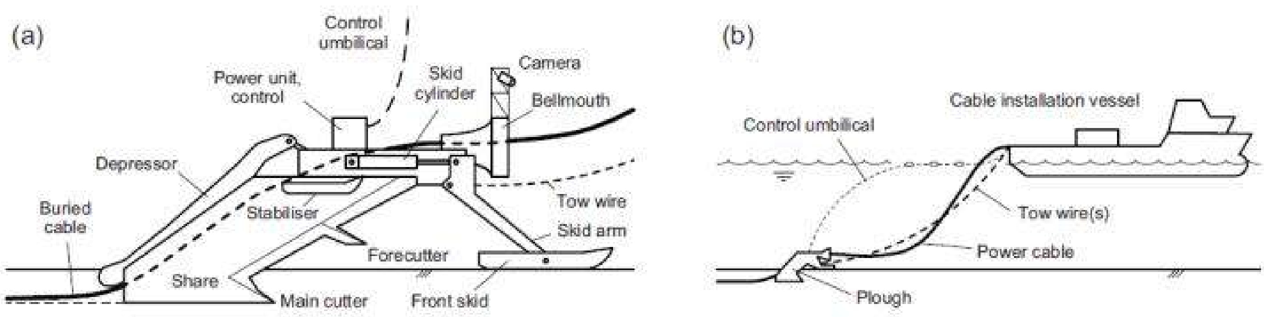


Figure 3- 2 – Subsea cable plough. (a) Principal components, (b) Simultaneous Lay and Bury operation

The jetting method fluidises the seabed soil by means of water jets installed on a special ROV and using the surrounding seawater as pumping medium. This method can only be used in soft or medium density seabed soil (Figure 3- 3).

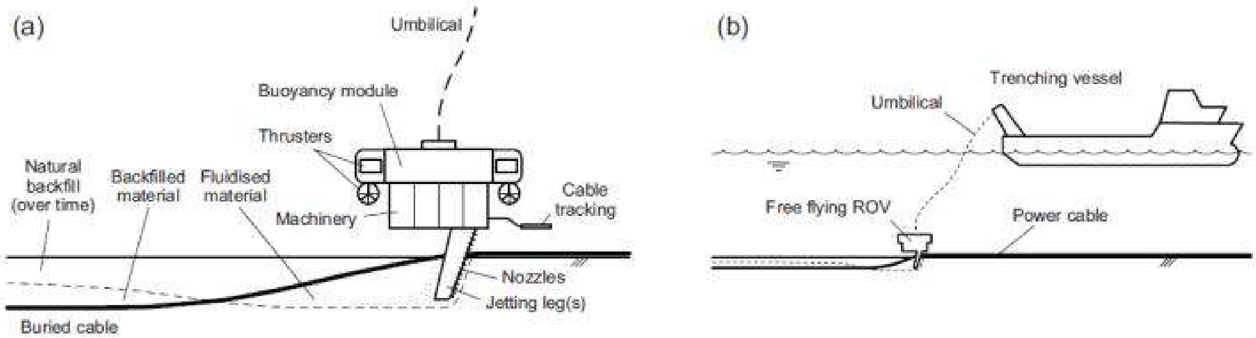


Figure 3- 3 – ROV jet trencher. (a) Principal components, (b) Post Lay Burial operation

Trenching machines have cutting tools (chains or wheels) to trench in much harder soils rather than water jets.

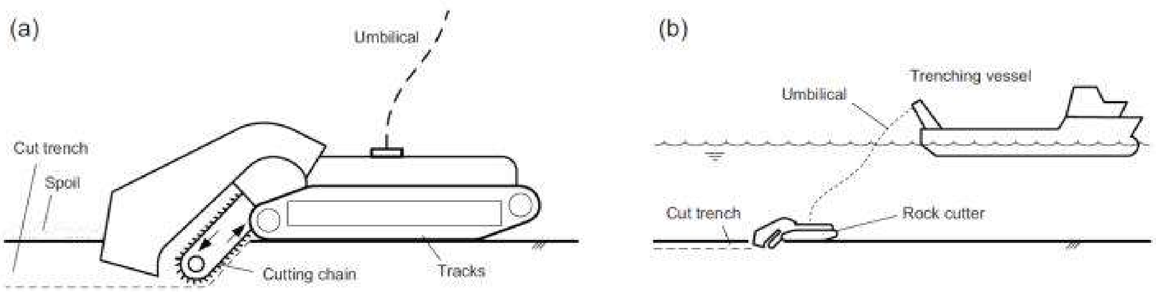


Figure 3- 4 – Trencher. (a) Principal components, (b) pre-lay rock cutting operation

The Contractor shall be responsible on issuing cable laying and protection procedures tailored to the configuration of each of the three systems to be installed, taking into account the cable spec's, the marine and environmental conditions on site, the local anthropogenetic activities (fishing and shipping) and the choice of the vessel(s) to be used.

Cable-lay vessel requirements

The proposed laying vessel shall guarantee endurance compatible with laying duration of working days at sea on 24h/day basis, be appropriate to the scale and requirements of the SOW and be fully certified as being safe and seaworthy for the required operations in the designated areas. The Vessel must carry life-saving appliances and standard personal protective equipment for everyone on board.

The main cable laying vessel shall have, as a minimum, the following characteristics:

- DP 2 class notation (e.g.: ABS DPS-2) or higher with interface to the DGPS geo-referencing system.
- Adequate cable tanks / turntables and cable loading capacity to stow the cable to be laid.
- A capstan system equipped with fleeting knives with diameter compatible with cable minimum bending radius and/or a linear cable engine (LCE's) with adequate braking capability to endure the expected cable laying tensions. The laying equipment shall be interfaced with lay control system and being able to pick-up/pay-out the cable for cable retrieval/lay.
- Two over boarding independent chutes with a diameter compatible with cable minimum bending radius. A system to accurately measure the over boarding angle at chute of the cable shall be present.
- ROV with USBL underwater positioning system for cable touchdown monitoring during the cable lay. ROV shall be a work class with depth rating at least of 1000m.
- A lay control system interfaced with dynamometers, sensors, vessel navigation and ROV positioning.
- A specific software for monitoring and control the laying speed and residual tension to be applied to the cable during lay (e.g.: Makai Lay).
- An adequate dry and temperature controlled jointing space to make field/repair joints if necessary.

The vessel shall be capable to accommodate for working, other than the operators and, at least, two Client Representatives.

In the sections of the routes in shallow to very shallow waters if the cable pull-in could not be practicable, it could be necessary the use of a cable lay barge with minimum draught.

In case the barges are not self-propelled, but the use of anchors or spud poles is foreseen, Contractor shall develop in due time the anchor/spud pattern to be put in place during the lay by means of a barge also exploiting the information coming from the marine survey results. The use of anchors or spud poles shall be in any case compatible with environmental restrictions.

The cable laying vessel shall meet the following main specifications:

- Length over all: 120-170 m
- Accommodation: around 100 persons
- Propulsion: Total Installed Power 10 to 20 MW
- 2/3 Offshore cranes
- Helicopter platform as an option
- Cable Lay Equipment: 1/2 basket carousels, 2 stern chutes, four track lay tensioners, tensioner deck seat

- Winch package
- Dynamic Positioning and Reference technologies
- Environment: Exhaust gas cleaning by SCR, engines approved according to Tier 3, sulphur free fuel, garbage recycling and sludge/garbage incinerator

Cable protection

Depending on anthropogenic and natural perturbations in the route area, the cables may need to be protected from damage caused by fishing gear or anchors, strong hydrodynamic forces or storms. When trenching is not possible, other methods exist for surface laid cables, such as rock-mattress covering, cable anchoring, ducting, cast-iron shells, concrete slabs, steel plates or dumped rocks. On uneven seafloors, the cable may form “free spans” along its route where it will hang without touching the seafloor. This may promote vibration, chafing, fatigue and, ultimately, cable failure. One solution is to fill the empty space between the cable and the seafloor with rock dumping or concrete bags. In addition to these different protection methods, authorities typically create a protected area encompassing the cable route, with prohibition of other human activities (fishing, anchoring, dredging, etc.) in order to protect the cable from damage.

Cable insulation will be XLPE, based on PE (polyethylene material) so no oil/liquid will be present in the cable.

According to the Consultant work methodology, Feasibility Studies (FS) and Environmental and Social Impact Assessment (ESIA) studies need to be synchronized so that the ESIA is informed by the technical analyses of the FS, and alternative analyses and technical findings/recommendations of the FS fully take into account E&S factors and findings of the ESIA. The ESIA and RPF processes will follow the scheme below in order to guarantee alignment with the engineering studies and mutual feedback system in the design phases.

3.1.2 Overhead Line

The design of structures required along an overhead line varies according to the voltage and can be dependent on the local environment in which it is located as a result of variable terrain, ground conditions, required clearance from other infrastructure and other constraints. For the HVTL, the height range of towers is generally between 20 m and 40 m depending on topography. The average span between towers is between 250/300 m for 132 kV and 350/400 m for 220 kV, depending on voltage and local topography. There are 4 concrete foundations installed per steel structure. The Right of Way can vary from 40 to 60 m depending on the voltage level and the Country legislations.

Transmission line construction, maintenance and decommissioning usually follow a standard sequence of activities:

- Preliminary procedures including verification that planning conditions have been satisfied; pre-construction site investigations including an access review and assessment of ground conditions; delineation of on-site working area;
- Establishment of temporary access routes and laydown/storage areas where necessary;
- Setting out of tower foundations or pole excavations;
- Installation of foundations as appropriate;
- Erection of towers or pole sets;
- Stringing of conductors and commissioning;
- Reinstate land; and

- Remove temporary access.

To minimise environmental disturbance, access to individual structure locations is generally along the local public road network, with subsequent works access to private land using existing farm entrances and tracks wherever possible. Access routes are typically marked or fenced on site to keep disturbance to a minimum. Specific planning conditions relating to access routes may also apply.

3.1.3 Terrestrial Underground Cable

For what concerns terrestrial underground cables, special High Voltage (HV) cables specifically designed for underground use are employed. The conductors in underground HV cables must be insulated to avoid a short circuit between the conductor and the ground around the cable. Cables are generally installed directly into the ground in an excavated trench. Typically, high voltage cable routes are located along public roads and open spaces. In some instances, a cable route may be required to cross private open ground or services. Transmission cable routes comprise sections of cable that are connected using cable joints. Cable joints are installed in joint bays which are typically concrete structures buried underground. Once installed, the road surface is reinstated. Where a cable route is in an open area, it is generally returned to agricultural/grassland use. Nevertheless, TANESCO and ZECO will forbid reinstatement of agricultural practice in the underground cable Right of Way. Where a cable passes through forested land the route is not replanted with trees to prevent any damage to the cable by tree root growth.

Cable laying depends on power transmission demand, in this project it is proposed a direct burial method which is shown typically in Figure 3- 5 for normal passing without any obstacles and in case of road crossing it is necessary to use protection as we are showing, as an example, in Figure 3- 6.

Direct laying of underground cables involves placing cables directly into a trench excavated in the ground. The process begins with digging a trench of appropriate depth and width, often with a bed of sand to cushion and protect the cable from damage. After the cable is laid, it's typically covered with another layer of soft material like sand or soil, followed by protective tiles or concrete slabs to prevent accidental damage during future excavation. The trench is then backfilled with earth, and markers are placed to indicate the presence of the cable. This method is simple, cost-effective, and suitable for rural or suburban areas with minimal construction or excavation activities.

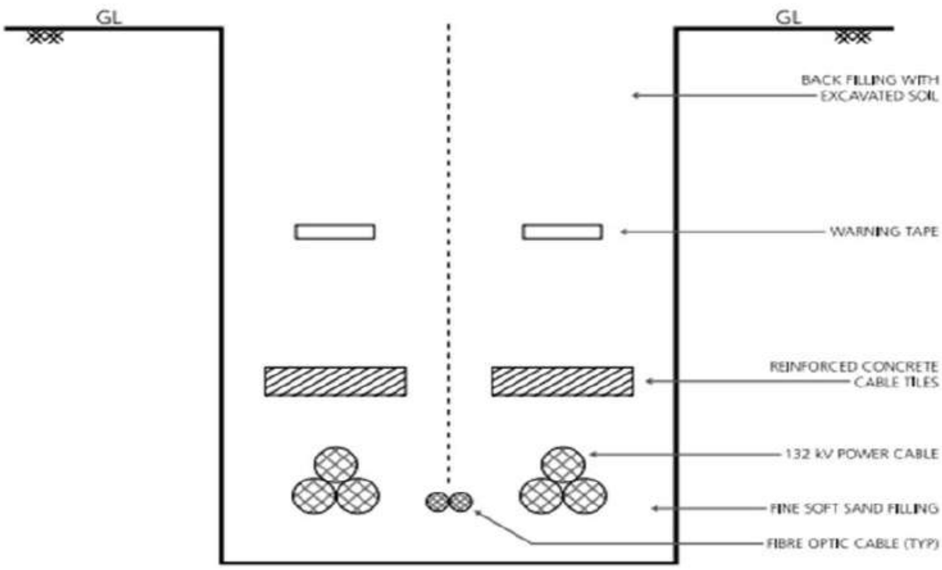


Figure 3- 5 – Cable laying method directly buried 132 kV Power / Pilot / F.O. Cable (extracted from Transmission Line - Interim Report)

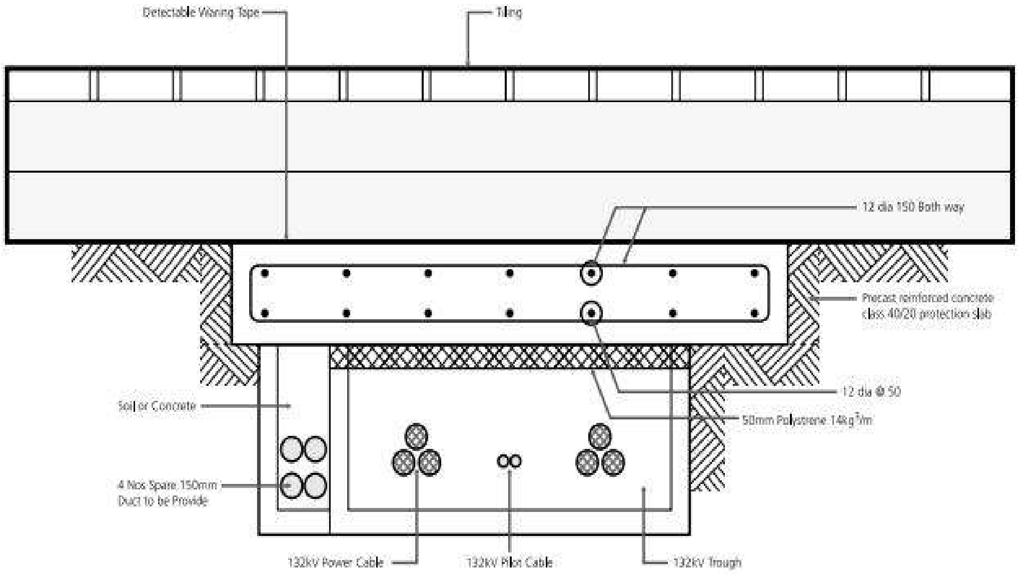


Figure 3- 6 – Protection slab details for road construction on top of the 132 kV Trough/Cable (extracted from Transmission Line - Interim Report)

The right of way of underground cable is completely different comparing to OHL, the permanent right of way may be approx. 1 m across, though temporary easements are needed for construction and to access splice vaults for maintenance. Routing should consider stakeholder impact, future construction plans along the line and accessibility, in Figure 3- 7 a typical right of way during construction of UCL in a city.

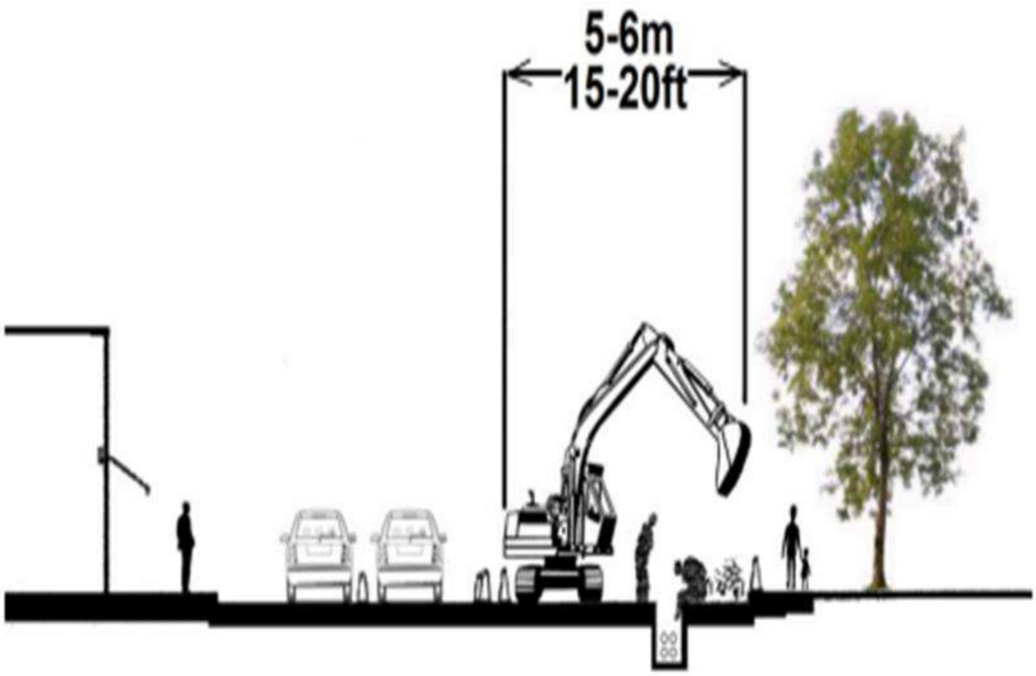


Figure 3- 7 – Cable route Right of Way during construction in a city street (extracted from Transmission Line - Interim Report)

3.1.4 Construction materials

The following main construction materials will be used during construction of the interconnection cables and substations:

- Concrete (cement, sand, aggregates, water)
- Steel bars for concrete reinforcement
- Formworks for concrete casting
- Submarine cable
- Underground cable
- Optical cables
- Carpentry
- Substation equipment (insulators, transformers, switchgears, etc.)

Other materials that will be used for construction purposes include fuel for vehicles and machinery and power from local power supply and/or diesel generators.

The following table presents an estimate of the main construction materials.

Table 3- 2 – Estimation of the main construction materials

Material	Quantity
Concrete (cement, sand, aggregates)	1,200 - 2,800 m^3
Steel bars for concrete reinforcement	100 - 350 tons
Formworks for concrete casting	5,000 - 10,000 m^2
Submarine cable	1,380 - 2,760 tons
Underground cable	85 - 170 tons
Optical cables	17 - 34 tons
Carpentry	5 - 10 tons
Substation equipment	50 - 100 tons
Fuel for vehicles and machinery	80,000 - 150,000 liters

3.1.5 Waste

Activities during the construction phase of the project that will generate waste include earthworks, removal of existing road pavements, vegetation clearing, conduit installation, joint bay construction, cable pulling and jointing, vehicle and plant wash-down, maintenance of equipment, substation upgrading, stormwater and groundwater dewatering, and operation of on-site offices.

The types of waste generated during construction can be broadly categorized into demolition waste (resulting from the removal of existing infrastructure) and construction waste (resulting from the use of new materials). These include:

- Demolition Waste: Excavated soil, removed road pavements, cleared vegetation, damaged steel bars, old conductors, and worn-out substation components.
- Construction Waste: Packaging materials, broken conductors, unused steel bars, concrete residues, scrap metal and wood, expired batteries, and domestic waste (e.g., food remains).

Air emissions, such as dust and exhaust gases from vehicles and fossil fuel-powered equipment, will also occur, primarily during the construction phase.

During the operation phase, waste generation will primarily involve domestic waste at substations, worn-out parts, broken insulators, backup batteries, and used oils from maintenance activities.

Where feasible, waste will be reused or recycled. Waste requiring disposal includes:

- Bitumen, concrete and asphalt because of removal of existing hard surfaces;
- Excavated earth material that is unsuitable for re-use;
- Waste water, oils, liquids and fuels from maintenance of construction plant and equipment;
- Wastes from site compounds (including sewage waste, putrescible waste, etc.);
- Building waste (packaging material, scrap metal, plastic wrapping, cardboard);
- Excess building materials that cannot be reused.

The table below presents an estimate of waste expected during construction. The estimation is based on typical projects of this nature and reflect an overall estimate. Actual waste quantities may vary based on project-specific practices and waste management strategies.

Table 3- 3 – Summary of estimated waste

Category	**Estimated Waste**
Concrete	100 - 190 m^3
- Cement	30 - 76 tons
- Sand	60 - 135 tons
- Aggregates	120 - 265 tons
Steel Bars (Reinforcement)	8 - 18 tons
Formwork for Concrete Casting	350 - 700 m^2
Submarine Cable	69 - 138 tons
Underground Cable	8.5 - 17 tons
Optical Cables	0.4 - 0.9 tons
Carpentry Materials	0.3 - 0.6 tons
Substation Equipment	4 - 8 tons

Fuel for Vehicles/Machinery	5,000 - 8,500 liters

Note: The estimates include a combination of demolition waste (e.g., from dismantling existing infrastructure) and fresh waste from construction activities.

All waste types have been considered in the impact assessment, and appropriate measures for their management, including recycling, reuse, and disposal, have been outlined in the respective sections of this report.

3.1.6 Ancillary services and facilities

Location of the facilities (campsites, machinery yard, site office, storage areas) will be determined in the vicinity of the internal roads that are used to carry the equipment. Provisions from the internal roads into the gravelled area of the switchyard for the equipment handling vehicles to access respective switchgear shall be provided. All service and access roads shall be of concrete pavement roads. Necessary street lighting and permanent drainage for the internal roads shall also be provided. All internal roads shall be of four (4) metres wide except for all internal roads for carrying power transformers, shunt reactors, neutral grounding reactors and station transformers. Also, all internal roads for carrying power transformers, shunt reactors, neutral grounding reactors and station transformers shall be minimum six (6) metres wide.

It is important to note that specific details regarding the source and types of construction materials, as well as the precise number, location, and design of campsites, have not been determined at this stage of the project. These elements will be defined and specified by the successful contractor during the project's design and development phase. The project will utilize existing roads as much as possible for access, minimizing the need for new road construction.

Site specific ESMP for these facilities will be prepared by Contractor. TANESCO or the consultant will prepare an impact assessment accordingly, after Contract award and before mobilization.

3.1.7 Operational and maintenance activities

The line route for a transmission line was chosen that it can ensure safety, quick maintenance and easy access during construction.

3.1.7.1 Submarine Cable

Preventative routine

During operation, inspections using tools like sub-bottom profilers and side-scan sonars are necessary to ensure accurate data collection and analysis.

Cable Faults

Cable faults are caused by many events, both man-made and natural. In water depths less than 200 metres, faults are nearly always caused by man-made activities such as fishing and anchoring.

When a cable requires repair, a cableship is mobilized from one of its global standby locations. Cable systems are constantly monitored, and when a fault is detected, staff at the cable stations begin tests to locate the problem. The fault location is then passed to the cableship, which loads spare cable and equipment before sailing to the site.

Upon arrival, the cableship uses a grapnel to recover the cable from the seabed, cutting it in the process. In buried sections, a ROV may assist. The ship retrieves both ends of the cut cable, tests them, removes damaged sections, and seals the cable. A spare cable section is joined to replace the damaged part, and the final splice connects the two ends. The repaired cable is then tested and lowered back to the seabed. If the cable was buried, a ROV reburies it to the original depth.

The final splice, where the cable is joined, can be hazardous to fishing gear due to its shape and position on the seabed. Since the burial of the final splice is not always fully effective, avoiding these areas is recommended.

3.1.7.2 Underground Cable

Underground high-voltage preventative cable maintenance includes the following activities:

- Inspecting ground connections, cable joints, and splices to verify their integrity and condition.
- Checking switchgears, transformers, and other above-ground equipment for cleanliness and physical condition.
- Removing dust and debris from the outer surfaces of termination joints.
- Conducting tests such as contact resistance on terminations and insulation resistance between ground connections and conductors to detect any developing damage in the system.
- Using infrared thermal scanning to identify defective electrical contacts and joints. Joints showing elevated temperatures must be cleaned, re-torqued, and re-tested.

Corrective maintenance is performed in response to faults such as damage from excavation, internal wire damage, overloading, or poor installation. This includes:

- Inspecting electric cable routes for defects after excavation activities.
- Performing insulation resistance tests to identify faults between conductors and ground connections.
- Locating faulty sections using a sheath tester and cable fault locator.
- Repairing damaged cables, followed by re-testing and re-commissioning.

3.1.8 Labor requirements

The construction phase of the project will require a significant workforce to support both land-based and sea-based activities. It is estimated that approximately 100 personnel will be engaged in sea-based operations, primarily working on ships for tasks such as submarine cable laying, marine surveys, and related logistics. On land, another 100 workers will be involved in activities such as earthworks, trenching, conduit installation, cable jointing, substation upgrades, and equipment maintenance. The labor force will comprise skilled, semi-skilled, and unskilled workers, including technicians, engineers, operators, and support staff. Recruitment will prioritize local communities where feasible, with specialized roles filled by external personnel as needed.

The Project will ensure compliance with labor laws and standards, including provisions for safe working conditions, fair wages, and adequate facilities for the workforce.

3.1.9 Project schedule

The following figure shows the possible schedule of the project for implementation.

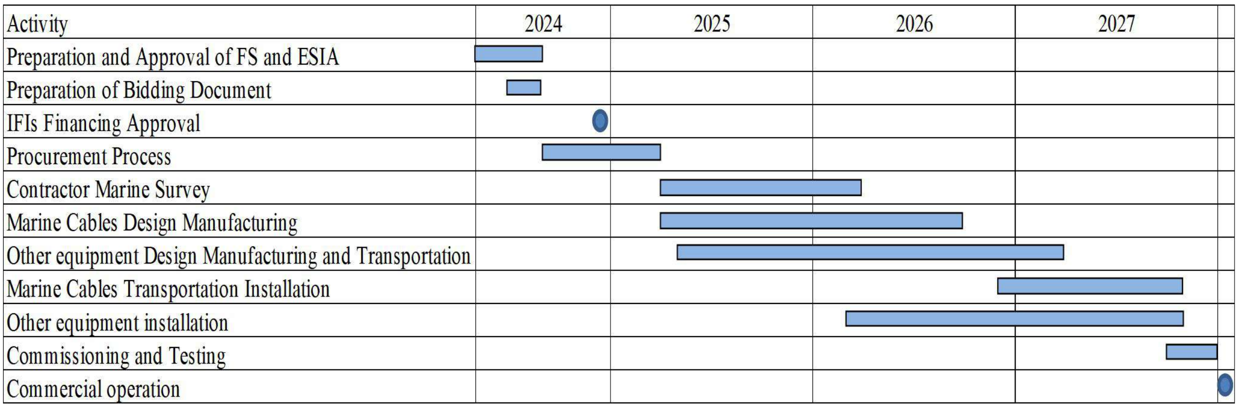


Figure 3- 8 – Project Schedule

4 ANALYSIS OF ALTERNATIVES

4.1 “No-go” Alternative

This option involves no change in the existing situation. It would imply continue reliability on the existing submarine interconnection to meet existing and future demand in Zanzibar. This option was rejected for the following reasons:

- The existing 33 kV interconnection system for Pemba Island is deemed insufficient to meet the increasing electricity demand, associated to the rapid expansion of social and economic activities;
- Necessity to implement long-term, reliable and quality power supply to the island, in order to sustain and promote its economic development;
- Necessity to upgrade the existing electrical systems, including substation, protection and control systems, adapting to the standard IEC 61850.

4.2 Alternatives sources of energy considered during construction

During construction, energy demands are high, particularly for powering construction machinery, vessels, and auxiliary systems. Two alternative sources have been considered:

- Diesel generators: Diesel-powered generators are considered the best option for providing reliable and high-output energy at remote construction sites. Diesel fuel is widely available and can easily support the operation of heavy construction equipment. Despite being non-renewable, it was chosen due to the project's need for uninterrupted power supply and cost efficiency in this context.

- Renewable energy sources: Renewable energy options such as solar and wind power were considered but rejected due to limitations in providing consistent energy supply. Solar power, though clean and sustainable, was not feasible for heavy industrial use, especially on offshore platforms and vessels where installation space is limited. Wind power was similarly deemed impractical for construction equipment and vessel operations due to intermittent supply and higher initial costs.

4.3 Alternative sources of water considered during construction

Water is essential for various construction activities, including dust suppression, concrete mixing, and workforce needs. Three alternative sources have been considered:

- Local water supply: The Contractor shall utilize the local municipal water supply where available. This source should be chosen for its reliability and ease of access, especially in coastal areas near substations or landfalls where infrastructure is already established.

- Desalination of seawater: Desalination plants were considered as an alternative in areas near the coast or offshore. However, this option was rejected due to the high energy demand, equipment costs, and time required to set up temporary desalination facilities. The desalination process was also deemed unnecessary when other sources of water were readily available.

- Imported water: Transporting water from distant sources is the less recommended due to logistical challenges and high costs associated with transportation. Moreover, it presented a significant carbon footprint, conflicting with environmental sustainability goals.

4.4 Alternative materials and equipment considered during construction

The choice of materials and equipment significantly impacts the project's environmental footprint and construction efficiency; therefore, several options have been evaluated.

- Standardized submarine cable materials: Proven, industry-standard materials such as copper or aluminum core submarine cables with robust insulation layers were preferred due to their reliability, durability, and ability to withstand harsh marine environments. These materials ensure long-term performance and minimize maintenance, making this the preferred option.
- Innovative lightweight cable designs: Newer, lightweight materials were considered but ultimately rejected due to insufficient testing for large-scale projects in marine environments. These materials, while offering reduced weight and installation costs, lacked the long-term reliability and resistance to corrosion required for underwater installations.
- Conventional construction equipment: Standard heavy construction equipment like trenchers, plows, and remotely operated vehicles (ROVs) were chosen for their proven efficiency in underwater and land-based excavation. Their availability and suitability for tough seabed conditions made them the preferred option.
- Electric or hybrid construction equipment: Electric or hybrid-powered construction equipment was considered for reducing emissions, but the technology was deemed insufficient to meet the heavy demands of this large-scale project. Their range and energy supply needs were found impractical, particularly for offshore operations.

4.5 Alternative technologies considered during construction

Different technological approaches to cable laying, trenching, and installation of substations were evaluated to enhance project efficiency and minimize environmental impacts.

- ROV-Assisted cable installation: The use of remotely operated vehicles (ROVs) for precision in cable placement and trenching along the seafloor was preferred for its accuracy and ability to reduce environmental disturbances. ROVs are particularly useful in sensitive marine environments and can work in challenging conditions, making this the preferred option.
- Manual cable placement and trenching: Manual or less automated cable placement technologies were rejected due to their increased risk of human error, inefficiency, and higher environmental impact. Additionally, manual methods would have extended the project timeline significantly.
- Horizontal Directional Drilling (HDD): While HDD was considered for the landing of subsea cables, it was ultimately rejected in favor of direct trenching due to site-specific soil conditions and cost implications. HDD also required more extensive equipment and had a higher risk of drilling fluid leaks. However, HDD has been specifically suggested as an alternative for the underground cable works to reduce the need for extensive trenching and minimize environmental disruption.

4.6 Environmental and Social Ranking Methodology

The environmental and social ranking methodology is based on standard literature indications on this topic (PADC Environmental Impact Assessment and Planning Unit). Table 4- 1 defines the existing environmental and social conditions which might be affected by actions. In the present analysis, 3 main environmental and social factors (landscape, biodiversity, socio-economic environment) and 2 actions (construction and operation of the interconnection projects) which might impact certain factors have been identified. It is underlined the present analysis considers only the environmental and social factors and impacting actions that are expected to distinguish the different alternatives.

Table 4- 1 – Environmental and social factors

LANDSCAPE	Alteration of natural landscape
BIODIVERSITY	Terrestrial habitat
	Marine and coastal habitat
	Protected areas
SOCIO-ECONOMIC ENVIRONMENT	Physical displacement
	Economic displacement

The environmental and social impact evaluation is carried out analyzing separately the Tanzania mainland and the island portion of the interconnection project. The analysis takes into account the marine part (terminal section of submarine cables close to the shoreline), the landing points and the terrestrial electric lines connecting to substations. For the terrestrial part, both underground cable (UGC) and overhead line (OHL) solution is analyzed, where feasible. In some cases, UGC is considered the sole alternative.

The matrix resulting from the combination of the environmental and social factors and the impacting actions is called “Matrix of Identification of Impacts”. The following is the matrix of identification of impacts for an alternative, in which positive, negative or negligible impacts have been defined.

Table 4- 2 – Matrix of Identification of Impacts for an Alternative, considering the underground cable solution

Pemba Island portion - Underground cable & Landing point

		IMPACTING ACTIONS	
		1	2
E&S FACTORS	**IMPACT**	**Construction - Underground cable at EXISTING Landing point**	**Operation - Underground cable at EXISTING Landing point**
LANDSCAPE	Alteration of natural landscape	-	-
BIODIVERSITY	Terrestrial habitat	X	-
	Marine and coastal habitat	X	X
	Protected areas	X	X
SOCIO-ECONOMIC	Physical displacement	-	-
	Economic displacement	-	-

Table 4- 3 – Matrix of Identification of Impacts for an Alternative, considering the overhead line solution

Pemba Island portion - Overhead line & Landing point

E&S FACTORS	IMPACT	IMPACTING ACTIONS	
		1	2
		Construction - Overhead line at EXISTING Landing point	Operation - Overhead line at EXISTING Landing point
LANDSCAPE	Alteration of natural landscape	-	X
BIODIVERSITY	Terrestrial habitat	X	X
	Marine and coastal habitat	X	X
	Protected areas	X	X
SOCIO-ECONOMIC	Physical displacement	X	-
	Economic displacement	X	-

4.6.1 *Description of Environmental and Social Factors*

The list of the environmental and social factors which could be impacted during the different project phases is given below. It is underlined that environmental and social factors which are deemed equivalent for all the transmission line routes (e.g. air quality, soil, noise, vulnerable groups, employment, etc.) are not taken into account in the present alternative analysis. Instead, a more detailed and complete set of environmental and social impacts will be considered in the subsequent impact assessment on the selected project alternative.

LANDSCAPE

Alteration of natural landscape: The overhead transmission lines would be highly visible in natural landscapes. The artificial appearance of a transmission line may have visually intrusion associations for some, particularly in a predominantly natural landscape. Generally, transmission lines and new roads are more easily accepted when they are situated close to existing roads. Visual evidence of these projects cannot be completely avoided, reduced, or concealed. The impact is considered absent or negligible in case of underground cables.

BIODIVERSITY

Terrestrial habitat: The construction of the transmission line will involve vegetation clearance in the Right of Way/Wayleave, resulting in habitat loss or habitat fragmentation for wildlife. However, the line corridor is small in comparison to the entire habitat size and therefore no considerable loss is anticipated.

The RoW will be managed by periodic vegetation clearance during operation of an overhead line. However, vegetation will generally be allowed to grow under the overhead line up to a height of about 2-3 m. Permanent vegetation loss will hence be restricted to the immediate areas surrounding the tower foundations and the access roads.

The line is not likely to permanently displace birds and animals from their native habitats since they can easily relocate to adjacent undisturbed areas, even if some microhabitat for specific animals, such as amphibians, could be destroyed (e.g. wetlands).
In case of underground cable, the impact is limited and the right of way is reduced in comparison to an overhead line.

Marine and coastal habitat: The laying of cables leads to seabed disturbance and associated impacts of damage, displacement or disturbance of flora and fauna, increased turbidity, possible release of contaminants and alteration of sediments.
These effects are mainly restricted to the installation, repair works and/or removal phase and are generally temporary. In addition, their spatial extent is limited to the cable corridor (in the order of 5 m width if the cable has been ploughed into the seabed). Some mobile benthos is able to avoid disturbance, though sessile species (bivalves, tubeworms, etc.) will be impacted.
The main threat will be from suspended matter from the trenching operations which could negatively impact active coral reefs.

Protected areas: The potential presence of protected areas impacted by the project footprint represents an additional risk to be evaluated in the analysis. The impacts on habitats with high biodiversity value, of significant importance or unique ecosystems (e.g. marine parks, forest reserves, natural parks, wetlands, etc.), which deserves particular attention, have to be considered.

SOCIO-ECONOMIC ENVIRONMENT

Physical displacement (Loss of residential land / relocation of inhabitants): The project will lead to land acquisition for transmission line right of way, causing permanent loss of land ownership for a number of families, clans and ethnic communities. A number of houses, secondary structures and community buildings that are located within the RoW will be demolished or moved. Upgrading of new and existing roads may also cause some displacements. This impact shall be mitigated by adequate compensation of the property losses.
Economic displacement (Loss of agricultural, grazing and commercial land): Land is an important asset and the majority of the people rely on land-based livelihoods. The project construction activities may cause losses in agricultural/grazing/commercial land. This impact shall be mitigated by adequate compensation of the property losses.

4.6.2 Definition of the Importance of the Impacts

The *importance* of the impact on an environmental and social factor is calculated using defined attributes: sign, magnitude, spatial extension, duration, reversibility and frequency.

The mentioned attributes are defined as follows:

- Sign: this attribute defines nature of the impact (beneficial or harmful).
- Magnitude: this attribute defines magnitude of the incidence of the impacting action on the considered environmental or social actor. Its intensity is classified as low, medium, high.
- Sensitivity: The sensitivity of an environmental or social component is evaluated on the basis of the presence/absence of some features which define both the current degree of the environmental or socio-economic quality and the susceptibility to environmental or social changes of the component. The sensitivity is classified as low, medium, high.
- Reversibility: this attribute refers to the possibility of restoring the affected factor and, if possible, the time lap necessary for the restoration. The reversibility is classified as short term, medium term and irreversibility.

The *importance* of an impact is calculated, per each action impacting an environmental and social factor, with the following equation:

$$I_{ij} = Si \cdot (MA_{ij} + SE_{ij} + RE_{ij})$$

The scores are given as indicated in Table 4- 4.

Table 4- 4 – Attributes for the definition of the importance of an impact, with related scores

Attributes	Description		Score
Sign (Si)	+	Positive	+1
	-	Negative	-1
Magnitude (MA)	L	Low	1
	M	Medium	2
	H	High	6
Sensitivity (SE)	L	Low	1
	M	Medium	2
	H	High	6
Reversibility (RE)	S	Short Term	1
	M	Long Term	2
	I	Irreversible	6

The attributes for the definition of the *importance* of the impacts on environmental and social factors, as reported in Table 4- 5, were evaluated in relative terms among the different project Alternatives, according to the quantitative or qualitative estimation of the impact, according to the available data, documentation and calculations. Whenever the quantification of the impacts was deemed difficult, the impacts were evaluated according to the Consultant's judgement.

As an example, the following tables shows the definition of the importance of the impacting action "Construction" on the different environmental and social factors.

Table 4- 5 – Definition of the importance of the impacting action "Construction" on the different environmental and social factors for the overhead line solution on Pemba Island

Construction - Overhead line at EXISTING Landing point

Pemba Island portion - Overhead line & Landing point

			ATTRIBUTES				
	FACTOR	IMPACT	Sign	Magnitude	Sensitivity	Reversibility	IMPORTANCE
-	LANDSCAPE	Alteration of natural landscape					
-1	BIODIVERSITY	IMPACT	-	M	M	I	-10
-1		Alteration of natural landscape	-	H	H	L	-14
-1		Terrestrial habitat	-	H	H	L	-14
-1	SOCIO-ECONOMIC	Marine and coastal habitat	-	H	H	I	-18
-1		Protected areas	-	H	H	I	-18

4.6.3 Matrices of Importance

The matrix, which includes the importance of the impact of all the actions on the environmental and social factors, is called Matrix of Importance. This matrix of importance is built aggregating the vectors of importance (i.e. the last column of Table 4- 4) relevant to each considered impacting actions. Through this procedure, the matrix of identification of impacts is compiled with the importance values given to the E&S factors. Summing all the importance values on each row of the matrix of importance, the overall positive and negative scores of each environmental and social factor is computed.

4.7 Routing Alternatives

The selection of the optimal landing points and routes of submarine cable and terrestrial overhead transmission lines (OHTLs) or underground cables (UGCs) will be undertaken according to criteria that fulfils technical, environmental and socioeconomic objectives, in order to achieve the most feasible solution. The consultant visited the project areas in March 2024 and in April 2024 in order to assess the field conditions and identify possible alternatives.

It has been assumed, that the submarine cable's landing points and the interconnection transitions can be accommodated within the buffer zone (60 m from the high tide coast level). Hence the components that would trigger resettlement are the overhead transmission lines (OHTLs) or underground cables (UGCs) and the possible enlargement of existing access roads.

The description of the main components and alternative locations/routes of the interconnection project is described in the following paragraph.

The interconnection from Tanga to Pemba Island will be realized at 132 kV voltage level.

In Tanga, three different landing point locations have been analyzed and one was immediately discarded due to the presence of houses and graves in the proximity of the shore. The possible alternatives are therefore:

- landing point of the existing 33 kV interconnection in Mnyanjanito (indicated in Figure 4- 1 as Option 1)
- alternative landing point, located approx. 1.5 km northwards of the existing, in the proximity of a fishermen camp and market (indicated in Figure 4- 1 as Option 3 and illustrated in Figure 4- 2)

The landing point will be connected to the existing 132/33 kV Majani Mapana substation by means of an underground cable (UGC) or an overhead transmission line (OHTL). The 8 km long line route will follow as much as possible the existing 33 kV distribution line route and the existing ring road alignment. Since the 132 kV transmission line will pass through a densely populated area, the underground cable solution is deemed preferable and allows to avoid land acquisition and resettlement. The overhead line indeed, requires at least 27 m of right of way, severely impacting on housing.

Figure 4- 1 – Locations of possible landing points and existing substation in Tanga

Figure 4- 2 – Locations of existing landing point, transmission line route and existing substation in Tanga


Figure 4- 3 – Fishermen camp/market and intertidal dune at proposed landing point (Option 3) at Tanga

4.8 Results of the analysis of alternatives

The matrices of importance of the different project alternatives are provided in the following paragraphs. The negative impacts are highlighted in red while the positive impacts in green. Empty cells represent positive or negative impacts with little relevancy or no impact at all.

In Tanga, two possible submarine cable landing points are proposed:

- landing point of the existing 33 kV interconnection in Mnyanjanito (option 1)
- alternative landing point, located approx. 1.5 km northwards of the existing, in the proximity of a fishermen camp and market (option 3)

Moreover, two possible solutions are available for the 132 kV connection from the submarine cable landing point to the existing 132/33 kV Majani Mapana substation:

- underground cable (UGC)
- overhead transmission line (OHTL)

The 8 km long line route will follow as much as possible the existing 33 kV distribution line route and the existing ring road alignment.

If the 132 kV UGC can be accommodated within the existing road, the land acquisition should be limited to 500 m of UGC passage through cultivated areas.
Instead, the 132 kV OHTL solution will trigger extensive resettlement, since the ROW is 27 m and would exceed both the ROW of 33 kV distribution line and the ROW of the existing road.

Table 4- 6 – Matrix of importance for the submarine cable, landing points and underground cable in Tanga

Identification of Impacts
Tanzania mainland (Tanga) portion - Underground cable & Landing point

FACTOR	IMPACT	IMPACTING ACTIONS 1: Construction - Underground cable at EXISTING Landing point	2: Operation - Underground cable at EXISTING Landing point	3: Construction - Underground cable at ALTERNATIVE Landing point	4: Operation - Underground cable at ALTERNATIVE Landing point	Sum of Impacts: EXISTING Landing Point – Negative Impacts	ALTERNATIVE Landing Point – Negative Impacts
LANDSCAPE	Alteration of natural landscape					0	0
BIODIVERSITY	Terrestrial habitat					0	0
	Marine and coastal habitat	-10	-5	-6	-5	-15	-11
	Protected areas	-10	-5	-10	-5	-15	-15
SOCIO-ECONOMIC	Physical displacement					0	0
	Economic displacement			-13		0	-13
						-30	-39

Table 4- 7 – Matrix of importance for the submarine cable, landing points and overhead line in Tanga

Identification of Impacts
Tanzania Mainland (Tanga) portion - Overhead line & Landing point

FACTOR	IMPACT	IMPACTING ACTIONS 1: Construction - Overhead line at EXISTING Landing point	2: Operation - Overhead line at EXISTING Landing point	3: Construction - Overhead line at ALTERNATIVE Landing point (fish market)	4: Operation - Overhead line at ALTERNATIVE Landing point (fish market)	Sum of Impacts: EXISTING Landing Point – Negative Impacts	ALTERNATIVE Landing Point – Negative Impacts
LANDSCAPE	Alteration of natural landscape		-9		-9	-9	-9
BIODIVERSITY	Terrestrial habitat	-4	-8	-4	-8	-12	-12
	Marine and coastal habitat	-10	-5	-6	-5	-15	-11
	Protected areas	-10	-5	-10	-5	-15	-15
SOCIO-ECONOMIC	Physical displacement	-18		-18		-18	-18
	Economic displacement	-18		-18		-18	-18
						-87	-83

Since the 132 kV transmission line will pass through a densely populated area, the underground cable solution is selected as preferable and allows to avoid extensive land acquisition and resettlement.

Both considered landing points are within the Tanga Coelacanth Marine Park; moreover, the existing landing point is located in front of an area marked for coral reefs, whose beach is dense with mangroves and very popular with fishermen.
Even if the existing landing point encompass slightly higher environmental impacts, it represents the preferred option, because the alternative landing point would create social issues due to the presence of a fishermen camp made of semi-permanent structures.

5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This policy framework provides guidelines for environmental management within the sector, outlining areas of focus. The legal and regulatory framework is crucial in providing mandates, assigning responsibilities and enforcing environmental procedures and standards. Finally, the institutional framework is essential for formulating policies, guidelines, and plans, ensuring compliance with laws and regulations, and overseeing the monitoring, evaluation, and adjustment of policies, plans, and regulations to address changing needs and challenges.

This section, focusing primarily on project relevant environmental and social aspects of Tanzania, includes:

- the legislative, policy, regulatory and institutional framework;
- international conventions and agreements that Tanzania government has signed, acceded or ratified;
- institutional arrangements;
- permitting requirements.

5.1 National regulations

The following subsections summarize the key legislation that is or may be, relevant to the project. The legislation considered to have the greatest relevance to the project is presented first.

5.1.1 The Constitution of Tanzania 1977-1995

The Constitution of the United Republic of Tanzania (1977 – 1995, Revised 1997) affirms the fundamental rights of its citizens. This includes the protection of life by society under the law. Article 24 specifically guarantees the right to property ownership and its protection under lawful circumstances. However, it acknowledges certain limitations pertaining to the enforcement and preservation of these rights, freedoms, and duties.

Article 30(2) of the Constitution highlights the need to balance individual rights with societal interests, especially in matters related to defense, public safety, order, morality, and health. It also emphasizes the importance of rural and urban development, as well as the promotion of public benefit through property and interest enhancement.

5.1.2 Environmental Management Act, 2004

The Environmental Management Act (EMA) Cap.191 (URT, 2004) includes measures to ensure sustainable environmental management, pollution prevention and control, and effective waste management. It also outlines mechanisms for ensuring compliance with environmental regulations.

In Part II Section 7(2) of the Act highlights its role as a legal framework for coordinating activities, resolving conflicts, and integrating them into a cohesive environmental management system.

It provides crucial technical support to sector ministries and is aligned with the fundamental rights enshrined in the Constitution of Tanzania, which underscores Tanzanians' entitlement to a clean, safe, and healthy environment. Part II, Section 4(1) and (2) of the Act emphasizes the right of individuals to access areas for recreational, educational, health, spiritual, cultural, and economic purposes.

Part VI of the Act mandates developers to conduct Environmental Impact Assessments (EIA) at their own expense before initiating any projects. The Third Schedule of the Act specifies the types of projects that require EIA. In addition, the EMA requires an Environmental Impact Assessment (EIA) Certificate from the Minister responsible for Environment before any development can begin.

The National Environment Management Council (NEMC) is responsible for ensuring that EIA requirements are met under the Act. NEMC reviews EIA reports and provides recommendations to the Minister responsible for Environment for certificate issuance. NEMC ensures that an EIA/ESIA report meets the required standards before forwarding it to the Minister for Certification.

Relevance to the project: The project is subject to regulations requiring an EIA. The Area of Interest identified under these regulations may include sensitive areas.

5.1.2.1 Hazardous Waste Management Guidelines

The Hazardous Waste Management Guidelines, established under the Environmental Management Act, provide a framework for the safe management of hazardous waste in Tanzania. These guidelines outline the responsibilities of waste generators, transporters, and disposal facilities to ensure the proper handling, storage, treatment, and disposal of hazardous materials. The guidelines aim to protect human health and the environment from the adverse effects of hazardous waste, emphasizing waste minimization, recycling, and safe disposal practices.

Relevance to the project: The Hazardous Waste Management Guidelines regulate the handling of hazardous materials during the project, including waste from cable installation, maintenance, and decommissioning. Adherence ensures environmentally safe waste management, minimizing risks to marine life and communities.

5.1.3 Environmental Impact Assessment and Audit Regulations, 2005. Amended in 2018

The Environmental Management Act makes it illegal to start, finance, approve, or license any projects listed in the regulations without the developer first submitting an application for an Environmental Impact Assessment (EIA) certificate to the relevant licensing or permitting authority, in the form of a project brief.

The Act outlines the entire EIA process, including registration, screening, assessment, review, and approval, as detailed in Section 4.3.1. In addition, the Act contains provisions for conducting environmental audits and monitoring to ensure continuous compliance with environmental standards.

Relevance to the project: The project requires an Environmental Impact Assessment (EIA) in accordance with the Environmental Impact Assessment and Audit Regulations of 2005, as amended in 2018, and the Environmental Management Act (EMA).

5.1.4 Marine Parks and Reserves Act No. 29, 1994

The Marine Parks and Reserves Unit (MPRU) is established by the Act to oversee the process of declaring marine parks and reserves. The Act prohibits certain activities, including construction, within these areas without authorization (Section 13). Furthermore, it an EIA for any activities taking place within marine parks or reserves (Section 13). In addition, it is necessary to inform the Warden or Unit Manager of any proposed land allocation or new use within a buffer zone and to conduct an Environmental Impact Assessment (EIA) for the proposed activity (Section 16).

Relevance to the project: The project's area of influence is primarily marine. This may include marine parks and reserves, which will be assessed in accordance with the Act.

5.1.5 Water Resources Management Act, 2009

The Water Resources Management Act, 2009 of Tanzania is a legislation aimed at effectively managing the country's water resources.

The Act primarily focuses on inland water resources such as rivers, lakes, groundwater, and wetlands. However, it includes provisions related to coastal water management, especially concerning issues such as pollution prevention, conservation of marine ecosystems, and sustainable use of coastal resources. When the Act mentions "water source" it refers to sea water as well, so part of the law intends to protect coastal areas from any kind of pollution.

Relevance to the project: The project may discharge effluents. The submarine cables will cross sea waters

5.1.6 Fisheries Act, No. 22, 2003

The Act serves as a comprehensive legal framework for the management, conservation, and regulation of fisheries and related activities.

Section 16 of the Act mandates the Director of Fisheries to hold discussions with neighboring riparian states to ensure their commitment to safeguarding transboundary aquatic ecosystems from any effluents that could potentially impact them.

Relevance to the project: The submarine cables will pass through sea waters that are used for fishing activities.

5.1.7 Tanzania Wildlife Management Authority Act, 2013

The Act establishes the Tanzania Wildlife Management Authority (TAWA) to autonomously oversee the protection, management, and administration of wildlife resources beyond national parks and the Ngorongoro Conservation Area. The Act allows for the creation of various reserves and areas, such as game reserves, wetland reserves (including marine water), and wildlife corridors. It also sets guidelines for hunting management, including the issuance of hunting licenses. In addition, the Act enforces regulations from the United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which includes the licensing procedures for importing and exporting endangered species.

Relevance to the project: The project will pass through sea waters considered a wildlife resource to be administrated and protected

5.1.8 Land Act No. 4, 1999 amended by the Land (Amendment) Act, 2004

The Land Act covers land administration, including local government roles, land allocation, and occupation. It establishes principles of land policy, emphasizing productive land use and sustainable development.

The Act also addresses compensation requirements and defines land occupancy rights, particularly for organizations or non-citizens seeking investment opportunities under the Tanzania Investment Act (1997). The Act includes provisions for reserved land, which is designated for purposes such as forests, national parks, and public utilities.

It also identifies hazardous land areas that pose risks to life or environmental degradation, such as mangrove swamps, coral reefs, wetlands, areas near water bodies, steep slopes, and ecologically fragile areas. The Act provides measures for the protection of hazardous land.

Relevance to the project: The project will lease/buy the land within its footprint from the Government of Tanzania

5.1.9 Land Acquisition Act No. 47, 1967

The Act empowers the president to obtain land for public use, setting out the circumstances in which public interest can be invoked. It also covers land acquisition for right-of-way purposes and resettlement sites. Before acquiring land, the Act requires investigations to be carried out, notices of intention to acquire land to be issued, and compensation criteria and limitations to be specified.

Relevance to the project: The project will lease/buy the land within its footprint.

5.1.10 Road Act, 2007

The Roads Act No. 13 of 2007 is a comprehensive piece of legislation in Tanzania that governs various aspects of road development, maintenance, and related activities. It also includes provisions for the acquisition of land and properties necessary for road projects. The Act establishes TANROADS as the main body responsible for the management, development, and maintenance of the national road network. Local roads are managed by respective local government authorities under the guidance and supervision of TANROADS. The Roads Act No. 13 of 2007 establishes a clear legal framework for the management of road reserves in Tanzania. By defining the designation, usage restrictions, enforcement, and compensation related to road reserves, the Act aims to ensure that these areas are preserved for their intended purposes.

Relevance to the project: The project will use the road reserve to accommodate the underground cables.

5.1.11 Forest Act, 2002

The purpose of the Act is to encourage the responsible management, sustainable development, and conservation of Tanzania's forest resources. It includes measures for managing and overseeing these resources, such as creating forest reserves, regulating trade, implementing conservation strategies, and establishing permitting and licensing procedures. Forest reserves include national forest reserves (known as catchment forests), district forest reserves, village forest reserves and mangrove areas.

Relevance to the project: During construction or operational activities, the developer must ensure full protection and conservation of forested coastal areas, such as mangroves forests.

5.1.12 Antiquities Act, No. 10, 1964, (amended by Act No. 22 of 1979)

The Act provides extensive protection for objects or structures of archaeological, paleontological, historical, architectural, artistic, ethnological, or scientific significance. It enables the identification of conservation areas and outlines procedures for reporting discoveries of relics, monuments, or other significant objects or sites. Additionally, Section 11 prohibits excavation, collection, or removal of relics without a proper license.

Relevance to the project: Cultural heritage may be present in the project area and will need to be managed accordingly.

5.1.13 Territorial Sea and Exclusive Economic Zone Act, 1989

The Act defines the territorial sea as extending up to 12 nautical miles from the coastal low-water line, and the exclusive economic zone as reaching up to 200 nautical miles from the coastal low-water line. Article 12 specifies that national laws related to fisheries, environmental management, merchant shipping, petroleum, and mining apply to activities such as exploring natural resources and addressing marine pollution in both the territorial sea and the exclusive economic zone.

Relevance to the project: The project includes offshore areas within both the territorial sea and the exclusive economic zone of Tanzania and Zanzibar.

5.1.14 Deep-Sea Fisheries Management and Development Act, 2020

This Act applies to all fishing and related activities, including vessels and individuals in areas beyond national jurisdiction following hot pursuit initiated in Tanzanian and Zanzibar waters. It establishes the Deep-Sea Fishing Authority as a corporate body with exclusive authority over fisheries exploration, exploitation, conservation, and management in the Exclusive Economic Zone. The Authority is responsible for formulating national policies, managing fisheries activities, coordinating research programs, and implementing conservation measures. To ensure sustainable management, the Authority has outlined prohibitions and directions, including guidelines on regional conservation measures and restrictions on certain fishing practices. Additionally, the Act mandates the maintenance of public registers and information systems for data collection. Port State Measures are applied to foreign and Tanzanian-flagged vessels when entering Tanzanian (and Zanzibar) ports, with some exceptions. The Act covers funding, offences, jurisdiction, and evidentiary procedures.

Relevance to the project: The submarine cables will pass through sea waters that are used for fishing activities.

5.1.15 Law of the Child Act No. 21, 2009

The Act delineates the rights of children, defined as individuals under the age of 18. It also regulates the employment and apprenticeship of children, detailed in Part VII.

Relevance to the project: Vulnerable people, such as children, might experience a greater impact from processes like land acquisition and employment, as well as the effects on communities that might be affected.

5.1.16 National Environmental Policy (NEP), 2021

The revised National Environmental Policy (NEP) of Tanzania updates the 1997 version comprehensively address current and emerging environmental challenges, including climate change, invasive species, and electronic waste. It prioritizes environmental integrity, food security, poverty alleviation, and economic benefits from environmental resources. The policy also addresses cross-cutting issues such as governance and gender. The objectives of this document include coordinated environmental management, sustainable land and water use, wildlife and biodiversity conservation, pollution management, and climate change resilience. To achieve these objectives, proposed measures include involving communities in land management, promoting trans-boundary water cooperation, engaging the private sector in conservation efforts, and improving waste management. Governance enhancements aim to improve accountability, transparency, resource availability, and private sector involvement in environmental initiatives.

Relevance to the project: The project may potentially cause environmental and social impacts.

5.1.17 National Land Policy, 1995 (revised in 1997)

The policy highlights the importance of preserving land resources by implementing sustainable development strategies. It includes various environmental concerns, with a particular emphasis on land use planning. This involves assessing land characteristics, effectively managing coastal, urban, and rural land resources, promoting resource sharing, and utilizing multiple land use techniques in areas with conflicting land use. In addition, it promotes involving communities in managing resources, making decisions about land use, and resolving conflicts.

Relevance to the project: The project will disturb coastal land during construction and affect land use.

5.1.18 National Land Policy (Draft), 2016

The 2016 National Land Policy of Tanzania is in line with the country's National Development Plans. Its goal is to improve livelihoods by promoting efficient land use, fair access, and secure tenure. The policy prioritizes transparent laws and strengthened land administration. The document outlines 31 objectives, which include securing land rights for all users, optimizing land resource utilization, protecting environmentally sensitive areas, facilitating public land availability, ensuring fair compensation for land, and providing access to land for those displaced by disasters. Implementation requires revising the legal framework, including the Land Act and Village Land Act, to improve land governance.

Relevance to the project: The project will disturb coastal land during construction and affect land use.

5.1.19 National Forest Policy, 1998

The policy provides guidelines for sustainable management and continuous advancement of Tanzania's forest resources. It is developed and overseen by the Ministry of Natural Resources and Tourism (MNRT). The policy emphasizes the need to conduct Environmental Impact Assessments (EIAs) for investments that involve converting forest land to other uses or pose potential harm to the forest environment, as stated in Policy Statement No. 23 (4.3.4).

Relevance to the project: During construction or operational activities, the developer must ensure full protection and conservation of forested coastal areas, such as mangroves forests.

5.1.20 Wildlife and Wetland Policy of Tanzania, 2007

The Tanzania Wildlife Policy promotes wildlife conservation, recognizing its importance for biodiversity, the economy, the environment, and water and soil conservation. The policy aims to maintain biodiversity and enhance economic contributions while acknowledging the impact of human activities on wildlife, both within and outside protected areas. It emphasizes the need for environmental assessments to mitigate negative effects of development projects. Tanzania's Wetland Policy underscores the importance of conserving and managing wetlands, which cover 10% of the country's land area, with 5.5% designated as Ramsar sites. These wetlands are important natural resources that contribute to biodiversity conservation, poverty reduction, water and soil conservation, and nutritional support for communities.

Relevance to the project: The project will conduct activities in coastal areas rich in wildlife.

5.1.21 National Human Settlements Development Policy, 2000

The National Human Settlements Development Policy (NHSDP) aims to promote sustainable human settlements and ensure the provision of adequate and affordable housing for all, including the poor. Protecting the environment within human settlements and safeguarding natural ecosystems from pollution, degradation and destruction are key objectives of the policy. Recognizing the importance of planning and management of human settlements, the NHSDP prioritizes environmental protection as a strategic component of settlement planning and development. It addresses issues such as inadequate waste management, air pollution from vehicular emissions and industrial activities, encroachment on fragile lands, dependence on unsustainable energy sources such as firewood and charcoal, and unauthorized sand mining in river valleys leading to environmental degradation. The policy requires developers to implement measures to protect settlements, control soil erosion and sedimentation, and prevent the displacement of households.

Relevance to the project: The project may displace dwellings and have economic and social impacts on potentially affected communities (PACs) including from project induced immigration (PIIM).

5.1.22 National Wildlife Policy of Tanzania, 1998

The policy recommends that priority should be given to development outside protected areas. However, if development within a protected area becomes necessary, strict measures must be taken. These include conducting Environmental Impact Assessments (EIAs) for developments within protected areas and undertaking comprehensive environmental planning for projects proposed in wildlife areas outside protected areas. These assessments and plans are essential to minimize adverse impacts on the environment and wildlife habitats.

Relevance to the project: The project will conduct activities in coastal areas rich in wildlife.

5.1.23 Tanzania Cultural Heritage Policy (Sera ya Malikale), 2008

The policy has several objectives, including defining the roles of the public, individuals, companies and institutions in the management of cultural heritage resources; outlining strategies for the management and administration of cultural heritage activities; establishing measures for the protection, management, conservation, preservation and development of cultural heritage resources; and identifying best practices for the research and conservation of cultural heritage. Relevant policies include the development of procedures for documenting and protecting culturally significant discoveries, the requirement that major projects such as mining and excavation be assessed for their impact on antiquities and cultural heritage, and the legal recognition of man-made objects as national cultural heritage when they are 100 years old or older.

Relevance to the project: Cultural heritage may be encountered in the project area and will need to be managed accordingly.

5.1.24 National Conservation Strategy for Sustainable Development (NCSSD), 1994

The National Conservation Strategy for Sustainable Development (NCSSD) offers a framework that integrates development and conservation by emphasizing the notion that prudent resource utilization fosters sustainable development. It aims to engage multiple stakeholders, such as government bodies, non-governmental organizations (NGOs), private enterprises, and the wider community, in environmental management and conservation efforts.

Relevance to the project: The project may have environmental and social impacts resulting from resource use and disturbance of land.

5.1.25 National Integrated Coastal Environment Management Strategy (NICEMS), 2003

The National Integrated Coastal Environmental Management Strategy (NICEMS) provides a framework for coastal governance in Tanzania, involving various government sectors and stakeholders. NICEMS is based on the National Environmental Policy (NEP) and will be in effect until 2025. Its aim is to promote the sustainable utilization of coastal resources and development. The document outlines the shared responsibilities for planning, managing, and enforcing coastal and marine resources among various ministries, including the Ministry of Natural Resources and Tourism (MNRT), the Ministry of Lands, Housing and Human Settlement Development, the Ministry of Water and Irrigation, and local government authorities.

Relevance to the project: The project will construct and operate in coastal areas.

5.1.26 National Strategy for Gender Development (NSGD), 2008

The National Strategy for Gender Development (NSGD) in Tanzania aims to achieve gender equality and equity, as required by the national Constitution and the Women and Gender Development Policy. It aims to accelerate the implementation of the Women and Gender Development Policy of 2000, which tackles gender disparities. The NSGD offers guidance to policymakers, planners, and program implementers on how to integrate gender considerations into their initiatives to meet international, national, and regional commitments.

Relevance to the project: Women may be disproportionately affected by land acquisition, employment and impacts on PACs.

5.1.27 National Gender Policy, 1999

The policy aims to provide guidance for ensuring gender-sensitive plans, programs, and strategies across all sectors and institutions. It emphasizes gender equality and aims to establish strategies for poverty eradication by ensuring both women and men have access to available resources for their development. The policy recognizes the significant role women play in societal development. The energy sector is committed to gender mainstreaming, ensuring equal opportunities for men and women in construction and related activities at all levels.

Relevance to the project: The policy mandates project management to prioritize gender issues and strive for equal employment opportunities for women and men within projects whenever feasible.

5.1.28 Occupational Health and Safety Act, 2003

The Occupational Health and Safety Act (OSHA) of 2003 aims to ensure the health, safety, and welfare of workers in their workplaces. The Act outlines the responsibilities of employers to provide safe working conditions, including risk assessments, safety training, and health monitoring. It also establishes a framework for the appointment of safety officers and the formation of safety committees. The Act emphasizes the need for safety regulations in various industries to prevent workplace accidents and illnesses.

Relevance to the project: The Occupational Health and Safety Act ensures strict adherence to health and safety standards during the construction and maintenance of the project. This is especially crucial during installation, where workers face hazardous conditions like underwater work and heavy machinery operation. To comply, thorough risk assessments, comprehensive worker training, and robust safety protocols are essential to prevent accidents and injuries.

5.1.29 Public Health Act, 2009

The Public Health Act of 2009 addresses public health concerns in Tanzania. It establishes a legal framework for the prevention and control of diseases, health promotion, and the maintenance of hygiene and sanitation standards. The Act empowers health authorities to enforce public health regulations, conduct health inspections, and manage health-related emergencies. It also emphasizes community involvement in public health initiatives and promotes the provision of essential health services.

Relevance to the project: The Public Health Act regulates environmental impacts affecting public health. The project activities must consider disruptions to communities, water quality, and marine ecosystems. To comply, health risk assessments are necessary, and measures must mitigate negative impacts on the population and environment.

5.1.30 Employment and Labour Relations Act, 2004

The Employment and Labour Relations Act of 2004 regulates employment relations in Tanzania. It establishes rights and obligations for both employers and employees, covering areas such as employment contracts, wages, working hours, and termination of employment. The Act also provides mechanisms for dispute resolution, including mediation and arbitration, and emphasizes the importance of collective bargaining. It aims to promote fair labor practices and protect workers' rights.

Relevance to the project: The Act protects worker rights in the project, ensuring fair labor practices, contracts, conditions, and dispute resolution. Adherence means equitable treatment of local workers, promoting collective bargaining, and providing a safe, non-discriminatory workplace.

5.1.31 Workers' Compensation Act, 2008

The Workers' Compensation Act of 2008 provides for compensation to workers who suffer injuries or illnesses arising from their employment. The Act establishes a no-fault compensation system, ensuring that workers receive benefits regardless of negligence. It outlines the procedures for filing claims and the types of benefits available, including medical expenses, rehabilitation costs, and lost wages. The Act is designed to protect workers and their families from the financial burden of work-related injuries.

Relevance to the project: The Workers' Compensation Act covers work-related injuries and illnesses in the project, especially in high-risk environments like cable installations and heavy equipment operations. Compliance requires provisions for immediate medical care, rehabilitation, and compensation for injured workers, safeguarding their rights and welfare.

5.2 International standards and regulations

5.2.1 International Agreements and Conventions

In addition to compliance with regulatory requirements, the Project will also adhere to the international conventions ratified by Tanzania. Key conventions and treaties potentially relevant to the Project are outlined in the following list:

- International Labour Organization Conventions (ILO):
  - ILO C029: Forced Labour Convention, 1930 (No. 29)
  - ILO C098: Right to Organise and Collective Bargaining Convention, 1949 (No. 98)
  - ILO C105: Abolition of Forced Labour Convention, 1957 (No. 105)
  - ILO C148: Working Environment (Air Pollution, Noise and Vibration) Convention, 1977 (No. 148)
  - ILO C138: 2 Convention C138: Minimum Age Convention, 1973 (No. 138)
  - ILO C081: Labour Inspection Convention, 1947 (No. 81) (Excluding Part II)
  - ILO C087: Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
  - ILO C182: Worst Forms of Child Labour Convention, 1999 (No. 182)
  - ILO C100: Equal Remuneration Convention, 1951 (No. 100)
  - ILO C111: Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- Environment:
  - United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), March 1973
  - Nairobi Convention for the Protection, Management and Development of The Marine and Costal Environment of The Eastern African Region and Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region
  - United Nations Convention on the Law of the Sea (UNCLOS), 1982
  - Convention on the Conservation of Migratory Species (Bonn Convention), June 1979
  - Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), June 1995
  - Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, January 1991
  - United Nations Convention to Combat Desertification, 1994
  - Convention on Biological Diversity, (Rio Convention), June 1992
  - International Convention for the Safety of Life at Sea (SOLAS), 1974
  - Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention), September 1998
  - Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000

  - African Convention on the Conservation of Nature and Natural Resources (revised), 2003
  - Stockholm Convention on Persistent Organic Pollutants, 2001
  - International Plant Protection Convention (IPPC), December 1951, amended 1997
  - Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention), and 1996 Protocol to the Convention
  - Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean, March 2010
- Social:
  - Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, November 1970
  - Convention on the Protection of World Cultural and Natural Heritage, November 1972
  - African Charter on Human and Peoples' Rights
  - Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)
  - Convention on the Rights of the Child
  - African Charter on the Rights and Welfare of the Child
  - Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa
  - Convention on the Rights of Persons with Disabilities
  - Convention for the Safeguarding of the Intangible Cultural Heritage, October 2003
  - Convention on the Protection and Promotion of the Diversity of Cultural Expressions, October 2005
- Climate Change:
  - United Nations Framework Convention on Climate Change (UNFCCC), 1992
  - Kyoto Protocol to the United Nations Framework Convention on Climate Change, December 1997
  - Vienna Convention for the Protection of the Ozone Layer, March 1985, and the Montreal Protocol on Substances that Deplete the Ozone Layer, September 1987
  - Paris Agreement (UNFCCC), 2015
- Government:
  - East African Community Treaty
  - United Nations Convention Against Corruption, 2003
  - Convention on International Regulations for Preventing Collisions at Sea (COLREGs), 1972
  - United Nations Sustainable Development Goals

5.2.2 Environmental and Social Safeguards of Development Partners

5.2.2.1 The African Development Bank's Safeguard Policies and Procedures

All African Development Bank (AfDB) financed projects must undergo environmental and social impacts screening as per the Bank's Environmental and Social Safeguards Policy. In 2013 the AfDB adopted an Integrated Safeguards System (ISS), which established the Bank Group's commitment to sustainable development and has been designed to address environmental and social impacts anticipated from the implementation of development projects.

Since that time, significant updates and revisions to safeguards frameworks have been carried out by AfDB's, in order to converge with the safeguards of the other Multilateral Financial Institutions (MFIs) in line with the aim for greater harmonization amongst development partners.

The current Integrated Safeguards System (ISS), updated in April 2023, comprises:

- The *AfDB Group's Vision for Sustainable Development*, which sets out the Bank Group's approach and aspirations regarding environmental and social sustainability.

- The *AfDB Group's Environmental and Social Policy* that sets out the Bank's commitments and the relevant principles and requirements that the Bank must follow regarding projects, activities and initiatives that it supports.
- *Ten (10) Environmental and Social Operational Safeguards (OS)*, together with supporting Annexes, which set out the mandatory requirements that apply to the projects, activities and initiatives of Borrowers.
- *Environmental and Social Guidance Notes (ISS Guidance notes)* are tools which provide technical guidance for the Bank and its Borrowers on specific methodological approaches, Good International Industry Practice (GIIP) and standards relevant to meeting the requirements of the Operational Safeguards.

The ***Ten E&S Operational Safeguards (OS)*** set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects, activities and initiatives supported through Bank financing throughout the life cycle of operations. The E&S Operational Safeguards will support Borrowers: (a) in achieving good international practice relating to environmental and social sustainability; (b) in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects, activities and other initiatives through ongoing stakeholder engagement.

The AfDB's Environmental and Social (E&S) Operational Safeguards are the following:

- *E&S Operational Safeguard 1* (*OS1*): Assessment and Management of Environmental and Social Risks and Impacts;
- *E&S Operational Safeguard 2* (*OS2*): Labour and Working Conditions;
- *E&S Operational Safeguard 3* (*OS3*): Resource Efficiency and Pollution Prevention and Management;
- *E&S Operational Safeguard 4* (*OS4*): Community Health, Safety and Security;
- *E&S Operational Safeguard 5* (*OS5*): Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement;
- *E&S Operational Safeguard 6* (*OS6*): Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- E&S Operational Safeguard 7 (OS7): Vulnerable Groups;
- E&S Operational Safeguard 8 (OS8): Cultural Heritage;
- *E&S Operational Safeguard 9* (*OS9*): Financial Intermediaries;
- *E&S Operational Safeguard 10* (*OS10*): Stakeholder Engagement and Information Disclosure.

The relevance of African Development Bank E&S Operational Safeguards (OSs) to the proposed interconnection project is outlined in the following table.

Table 5- 1 – African Development Bank OSs and their relevance to the Project

AfDB E&S OSs	Relevance to the project
OS1: Assessment and Management of Environmental and Social Risks and Impacts	Whereas the activities to be financed by the project will have a range of environmental and social benefits, the activities could also be a source of adverse environmental and social impacts as highlighted below: - Generation of hazardous and non-hazardous waste; - Small scale soil erosion and alteration of land stability; - Landscape disturbance; - Potential risks to flora and fauna; - Introduction of occupational and community health risks; - Localized dust emissions from trenching and installation of equipment, emissions to air from vehicle fleets (exhaust emissions); and - Noise pollution from installation of equipment and transformer sets, among others. *This standard aims at identifying all the probable E&S risks on the project and defining appropriate mitigation measures in order to minimize such risks.*
OS2: Labour and Working Conditions	The project will have direct and contracted workers that will be engaged by project implementing entities as well as primary supply workers. The workers will be exposed to occupational health risks when undertaking construction, operation and maintenance activities. Additionally, other risks such as exploitation and unfair wages, electrocution, discrimination at work and exposure to Gender Based Violence (GBV), Sexual Harassment (SH), spread of HIV/ AIDs and poor working conditions could impact on timely project delivery, lead to injury and even fatalities. Road accidents could also easily occur during project implementation. *The project should ensure proper labour and working conditions during the construction,*

AfDB E&S OSs	Relevance to the project
	operation and decommissioning phases.
OS3: Resource Efficiency and Pollution Prevention and Management	Improper disposal of waste and leachate that is generated in landfills could cause pollution. Erosion and sedimentation as well as pollution, can result from civil works on transmission line and substations. *The assessment of E&S risks related to the project should identify the potential of pollution of environmental media (air, water, soil) as a result of implementing project activities during the construction, operation and decommissioning phases.* *Additionally, the potential for project activities to over use natural resources such as water and energy should be considered.*
OS4: Community Health, Safety and security	The project may introduce several health and safety risks to the community. These could be related to an increase in crime, prostitution, GBV, and sexual exploitation. Additionally, the project could contribute to other risks such as; electric shocks during installation and connections, noise, traffic related risks during transportation of personnel and items, etc. *E&S risk assessment for all the project components should consider community health, safety and security aspects.*
OS5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement	The project could require land acquisition in the right of Way of the underground cables and overhead lines and at the locations of new substations. *The project should aim at avoiding displacement of people. Where land take and displacement are inevitable for some project components as highlighted above, compliance with this standard must be sought to ensure compensation of affected individuals/communities. Additionally, impacts on assets and livelihoods must be considered.*
OS6: Habitat and Biodiversity Conservation and	Activities involving creation of a right of way and construction of substations, will entail

AfDB E&S OSs	Relevance to the project
Sustainable Management of Living Natural Resources	clearance of vegetation to set up project components. Electricity transmission lines pose fatal risks to birds through collision and electrocution and also habitat fragmentation for terrestrial fauna. *Actions to enhance biodiversity conservation and protection of living natural resources should be considered by the project.*
OS7: Vulnerable Groups	*The needs and priorities of project host communities will be identified in the Stakeholder Engagement Plan. Additionally, the E&S risk assessment will identify impacts of the project on vulnerable groups.*
OS8: Cultural Heritage	Excavation works could unearth materials of cultural importance or damage sacred sites. These could easily be destroyed if not appropriately managed. *The E&S risk assessment will identify if cultural heritage (tangible and intangible forms of culture) will be affected by the project.*
OS10: Stakeholder Engagement and Information Disclosure	Limited/ inadequate stakeholder engagements could lead to public opposition and hostility to the project. *A Stakeholder Engagement Plan (SEP) will be developed for the project. Stakeholder consultation will be undertaken throughout the project's lifespan.*

5.2.3 Gap Analysis with Tanzanian legislation

The Tanzanian policy and legal framework are generally consistent with the African Development Bank Operational Safeguards (OSs), albeit some gaps. A gap analysis between the national legislation and African Development Bank Operational Safeguards is presented in the following table.

Table 5- 2 – Gap analysis between Tanzanian Laws and both African Development Bank (AfDB) Operational Safeguards (OSs)

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
OS 1 – Assessment and Management of Environmental and Social Risk and Impact			
<u>III.2.4. Information disclosure</u> 57. The Bank will apply its Policy on Disclosure and Access to Information regarding all documents provided to it by the Borrower, subject to the confidentiality concerns described therein. 58. For all projects, the Bank will require the Borrower to provide sufficient information to its stakeholders about the potential risks and impacts of a project or programme during consultations. This information will be disclosed in a timely manner, in an accessible place, and in a form and language understandable to project-affected parties and other interested parties, as set out in OS10, so that they can provide meaningful input into project design and mitigation measures. …	The Environmental Management Act, 2004 states at Section 90 that: "(1) Notwithstanding the provisions of Section 87 of this hearing and Act and other provisions of this Act, the review of the information disclosure Environmental Impact Statement shall be conducted, inter alia, through public hearings …" The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 17 that: "(2) In seeking the views of the public following the approval of the project brief, the developer or proponent shall: (a) publicize the project and its anticipated effects and benefits by… (b) hold, where appropriate, public meetings with the affected parties and communities to explain the project and its effects, and to receive their oral or written comments;	No major gaps.	Tanzanian laws are aligned with AfDB ISS. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
	(c) ensure that appropriate notices are sent out at least one week prior to the meetings …”		
III.3. Consultation and participation 63. The Bank recognizes the importance of early and continuing engagement and meaningful consultation with stakeholders. The Bank will require the Borrower to engage with stakeholders, including communities, vulnerable groups, or individuals affected by proposed projects, and with other interested parties, through information disclosure, safe consultation free of reprisal, and informed participation in a manner proportionate to the risks to and impacts on affected communities. The Borrower shall provide documentary evidence to the Bank on how these requirements have been met. …	The Environmental Management Act, 2004 states at Section 89 that: “(2) Without prejudice to subsection (1), upon receipt of the Environmental Impact Statement, the Council shall: (a) circulate it for written comments from various institutions and government agencies; (b) notify the public by any appropriate means of the place and time for reviewing the Environmental Impact Statement and submitting written comments in a prescribed manner; and (c) solicit oral or written comments by any appropriate means, of the people who will be affected.” The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 17 that:	The Tanzanian legislation ensures that the developer of a project will seek views of any person who is or is likely to be affected by the Project (Environmental Management Act, 2004). However, there is no special provision with regards with disadvantaged or vulnerable people.	Harmonization of Tanzanian laws with AfDB ISS provisions (in particular, those of OS10) shall be performed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
	"(1) During the process of conducting an environmental impact assessment study, the developer or proponent shall in consultation with the Council, seek the views of any person who is or is likely to be affected by the project …"		
III.4. Monitoring and implementation Support 66. The Bank will provide implementation support regarding the E&S performance of the project, which will include reviewing the Borrower's monitoring reports on the compliance of the project with the requirements of the financing agreement, carrying out implementation support visits, and providing capacity-building support where appropriate. The Bank will monitor the E&S performance of the operations in accordance with the requirements of the financing agreement, including the ESMS and/or the ESMP, and design changes or unforeseen circumstances.	The Environmental Management Act, 2004 states at Section 99 that: "(1) The Council shall, in consultation with the relevant sector Ministry or government agency, monitor: (a) all environmental criteria and phenomena with a view to making an assessment of any possible changes in the environment and their possible impacts; and (b) the operation of any project or undertaking with a view to determining its immediate and long term effects on the environment."	Tanzanian legislation foresees periodic monitoring during project implementation and operation.	Provisions of national legislation will be harmonized with AfDB ISS requirements.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
…			
III.5. Grievance mechanisms and accountability 73. The Bank will require the Borrower to provide a grievance mechanism, process or procedure to receive and facilitate the resolution of concerns and grievances of project-affected parties and other interested parties arising in connection with the project, in particular regarding the Borrower's E&S performance. The grievance mechanism will be proportionate to the risks and impacts of the project. …		No specific prescriptions for a grievance and redress mechanics are present in Tanzanian legislation.	A grievance and redress mechanism will be foreseen according to AfDB ISS provisions.
Glossary - Categorization of project environmental and social risk - Category 1: High-risk operations likely to cause significant and/or irreversible adverse environmental and/or social impacts on a large scale, or to significantly affect environmental or social components that the Bank or the borrowing country considers sensitive. …	The Environmental Management Act, 2004 states at Section 81 that: "Any person, being a proponent or a developer of a project or undertaking of a type specified in the Third Schedule to this Act, to which environmental impact assessment is required …" The Environmental Management (Environmental Impact Assessment and Audit) (Amendment)	The Project is included among those requiring an Environmental Impact Assessment both for Tanzanian legislation and lender's safeguards.	Tanzanian laws are aligned with AfDB ISS. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
- Category 2: Moderate-risk operations likely to cause adverse E&S impacts that are lower than in Category 1 operations, medium-scale, easily reversible, and readily minimized by applying appropriate management and mitigation measures, or incorporating internationally recognized design criteria and standards. … - Category 3: Low-risk operations that do not directly or indirectly adversely affect the environment and that are unlikely to induce adverse social impacts. This category does not require a formal ESA although E&S mitigation or maximization measures may be included/recommended in the project design.	Regulations, 2018: "4A.-(1) The projects under these Regulations shall, in consideration of magnitude of impacts on the environment, be classified into the following categories, namely: (a) "A" category for Mandatory Projects; (b) "B1" category for Borderline Project; (c) "B2" category for Non-Mandatory; and (d) "Special Category"."		
<u>Objectives</u> 5. The objectives of OS1 are as follows: • Identify and assess the E&S risks and impacts including those related to gender	Environmental Impact Assessment and Audit Regulations (2005), Part V Environmental Impact Statement: Reg. 18 "… (i) the environmental effects of the project including the	No major gaps. The concept of the Project's area of influence is not remarked in Tanzanian laws, even if direct and indirect impacts are envisaged to be assessed. Some specific impacts are not	Tanzanian laws are generally aligned with AfDB OS1. Harmonization of Tanzanian laws with AfDB OS1 provisions shall be performed for some specific impacts (gender inequalities,

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
inequalities, climate change, and vulnerability of Bank lending, investment, and grant-supported operations, in their areas of influence in a manner consistent with the OSs. • Provide opportunity for stakeholder engagement and consultation in assessing and managing the E&S risks and impacts. • Adopt a mitigation hierarchy approach as follows: - anticipate and avoid risks and impacts; - where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; - once risks and impacts have been minimized or reduced, mitigate them; and - where significant residual impacts remain, compensate for or offset them, where technically and	social and cultural effects and the direct, indirect, cumulative, irreversible, short term and long term effects anticipated; …”	explicitly considered in Tanzanian legislation (gender inequalities, climate change, vulnerable groups, etc.).	climate change, vulnerable groups, etc.). The AfDB OS1 will be applied in the definition of the Project’s direct and indirect Area of Influence.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
financially feasible. • Adopt differentiated measures so that adverse impacts do not fall disproportionately on the vulnerable to prevent them from being disadvantaged in sharing development benefits and opportunities resulting from the project. • Utilize national E&S institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate. …			
Scope of application 6. This OS applies to all Bank Group's funded operations, including programme-based operations (PBOs), programme lending that leads to individual subprojects, lending to or investing in financial intermediaries (FIs), and project activities funded through other financial instruments managed by the Bank, except for short-term, exceptional circumstances and emergency	Legislative requirements for Environmental Impact Assessment stated in The Environmental Management Act, 2004 and in the Environmental Impact Assessment and Audit Regulations, 2005 are equivalent.	No major gaps	Tanzanian laws are aligned with AfDB OS1. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
relief, which is specifically exempted.			
Requirements – A. General 11. The Borrower shall assess, manage, and monitor the E&S risks and impacts of the project throughout the project life cycle so as to meet the requirements of the OSs in a manner and within a time frame acceptable to the Bank. 12. The Borrower shall: a. conduct an ESA of the proposed project, including stakeholder engagement; b. undertake stakeholder engagement and disclose appropriate information in accordance with OS10; c. develop an Environmental and Social Plan (ESMP) and implement all measures and actions set out in the financing agreement including the ESMP; and d. conduct monitoring and reporting on the E&S performance of the project against the OSs.	The Environmental Management Act, 2004 states at Section 81 that: "Any person, being a proponent or a developer of a project or undertaking of a type specified in the Third Schedule to this Act, to which environmental impact assessment is required to be made by the law governing such project or undertaking or in the Assessment absence of such law, by the regulations by the Minister, shall undertake or cause to be undertaken, at his own cost, an environmental impact assessment study."	No major gaps. The Project is included among those requiring an Environmental Impact Assessment both for Tanzanian legislation and lender's safeguards.	Tanzanian laws are aligned with AfDB OS1. No action needed.
B. Use of Borrower's Environmental	Environmental Impact Assessment	No major gaps. The Project is	Tanzanian laws are aligned with

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
and Social Framework 16. If the Borrower and the Bank propose to use all or part of the Borrower's Environmental and Social Framework for the management of proposed project E&S risks and impacts, the Bank will review the Borrower's Environmental and Social Framework in accordance with the requirement of para. 19. The Borrower shall provide information to the Bank in connection with the assessment	and Audit Regulations (2005), Part III Project registration and Screening: Reg. 5 "An application for an environmental impact assessment certificate shall be made in the format of a project brief set out in the Third Schedule to the Act and the First Schedule to these Regulations, and the applicant shall submit the application together with the prescribed fee to the Council." Reg. 9 "(1) The Council shall screen the project brief guided by screening criteria as specified in the Second Schedule to these Regulations. (2) The screening process shall be undertaken with the objective of determining whether an environmental impact assessment be undertaken."	included among those requiring an Environmental Impact Assessment both for Tanzanian legislation and lender's safeguards.	AfDB OS1. No action needed.
C. The Environmental and Social Assessment 19. The Borrower shall carry out an ESA of the project proposed for Bank support to assess its E&S risks and impacts throughout the project	Legislative requirements for Environmental Impact Assessment stated in The Environmental Management Act, 2004 and in the Environmental Impact Assessment and Audit Regulations, 2005 are	No major gaps	Tanzanian laws are aligned with AfDB OS1. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
life cycle. The assessment shall be proportionate to the potential risks and impacts. Accordingly, it will assess, in an integrated manner, all relevant direct, indirect and cumulative E&S risks and impacts throughout the project life cycle, including those specifically identified in OS2 to OS10, as well as contextual issues such as the prevailing political economy, which may affect how risks and impacts manifest themselves.	equivalent.		
<u>C. The Environmental and Social Assessment - Mitigation hierarchy</u> 23. The ESA will always apply the mitigation hierarchy, as follows: • anticipate and avoid risks and negative impacts; • where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; • once risks and impacts have been minimized or reduced, mitigate them; and • where significant residual impacts remain, compensate for, or in the case of	Environmental Impact Assessment and Audit Regulations (2005), Part IV The Environmental Impact Assessment: Reg. 12 "… (e) to anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposal; …"	No major gaps, mitigation hierarchy approach is included in the provisions of Tanzanian relevant legislation.	Tanzanian laws are aligned with AfDB OS1. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
biodiversity and habitat losses, offset them, where technically and financially feasible.			
<u>C. The Environmental and Social Assessment</u> 24. The ESA, informed by the scoping of the issues, will take into account all relevant E&S risks and impacts of the project…	Environmental Impact Assessment and Audit Regulations (2005), Part IV The Environmental Impact Assessment: Reg. 13 "(1) An environmental impact assessment shall be conducted in accordance with scoping and the terms of reference developed during the scoping exercise by the developer or proponent. … (4) The scoping report shall contain among other things the following components: (a) how the scoping exercise was undertaken; (b) identification of issues and problem; (c) synthesis of results of the scooping exercise including details of potential negative and positive impacts; (d) stakeholder groups identified and how they were involved in the scoping exercise;	No specific requirements of the contents of the Project scoping are provided in AfDB OS1.	Tanzanian laws shall apply in the preparation of the scoping report.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
	(e) spatial, temporal and institutional boundaries of the project; (f) project alternatives; and (g) terms of reference."		
<u>C. Environmental and social assessment</u> 24. The ESA, informed by the scoping of the issues, will take into account all relevant E&S risks and impacts of the project, as follows: • **Environmental risks and impacts**, including: (i) those identified in the E&S Operational Safeguards (OSs), cross-cutting policies and strategies, and in the EHSGs, such as impacts related to noise, vibrations, pollution, wastes, soil integrity, hydrogeology, as well as visual and landscape impacts; (ii) those related to community safety … (iii) those related to climate change and other transboundary or global risks and impacts; … • **Social risks and impacts** including: (i) impacts on	The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 16 that: "An environmental impact assessment shall take into account environmental, social, cultural, economic, and legal considerations, and shall: (a) identify the anticipated environmental impacts of the project and the scale of the impacts; (b) identify and analyse alternatives to the proposed project; (c) propose mitigation measures to be taken during and after the implementation of the project; and (d) develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of	No major gaps. The Project is included among those requiring an Environmental Impact Assessment both for Tanzanian legislation and lender's safeguards. No specific mentions in Tanzanian legislation about impacts on health and safety, climate change, transboundary impacts, vulnerable groups, cultural heritage.	Harmonization between Tanzanian laws and AfDB OS1 will be performed. The impact analysis will adhere to AfDB OS1 provisions.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
people's way of life, their culture, social structure, and their community (including from a legacy perspective); (ii) threats to human safety and security (including reprisal risks) through the escalation of personal, communal or inter-state conflict, crime or violence including sexual exploitation, abuse, and harassment (SEAH); (iii) risks that project impacts fall disproportionately on individuals and groups who, because of their particular circumstances, may be vulnerable; … (vii) impacts on the health, safety, and well-being of workers and project affected communities; and (viii) risks to cultural heritage. 25. Where the ESA of the project identifies specific individuals or groups as vulnerable, the Borrower, in consultation with members of vulnerable groups, will propose and implement differentiated measures so that	implementing the measures."		

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
adverse impacts do not fall disproportionately on the vulnerable, and to prevent them from being disadvantaged in sharing any development benefits and opportunities resulting from the project. 28. The ESA will also identify and assess, to the extent appropriate, the potential E&S risks and impacts of the ancillary services… 31. The ESA shall consider potentially significant project-related transboundary and global risks and impacts, such as impacts from effluents and emissions, the increased use or contamination of international waterways, emissions of climate pollutants, including greenhouse gases (GHGs) and black carbon …			
<u>C. Environmental and social assessment</u> 31. The ESA shall consider potentially significant project-related transboundary and global	The Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations 2018, Second Schedule – Project screening criteria:	No specific evaluation of climate change risk and adaptation measures are required in Tanzanian legislation.	Climate change risk assessment will adhere to AfDB OS1 provisions.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
risks and impacts, such as impacts from effluents and emissions, the increased use or contamination of international waterways, emissions of climate pollutants, including greenhouse gases (GHGs) and black carbon, and impacts on threatened or depleted migratory species and their habitats. The ESA will also incorporate assessments of climate change mitigation, adaptation, and resilience issues, as appropriate	"8. The project shall not cause: (a) adverse socio economic impact; (b) land degradation; (c) water pollution; (d) air pollution; (e) damage to wildlife and habitat; (f) adverse impact on climate and hydrological cycle; and (g) creation of by-products, residual or waste materials which require handling and disposal in a manner that is not regulated by existing authorities."		
<u>D. The Environmental and Social Management Plan</u> 32. The Borrower shall develop and implement an ESMP, which will set out measures and actions required for the project to achieve compliance with the OSs over a specified time frame. The ESMP will be agreed on with the Bank, will be binding, and will be referred to in the financing agreement. … 36. The Borrower shall diligently implement the measures and actions identified in the ESMP in accordance with the time frames	The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 16 that: "An environmental impact assessment shall take into account environmental, social, cultural, economic, and legal considerations, and shall: … (c) propose mitigation measures to be taken during and after the implementation of the project; and (d) develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and	No major gaps, ESMP and monitoring are included in the provisions of Tanzanian relevant legislation.	Tanzanian laws are aligned with AfDB OS1. No action needed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
specified, and will review the status of implementation of the ESMP as part of its monitoring and reporting.	environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.”		
OS 2 – Labour and Working Conditions			
OS2 main objective is to ensure that the employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship.	Employment and Labour Relations Act, 2004; National Employment Policy, 2008	Tanzanian legislation is in line with AfDB OS2 for what concerns employment.	No action needed
OS 3 – Resource Efficiency and Pollution Prevention and Management			
OS3 main objective is to avoid or minimise adverse impacts on human health, project related emissions of short and long-lived climate pollutants, generation of hazardous and non-hazardous waste, and minimise or manage the risk and impacts associated with pesticide use.	Environmental Management Act, 2004; National Environment Policy, 1997	The Tanzanian legislation is in line with AfDB OS4 for what concerns resource efficiency and pollution prevention.	No action needed
OS 4 – Community Health, Safety and Security			
OS4 promotes quality and safety in the design and construction of infrastructure. It ensures that community exposure to project-related traffic and road safety risks,	HIV/AIDS Act, 2008 Road Safety Policy, 2009 National HIV/AIDS Policy, 2001	The Tanzanian legislation answers part of the objectives of OS4.	AfDB OS4 requirements on community health, safety and security will be applied.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
diseases and hazardous materials will be avoided or minimised. All adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and nonroutine circumstances should be anticipated and avoided whenever possible.			
OS 5 – Land Acquisition, Restrictions on Access to Land and Land Use and Involuntary Resettlement:			
Requirements – A. General – Eligibility classification 13. Affected persons may be classified as follows: a. persons who have formal legal rights to land or other assets recognized under the laws of the country concerned. This category generally includes people who are physically residing at the project site and those who will be displaced or may lose access or suffer a loss in their livelihood as a result of project activities; b. persons do not have formal legal rights to land or other assets at the time of the census or evaluation but can	According to the Land Acquisition Act, 2002, Holders of granted Rights of Occupancy or persons with recognised customary land rights are entitled to the same compensation rights. However, the Land Acquisition Act stipulates that no compensation shall be awarded in respect of land which is vacant (i.e. unproductive). Tenants are not eligible for any compensation or assistance.		The eligibility criteria of OS5 will be applied.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
prove that they have a claim that would be recognized under the customary or national law in the country. This category may include people who may not be physically residing at the project site, or persons who may not have any assets or direct sources of livelihood derived from the project site, but who have spiritual and/or ancestral ties with the land and are locally recognized by communities as customary inheritors. Depending on the country's customary land use rights, they may also be considered to have a claim if they are sharecroppers, tenant farmers, and seasonal migrants or nomadic families losing user rights; c. persons who have no recognizable legal right or claim to the land they are occupying in the project area of influence and who do not fall into either of the two			

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
categories described above. If they themselves or witnesses can demonstrate that they were in occupancy within the project area of influence for at least six months prior to a cut-off date established by the Borrower, they may be entitled to resettlement assistance other than compensation for land to improve their former living standards (compensation for loss of livelihood activities, common property resources, structures and crops, etc.).			
Requirements – A. General – Compensation and benefits for affected persons 19. Affected people will be compensated for all their losses at the full replacement cost before their actual move; before land and related assets are taken; and if the project is implemented in phases, before project activities begin for each particular phase. The Borrower shall give preference to land-based resettlement strategies,	• The Land (Assessment of the value of land for compensation) Regulations of 2001 provides a valuation methodology • The compensation for any improvements on land should be the price that the said improvements can fetch if sold in the open market. According to this law, all the compensation values are based on the market value of the property		The affected land parcels and assets will be compensated at full replacement cost, according to AfDB OS5 provisions.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
and as a matter of priority, will offer land-for-land compensation and/or in-kind compensation in lieu of cash compensation where feasible. If there are significant time delays that render previously agreed replacement costs and compensation materially below current replacement costs and compensation, then appropriate adjustments may be required.	• The assessment of the value of the land should be done by a qualified valuer approved by the District Valuer and then approved by the Chief Valuer of the Government or his/her representative • Assessment methods should be based on a comparison of recent sales of similar properties		
<u>Requirements – A. General – Compensation and benefits for affected persons</u> 20. The Borrower shall take possession of acquired land and related assets only after compensation in accordance with this OS has been made available and, where applicable, displaced people have been resettled and resettlement assistance and/or moving allowances have been provided to them in addition to compensation. In addition, livelihood restoration and improvement programmes will commence in a timely manner in	• The Land Acquisition Act, 2002 and the Land Act, 1999 both stipulate that affected owners should be paid full, fair and prompt compensation. • The Land Acquisition Act (section 15) specifies that the land could be taken before the compensation has been paid to the affected person. • The Land (Assessment of the value of land for compensation) Regulations of 2001 details that "prompt payment of compensation" means payment of compensation within six months after the land has been		The Project will only acquire the affected land parcels after all compensation and resettlement assistance have been provided to the affected persons.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
order to ensure that affected persons are sufficiently prepared to take advantage of alternative livelihood opportunities as the need to do so arises.	acquired or revoked.		
OS 6 – Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources			
<u>Requirements – A. General – Modified Habitats</u> 20. This OS applies to the areas of modified habitat that include significant biodiversity value, as determined by the ESA required in OS1. The Borrower shall avoid or minimize impacts on such biodiversity (through further degradation and habitat conversion) and implement mitigation measures as appropriate. <u>Requirements – A. General – Natural Habitats</u> 22. If natural habitats are identified as part of the assessment, the Borrower shall avoid adverse impacts on them in accordance with the mitigation hierarchy. Where natural habitats have the potential to be adversely affected by the project, the Borrower shall	The Environmental Management Act 2004 stipulates that the responsible Minister may declare Environmental Protected Areas by considering flora and fauna, special feature, the interests of the local communities and accordance with international society. (Article 47) Under the National Policies for National Parks in Tanzania, 1994, although, the primary objectives are the protection and inheritance of natural resources (Article3.1), permission of all projects in National Parks is granted based on Environmental Impact Assessment, which clarify positive and negative impacts. Analogously, according to the Marine Parks and Reserves Act, 1994, the Minister may authorize	Under the domestic law in Tanzania, even within National Parks or marine parks, project permission can be granted depending on the EIA result. It is not prescribed to ensure that the project will not cause significant modification of natural habitats or to minimise any further degradation or habitat conversion in modified habitats.	AfDB OS6 requirements will be applied.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
not implement any project-related activities unless: • there are no technically and financially feasible alternatives; and • appropriate mitigation measures are put in place, in accordance with the mitigation hierarchy, to achieve no net loss and, where feasible, preferably a net gain of biodiversity, and the maintenance of ecological functions over the long term. 23. The opinions and concerns of affected communities, as identified through the consultation process, should inform the design of the mitigation measures. 24. When residual impacts remain despite best efforts to avoid, minimize, and mitigate them, and where appropriate and supported by relevant stakeholders, mitigation measures may include biodiversity offsets adhering to the principle of 'like-for-like or better'.	construction activities within a marine park, provided that an assessment of environmental impact of such activities has been conducted.		
29. Where the project occurs within, or has the potential to	Under the Environmental Management Act 2004, for each	Environmental Management Plan formulated for each protected area	AfDB OS6 requirements will be applied.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
adversely affect, an area that is legally protected, designated for protection, or regionally or internationally recognized, the Borrower shall ensure that any activities undertaken are consistent with the area's legal protection status and management objectives. The Borrower shall also identify and assess potential project-related adverse impacts, and apply the mitigation hierarchy so as to prevent or mitigate adverse impacts from projects that could compromise the integrity, conservation objectives, or biodiversity importance of such an area.	national protected area, environmental management plan shall be prepared, which includes zoning, access restrictions, use restrictions and benefit sharing in order to conserve areas.	includes conservation and mitigation measures that AfDB Guidelines require. Therefore, when reviewing projects requested, it is necessary to confirm if the content of Environmental Management Plan meet the requirements of AfDB Guidelines and the projects requirements are in accordance with them.	
OS 7 – Vulnerable Groups			
<u>Objectives</u> 11. The objectives of OS7 are as follows: • To ensure that vulnerable groups and individuals are identified as early as possible in Bank Group operations and that engagement is meaningful, taking into account individuals' and communities'		No specific evaluation of impacts on vulnerable groups are required in Tanzanian legislation.	The impact analysis on vulnerable groups will adhere to AfDB OS7 provisions.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
specificities, and delivered in an appropriate form, manner and language. • To affirm, respect, and protect the rights and interests of vulnerable individuals and groups throughout the life cycle of the project or investment. • To recognize, respect, and preserve the culture, knowledge, and practices of highly vulnerable cultural groups and minorities including indigenous peoples, and to provide them with an opportunity to adapt to changing conditions that could arise due to project activities in a manner and in a time frame acceptable to them. • To adopt a gender-responsive approach to the management of E&S impacts, which takes into account the rights and interests of women and girls, men, and boys, including paying specific attention to the differentiated burden of			

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
impacts that women and girls might face. …			
OS 8 – Cultural Heritage			
Objectives 3. The objectives of OS8 are as follows: • To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To address cultural heritage as an integral aspect of sustainable development. • To promote meaningful consultation with stakeholders regarding cultural heritage as a means to identify and address risks and impacts related to cultural heritage. • To promote the equitable sharing of benefits from the use of cultural heritage with affected stakeholders.		The Tanzanian legislation ensures the management, protection and preservation of movable and immovable tangible cultural heritage resources (Land Acquisition Act, 2002). With regards with Intangible Cultural Heritage (ICH), there is no official list of the Tanzanian ICH, but Tanzania has become a State Party to the 2003 convention for the safeguarding of the Intangible Cultural Heritage on January 2012. However, no specific evaluation of impacts on cultural heritage are required in Tanzanian legislation.	The impact analysis on cultural heritage will adhere to AfDB OS8 provisions.
OS 9 – Financial Intermediaries			
Not triggered			
OS 10 – Stakeholder Engagement and Information Disclosure			
Objectives 5. The objectives of OS10 are as	The Environmental Management Act, 2004 states at Section 89 that:	The Tanzanian legislation ensures that the developer of a project will	Harmonization of Tanzanian laws with AfDB OS10 provisions shall be

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
follows: • To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders, and build and maintain a constructive relationship and channels of communication with them, in particular project-affected parties. • To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and E&S performance. • To promote and provide the means for safe, effective, and inclusive engagement with project-affected parties, inclusive of women's perspectives, in an equitable manner, and vulnerable groups, in a manner free of reprisal, throughout the project life cycle on issues that could potentially affect them. • To enhance project benefits and mitigate harm to local communities. • To ensure that appropriate	"(2) Without prejudice to subsection (1), upon receipt of the Environmental Impact Statement, the Council shall: (d) circulate it for written comments from various institutions and government agencies; (e) notify the public by any appropriate means of the place and time for reviewing the Environmental Impact Statement and submitting written comments in a prescribed manner; and (f) solicit oral or written comments by any appropriate means, of the people who will be affected." The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 17 that: "(1) During the process of conducting an environmental impact assessment study, the developer or proponent shall in consultation with the Council, seek the views of any person who is or is	seek views of any person who is or is likely to be affected by the Project (Environmental Management Act, 2004). However, there is no special provision with regards with disadvantaged or vulnerable people.	performed.

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
project information on E&S risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format. • To provide project-affected parties with accessible and inclusive means to provide input, raise issues, questions, proposals, concerns, and grievances, and allow Borrowers to respond to and manage such grievances. • To promote development benefits and opportunities for project-affected communities, taking into account the needs of women, including vulnerable groups, in a manner that is accessible, equitable, culturally appropriate, and inclusive.	likely to be affected by the project …” The Environmental Management Act, 2004 states at Section 90 that: “(1) Notwithstanding the provisions of Section 87 of this hearing and Act and other provisions of this Act, the review of the information disclosure Environmental Impact Statement shall be conducted, inter alia, through public hearings …” The Environmental Impact Assessment and Audit Regulations, 2005 states at Reg. 17 that: “(2) In seeking the views of the public following the approval of the project brief, the developer or proponent shall: (a) publicize the project and its anticipated effects and benefits by… (b) hold, where appropriate, public meetings with the affected parties and communities to explain the project and its effects, and		

AfDB OS Objectives	Tanzania Laws Requirements	Gaps	Recommended action
	to receive their oral or written comments; ensure that appropriate notices are sent out at least one week prior to the meetings …”		

5.3 Institutional Framework

5.3.1 Tanzania Electric Supply Company Limited (TANESCO)

Tanzania Electric Supply Company Limited (TANESCO), the Project Developer, is a state-owned enterprise established under a Memorandum and Articles of Association, incorporated on November 26, 1931. TANESCO is responsible for generating, purchasing, transmitting, distributing, and selling electricity on the Tanzanian mainland, which serves an estimated population of 50 million. The company owns the majority of electricity generation, transmission, and distribution infrastructure on the Tanzanian mainland.

Additionally, TANESCO supplies bulk electricity to the Zanzibar Electricity Corporation (ZECO), which distributes power to the islands of Unguja and Pemba.

As part of this interconnection project, TANESCO is responsible for the implementation, mitigation, and monitoring of all associated environmental impacts. TANESCO is involved in ensuring that its operations comply with environmental regulations and standards. The company engages with local communities to address concerns related to electricity supply and infrastructure development, ensuring that projects are carried out with minimal disruption.

TANESCO will be responsible in overseeing the planning and implementation of Environmental and Social Management Plan (ESMP), coordinating with relevant government agencies, and ensuring compliance with national and international standards.

Also, TANESCO will facilitate ESIA preparations, disclosure and implementation.

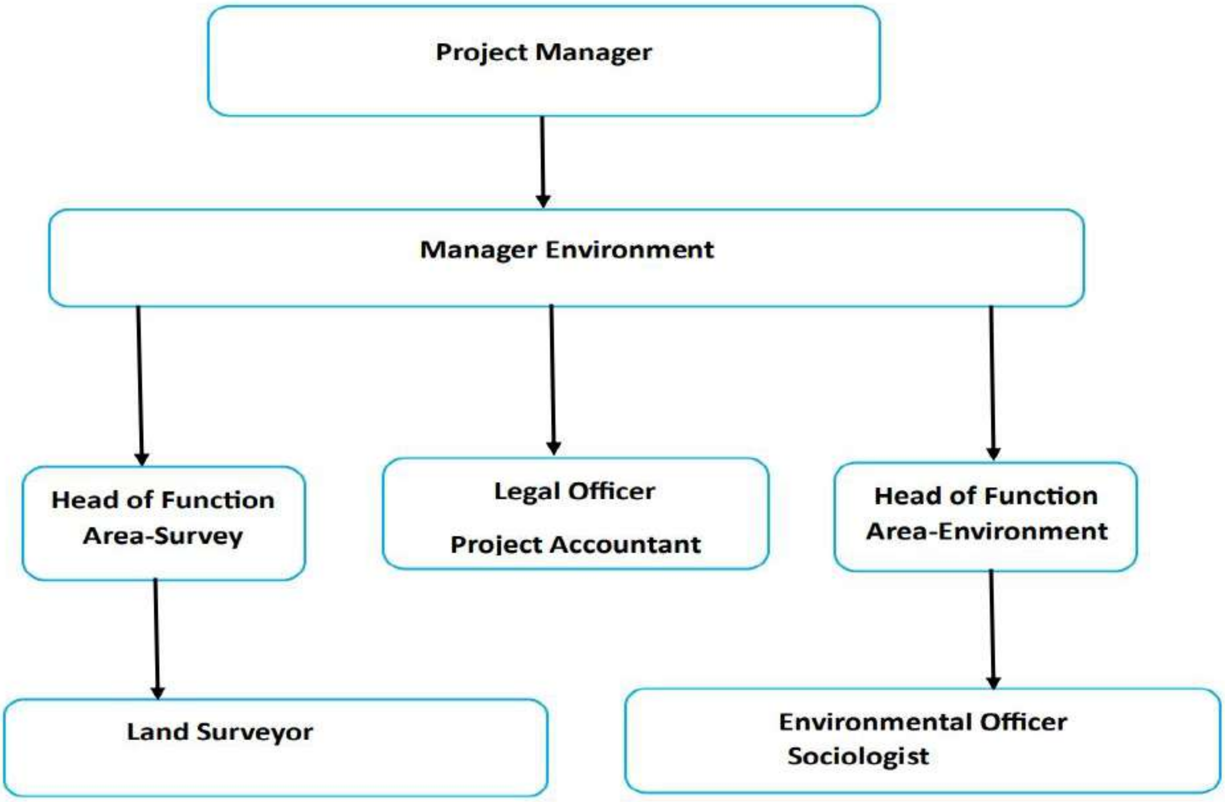


Figure 5- 1 – TANESCO Project Implementation Unit

Table 5- 3 – Key Roles and Responsibilities

Member	Key Role and Responsibilities
Project Manager	✓ Leading implementation of E&S obligations (community engagement, information sharing & grievance management, livelihood restoration and corporate social responsibility) ✓ Coordinate the day-to-day project activities including, ESMP and RAP implementation and other construction activities ✓ Supervising and monitoring the performance of other PIU in executing their daily implementation of ESMP and RAP ✓ Receiving and review the reports which submit to his office from Manager Environment ✓ Accountable for reporting to TANESCO and Lenders on E&S matters ✓ Establishing appropriate organizational structure and scrutiny of suitable resources to implement the ESMP, RAPs, SEP and LRP ✓ Contribute to the project appraisal processes by reviewing, analysing, and advising on social and environmental impact/risks ✓ Play a role of report the progress of ESMP implementation to the high level of TANESCO management
Manager Environment	✓ Advise the project manager on the project environmental & Social issues, and advise on the best ways to mainstream environmental and social aspects into project design including ESMP implementation, livelihood restoration and corporate social responsibility, capacity building, awareness raising and public consultation ✓ Managing the E&S team and third parties involved in the implementation of E&S obligations ✓ Receiving the report from Head of Function Area, Project Accountant and Legal officer ✓ Reporting the progress of ESMP implementation to Project Manager.
Head of Function Area (HOFA)-Survey	✓ Sorting Land acquisition issues including valuation and reporting to Manager Environment for discussion and actions ✓ Assigned the task Land surveyor for handling ESMP and RAP issues. ✓ Reporting to Manager Environment on the day-to-day implementation of ESMP and RAP
Head of Function Area (HOFA) - Environment	✓ Reviewing the E&S report submitted by environment officer, Sociologist and third parties during ESMP and RAP implementation ✓ Reporting to Project Manager any raised E&S issues ✓ Assigned task to Environmental officer and sociologist
Project Accountant	✓ Controlling financial issues and preparing budget for implementation of ESMP activities ✓ Effecting compensation payments to PAPs and other cost relating to ESMP implementation ✓ Reporting to Manager Environment on the cost relating to daily project implementation. ✓ Works in collaboration with Environmental officer, legal officer, sociologist and land surveyor for handling all project ESMP issues

Legal Officer	✓ Providing legal advices about the project and sharing the legal ideas with other project implementor team ✓ Responding to legal matters raised by PAPs regarding the compensation payments ✓ Works in collaboration with Environmental officer, accountant, sociologist and land surveyor for handling all project ESMP issues
Environmental Officer	✓ Reporting HOFA-environment on environment safeguards issues during project implementation. ✓ A key focal point for project on environmental matters ✓ Works in collaboration with sociologist, legal officer, accountant and land surveyor for handling all project RAP issues ✓ Ensuring compliance on environmental aspects are implemented as Nation Laws and AfDB ISS requirements
Sociologist	✓ Reporting to HOFA-environment on social safeguards issues ✓ A key focal point for project on social matters ✓ Works in collaboration with Environmental officer, legal officer, accountant and land surveyor for handling all project RAP issues ✓ Ensuring compliance on social aspects as indicated in RAP and ESMP are implemented as Nation Laws and AfDB ISS requirements
Land Surveyor	✓ Reporting to HOFA-Survey all matters relating with Land Acquisition issues ✓ A key focal point for project on Land Acquisition matters ✓ Works in collaboration with Environmental officer, legal officer, accountant and land sociologist for handling all project RAP issues ✓ Ensuring compliance on Land Acquisition issues are implemented as Nation Laws and AfDB ISS requirements

5.3.1.1 Capacity assessment

TANESCO plays a pivotal role in enforcing and overseeing Environmental and Social Assessments (ESAs) for energy projects. The organization is committed to ensuring compliance with environmental regulations and social standards throughout the project lifecycle, safeguarding both natural resources and affected communities.

TANESCO's capacity for ESA enforcement and oversight is underpinned by:

- A well-defined regulatory framework, aligned with national legislation and international best practices, mandates environmental and social compliance in project planning and execution.
- A team of qualified professionals with expertise in environmental science, social development, and engineering enables effective assessment and management of potential project impacts.
- Ongoing training and development programs ensure that TANESCO staff remain updated on the latest environmental and social standards, policies, and mitigation strategies.

TANESCO's decentralized operational structure further enhances its capacity for ESA enforcement and oversight:

- Regional offices strategically located in key project areas facilitate localized oversight and enforcement of ESA requirements.

- Direct engagement with local communities fosters trust, transparency, and the incorporation of local perspectives into project planning and implementation.
- Close collaboration with local government authorities and regulatory bodies streamlines compliance processes and strengthens enforcement capabilities at the local level.

5.3.2 National Environment Advisory Committee (NEAC)

The National Environmental Advisory Council (NEAC) was established under EMA Section 11 to advise the Minister responsible for the Environment and other sector ministries on environmental issues. NEAC's specific task is to advise the minister or sector ministry on the protection and management of the environment, using the Environmental Impact Statement (EIS) as a basis. This involves offering guidance on environmental standards, guidelines, and regulations that are relevant to environmental protection.

5.3.3 Vice President’s Office – Minister Responsible for Environment and Union Matters Minister Responsible for Environment

The Minister, appointed under EMA Cap.191 Section 13, has the authority to issue guidelines and regulations regarding the environment. This includes formulating policy guidelines for promoting, protecting, and sustainably managing the environment, as well as assigning duties to relevant entities. Under the Environmental Impact Assessment (EIA) and Audit Regulations (2005), the Minister is responsible for approving development projects by issuing a decision letter or EIA Certificate. The Minister can delegate EIA authorization responsibility to the Director of Environment, Local Government Authorities (LGAs), and Sector Ministries. Currently, the Minister for Environment operates within the Vice President's Office (VPO).

5.3.4 Ministry of Lands, Housing and Human Settlements Development

The Minister of Lands, Housing, and Human Settlements Development has exclusive jurisdiction over all land affairs, including policy formulation and implementation as outlined in the Land Act, 1999, Cap 113, and the Land (Amendment) Act 2004. The Minister is responsible for land use planning, granting permits for non-village or reserved land usage, and conducting land valuation and compensation assessments.

5.3.5 Vice President’s Office (Division of Environment) and Director of Environment (DOE)

The Director, appointed under Section 14 of EMA Cap. 191, plays a crucial role in coordinating, advising, assessing, monitoring, and reporting on environmental matters. In particular, the Director of Environment guides the Minister for Environment in approving environmental assessment reports, such as environmental impact statements (EIS) and environmental audits, for development projects. As the head of the Division of Environment (DoE) in the Vice President's Office (VPO), the Director is responsible for coordinating environmental policy and implementing the Environmental Management Act (EMA) and EIA Guidelines. As the head of the Division of Environment (DoE) in the Vice President's Office (VPO), the Director is responsible for coordinating environmental policy and implementing the Environmental Management Act (EMA) and EIA Guidelines. Additionally, the Director approves and issues Environmental Certificates. The Director provides advice to the government on environmental issues, ensures compliance with national environmental standards, and enforces environmental regulations. They also offer policy direction and leadership, particularly regarding hazardous waste management under the EMA. The Environment Division comprises separate directorates that concentrate on the conservation of natural habitats, management of pollution, and assessment of environmental impact.

5.3.6 National Environmental Management Council (NEMC)

The Council is responsible for enforcing, reviewing, and monitoring Environmental Impact Assessments (EIA) and submitting bi-annual reports on the implementation of provisions under the Environment Management Act. The Director General of the National Environment Management Council (NEMC) is appointed by the President and serves as the Council's Secretary. The composition of the group includes a chairperson appointed by the President, the Director of Environment, and seven members appointed.

5.3.6.1 Capacity assessment

The National Environment Management Council (NEMC) of Tanzania is the principal government agency responsible for overseeing and coordinating environmental management activities across the country. NEMC's mandate includes environmental monitoring, enforcement of regulations, and promoting sustainable development. NEMC's organizational structure is designed to enable effective coordination, monitoring, and implementation of Tanzania's environmental policies and regulations. The structure is relatively hierarchical and comprises divisions, units, and regional offices that work together to fulfill its mandate: Board of Directors, Executive Management, Divisions and Units.

The divisions that will be mainly involved in the project ESHS safeguards enforcement and oversight include: Environmental Impact Assessment (EIA) Division, Environmental Monitoring and Reporting Division, Legal and Enforcement Division, Regional Offices.

- Environmental Impact Assessment (EIA) Division plays a central role in the evaluation and monitoring of Environmental Impact Assessments (EIAs) for development projects, as mandated by the Environmental Management Act (EMA), 2004. This division is responsible for reviewing EIA reports submitted by developers, conducting site visits, and ensuring compliance with approved mitigation measures.
- Environmental Monitoring and Reporting Division focuses on monitoring the quality of the environment (air, water, soil, etc.) across the country. It is tasked with collecting data, analyzing environmental trends, and preparing reports that inform decision-makers. Key functions also include monitoring pollution levels, waste management practices, and environmental compliance.
- Legal and Enforcement Division is responsible for enforcing environmental laws, ensuring compliance with regulations, and taking legal action against violators. It handles environmental violations, such as illegal logging, pollution, unapproved development, and wildlife trafficking. The division may issue fines, penalties, or take legal action against offenders.
- NEMC has regional offices in different parts of Tanzania to support decentralized environmental management efforts. These offices are crucial for monitoring local compliance, providing technical support, and liaising with local authorities and communities. The regional offices are typically located in key administrative regions across the country.

As described, NEMC has a key role in enforcing environmental laws and regulations in the country, but its capacity in this area can be subject to various challenges and limitations.

NEMC has qualified staff, including environmental officers, legal experts, and technical specialists, who are responsible for monitoring environmental compliance and enforcing regulations. However, the number of staff relative to the scale of Tanzania's environmental challenges is often insufficient. Despites the efforts to train its staff, there are be gaps in specialized technical expertise, particularly in new or emerging areas like climate change adaptation and environmental monitoring using advanced technologies. NEMC's ability to carry out environmental inspections and monitoring in remote or rural areas can be limited by a shortage of field staff, transportation, and logistical support. NEMC faces financial constraints that affect its ability to hire sufficient staff, acquire the necessary equipment (e.g., monitoring tools, vehicles), and carry out frequent inspections. This limits the scope and frequency of enforcement activities.

To enhance NEMC's enforcement role, several measures could be considered:

- Providing NEMC with more financial resources, staffing, and operational support would enable more regular inspections, better monitoring, and more effective enforcement.
- Decentralizing enforcement activities and building the capacity of local authorities and communities to monitor and enforce environmental regulations would enhance the effectiveness of NEMC's work.

Expanding the use of technology for real-time monitoring (e.g., satellite surveillance, drones, mobile applications) and improving data management systems would enhance the ability to track violations and respond promptly.

5.3.7 Ministry of Natural Resources and Tourism

The MNRT is responsible for managing and conserving Tanzania's natural and cultural assets, as well as promoting tourism development. It includes several subdivisions relevant to the project, such as the Forestry and Beekeeping Division, Wildlife Division (mandated by the Wildlife Act, 2013), Antiquities Division (established under the Antiquities Act Cap 333, 1979), and Tourism Division (with defined functions outlined in the Tourism Act, 2008).

5.3.8 Sector Ministries Environmental Sections

Environmental sections, established under EMA Section 30, are responsible for addressing and reporting sector-specific environmental issues. The EIA and Audit Regulations (2005) assign specific functions to relevant sector ministries, including participation in a cross-sectoral advisory committee for reviewing EIA, verification of audit reports, monitoring of ongoing projects, and submission of monitoring reports to the National Environment Management Council (NEMC).

5.3.9 Regional Secretariats

The Regional Secretariats are responsible for coordinating environmental management advice within their respective regions. They work closely with the Department of Environment (DOE) and the Director General of the National Environment Management Council (NEMC) to ensure the implementation and enforcement of the Environmental Management Act (EMA). Each Secretariat is headed by a Regional Environment Management Expert, appointed by the Minister responsible for Regional Administration. This Expert offers guidance to local authorities regarding the implementation and enforcement of the EMA. They also act as a vital link between the region, the Director of Environment, and the Director General of NEMC, facilitating effective communication and coordination.

5.3.10 Local Government Authorities

Local Government Environmental Management Officers, appointed by each City, Municipal, District, and Town Council, have various responsibilities. These include overseeing the enforcement of the Environment Act, advising the Environment Management Committee, promoting environmental awareness, reviewing by-laws on environmental management and sector-specific activities, and reporting on the implementation of the EMA to the Director of Environment and the Director General. The City, Municipal, and District Environment Management Committees are responsible for functions outlined in the Local Government Act. They also carry out functions specified by the EMA and may be tasked by the Minister to execute directives aimed at promoting sustainable environmental management. Township Environment Management Committees are responsible for managing the environment within their jurisdictions and fulfilling duties assigned by the Minister of Councils to advance environmental sustainability.

5.3.11 Standing Committee on Urban Planning and Environment

According to EMA Section 37, environment standing committees must perform additional functions as prescribed by the EMA or assigned by the Minister for Environment. Additionally, Section 41 grants general powers to each environment management committee within their respective administrative areas. The powers of the committee include initiating inquiries and investigations, summoning individuals to provide information, resolving conflicts between parties, inspecting and examining premises involved in the transport or storage of pollutants, ordering the removal of harmful substances or articles, and initiating civil or criminal proceedings in response to violations of directives issued by the committee.

5.3.12 Environment Management Officers, designated or appointed

The Environmental Management Act, Cap. 191, requires Local Government Authorities (LGAs) to appoint public officers responsible for managing environmental aspects on a daily basis. These officers and committees are designated at two levels of local government administration: upper level (city, municipal, town, and district councils) and lower level (township, ward, mtaa, village, and subvillage (Kitongoji)). Their duties include enforcing the EMA, advising the environment management committee, reporting on the local environment's status, and monitoring the preparation, review, and approval of Environmental Impact Assessments (EIAs) for local investments.

5.3.13 OSHA

The Occupational Health and Safety Authority (OSHA) is a legally established Authority in the country which performs the role of inspection and advising the government on matters related to occupational, health and safety at work places (construction sites for bridges, roads, dams and steel structures).

5.3.14 Marine Parks and Reserves Unit (part of the Ministry of Agriculture, Livestock and Fisheries)

The Marine Parks and Reserves Unit, established under the Marine Parks and Reserves Act (1994), Cap 146, holds responsibility for various key functions. It oversees the management and administration of marine parks and reserves, ensuring their sustainable use. Additionally, the unit facilitates research and monitors resource conditions and uses within the marine protected area.

6 ENVIRONMENTAL AND SOCIAL BASELINE

A baseline study defines the 'pre-implementation exposure' condition for the set of indicators that will be used to assess impacts of construction activities in the area. When compared with the condition of the same indicators at some point during and post-implementation, the baseline study forms the basis for a 'before and after' or 'change over time' assessment. Without baseline, data to establish pre-operation conditions for outcome and impact indicators it is difficult to establish whether change at the outcome level has in fact occurred.

Therefore, environmental and social baseline conditions existing at the proposed project area and the surrounding community that will likely be affected by the project's activities are examined.

6.1 Study Area

To facilitate a comprehensive analysis within the project's framework and typology, this document delineates distinct study areas. These areas include:

1) A specific study area for Pemba Island;
2) A specific study area for Tanga, on Tanzania mainland;
3) A deep-sea study area for the interconnection.

The identified study areas are named **Areas of Influence** (AoIs).

Regarding points 1 and 2, the AoIs were identified through consultations and guidance from the relevant authorities. These include the marine landing points and the onshore parts of the project. The following parameters were considered, in consultation with the client and relevant authorities:

- Landing point locations;
- Approximative transition point location;
- Transmission line corridors.

For the study areas related to Pemba Island and Tanga:

- The project **Direct Areas of Influence** (AoIs) are defined based on the project footprint, including the landing point, transmission line corridor (Right of Way), substations and all ancillary project components.
- The **Indirect Area of Influence** (IAoI) for the project is primarily determined by **potential impacts** on biological, ecological and social factors. It has been identified as a 500-meter zone surrounding the project footprint for the terrestrial part and a 1-km buffer surrounding the project footprint from the coast and along the proposed marine route to a depth of 40 m. This depth limit was chosen because the coastal project area is not used by large vessels for anchoring, only by smaller boats like canoes. For the proposed substation, it was considered a 1-km buffer.

The project **footprint** has been calculated considering a width of 1.5 m for underground cable area and extra 3.5 m of temporary land occupation during construction phase for machinery movements**.** Submarine cable footprint was calculated for a width of 5 m.

Table 6- 1 – Project footprint and temporary land occupation for machinery movements in hectares

	Project Footprint (ha)	Temporary Land (ha)
UGC	1.26	2.94
Submarine Cable	0.041	NA
Substation	0.35	NA
Total	1.65	2.94

Regarding point 3, the deep-sea area is the link between the two landing points and was designed as a polygon sufficiently wide to account for possible environmental constraints in seafloor morphology and biodiversity sensitivities. This area was designed considering the proposed marine route and landing points.

For the deep-sea study area:

- The project **Direct Areas of Influence** (AoI) is defined based on the project footprint (marine cable route).
- The **Indirect Area of Influence** (IAoI) for the project is primarily determined by potential impacts on biological and ecological factors. It has been identified as an area of 10 kilometres surrounding the project footprint. This area considers the high mobility of marine species and potential disruptions from noise and lights. For instance, marine mammals known to migrate and feed within the project area, due to their high mobility, may be affected by those impacts that may occur within a larger area (e.g., noise, lights).

Such areas are shown below.

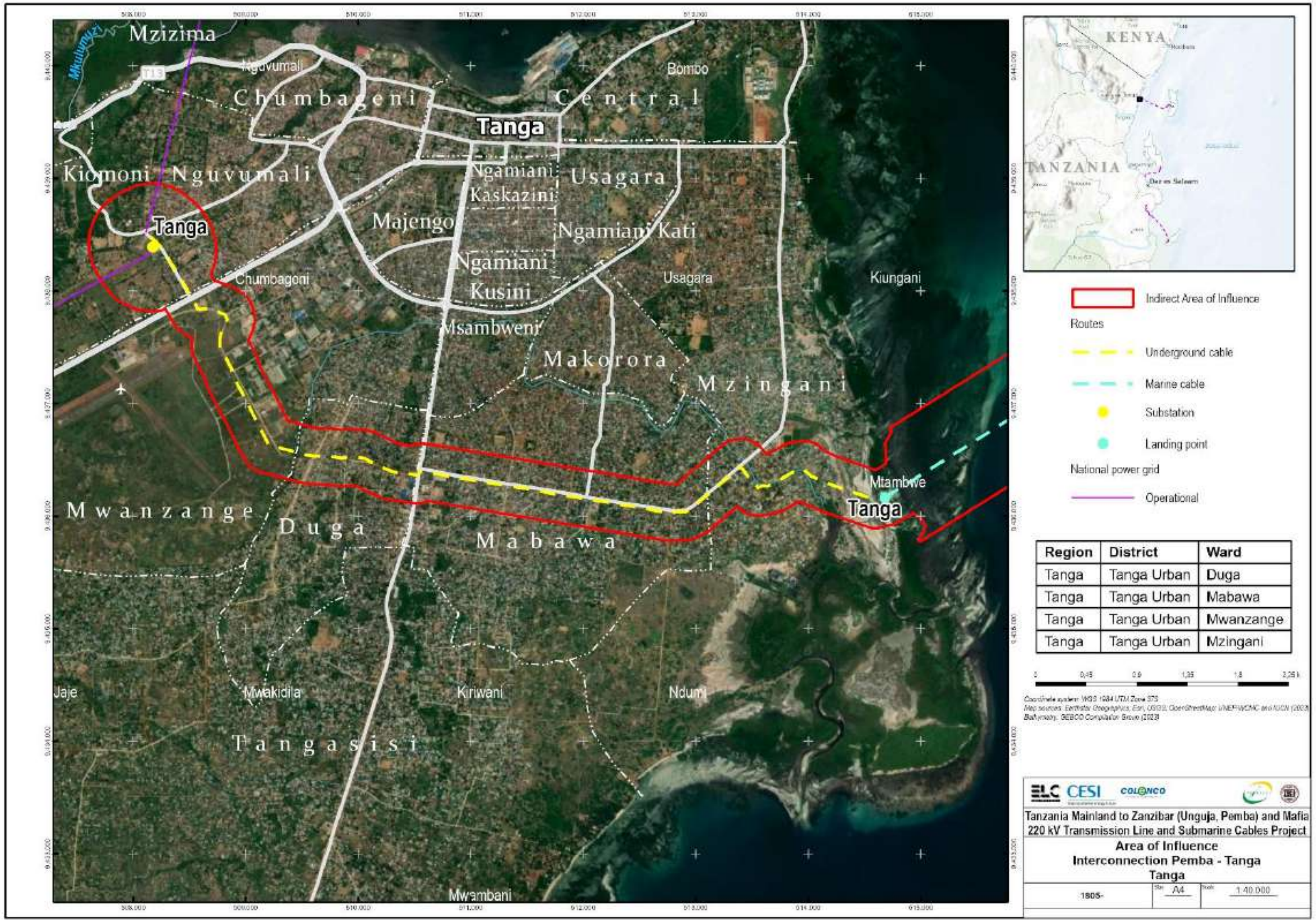


Figure 6- 1 – Tanga Area of Influence

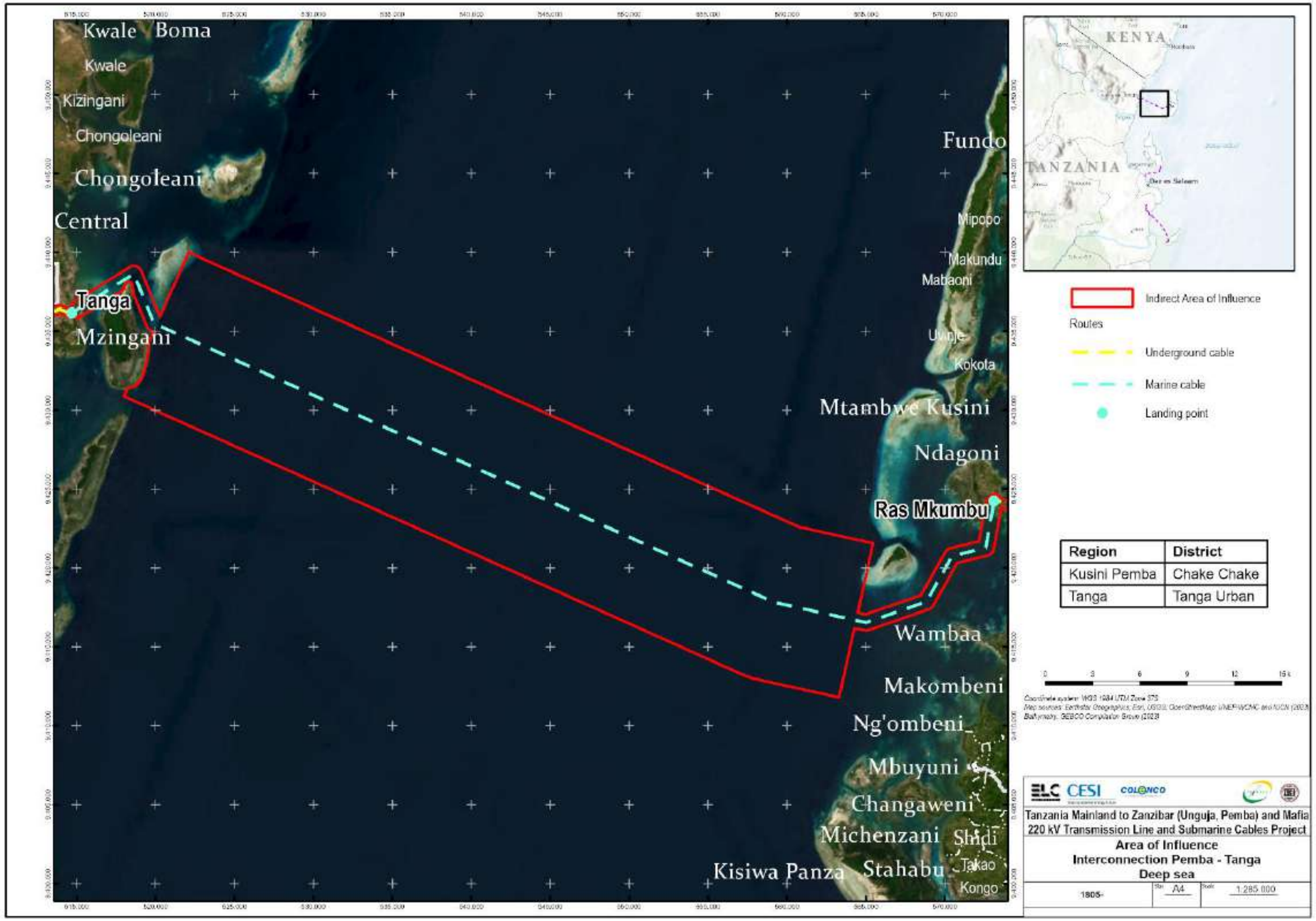
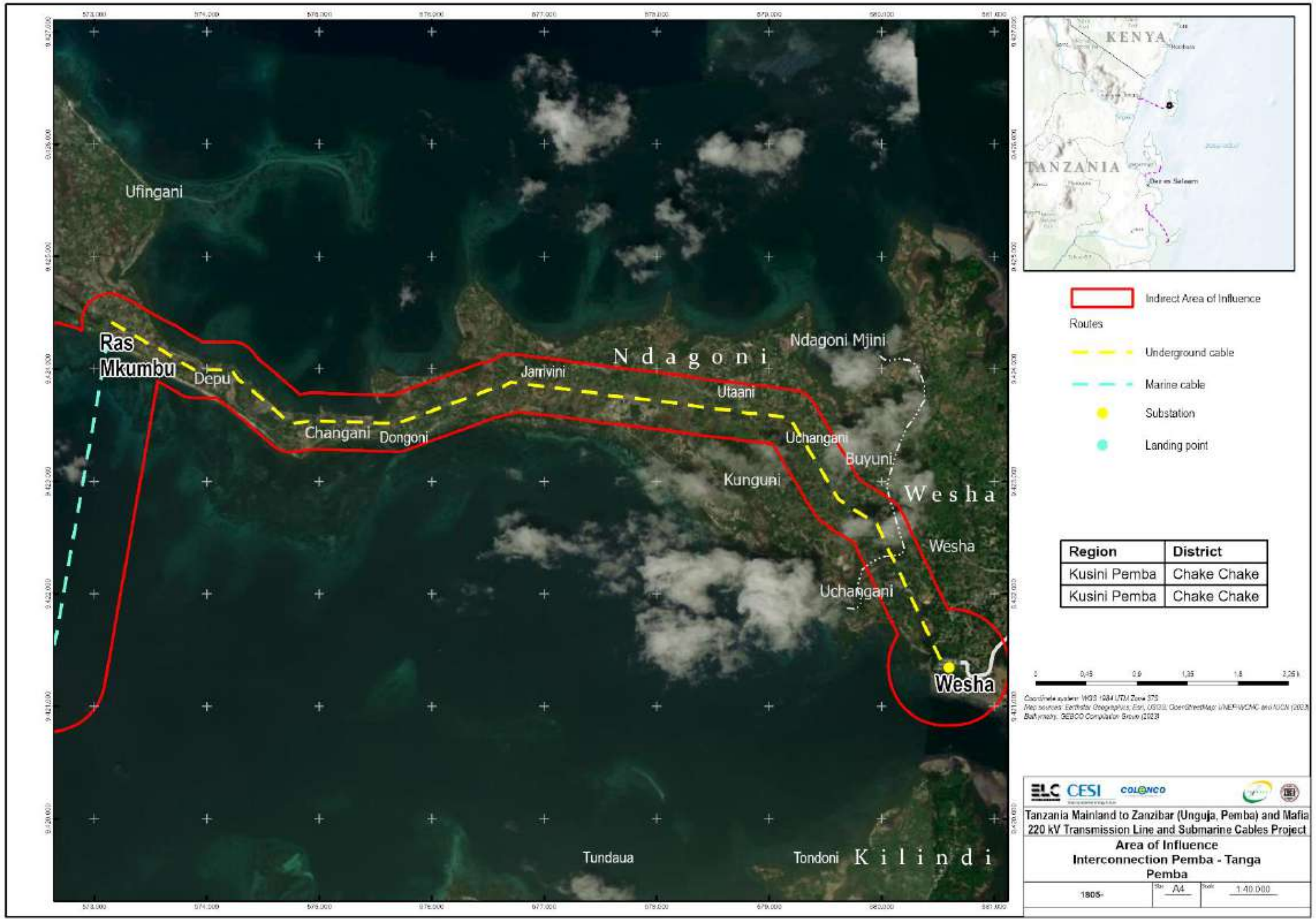


Figure 6- 2 – Deep-sea Area of Influence



Region	District
Kusini Pemba	Chake Chake
Kusini Pemba	Chake Chake

Figure 6- 3 – Pemba Island Area of Influence

6.2 Onshore Baseline

6.2.1 Physical Environment

6.2.1.1 Climate

The climate of Tanzania can broadly be classified into four types: the hot, humid coastal plains; the hot, arid zone of the central plateau; the high, moist lake regions; and the temperate highland area.

The monsoons have the dominant influence on wind direction and strength, temperature and rainfall, among others. There are two monsoon seasons, namely the Northeast monsoon which prevails from November to February and is characterized by higher air temperatures (> 30°C) and weaker winds, and the Southeast monsoon which lasts from April to September and is marked by lower air temperature (approximately 25°C) as well as stronger winds. Occasionally, the Southeast monsoons are associated with epidemic events such as storms and cyclones.

The months of March/April and October/November are the inter-monsoon periods and usually are the calmest. June and July are the windiest months while March, April and November experience the lowest and most variable wind speeds.

The mean temperature prevailing in Tanga is recorded as 26.0 °C and the fluctuation of temperatures across the seasons is referred to as 4.3 °C. About 982 mm of precipitation falls annually. Precipitation is the lowest in February, with an average of 35 mm. On average, the highest amount of rainfall occurs during May with a mean value of 175 mm (Table 6- 2).

Table 6- 2 – Humidity, temperature, precipitation and sunshine at Tanga[1]

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
HR (%)	70%	69%	75%	81%	82%	79%	77%	78%	77%	78%	80%	75%
Temp. Min (°C)	25	25.1	25	24.2	23.1	21.9	21.1	21	21.5	22.4	23.5	24.5
Temp. Max (°C)	32.6	32.9	32	29.6	28	27.3	27.1	27.5	28.5	29.2	29.8	31.5
Rainfall (mm)	36	35	96	154	175	55	47	54	53	101	96	80
Days with precip.	6	6	15	19	15	11	12	13	13	15	17	14
Daily hours sunshine	9.0	8.8	8.1	7.0	7.3	8.1	8.1	7.8	7.5	7.1	7.5	8.9

6.2.1.2 Climate change

Tanzania, like many developing nations, is highly susceptible to the impacts of climate change, with its islands and coastal regions particularly vulnerable to rising sea levels. The country has experienced increasingly severe climate-related events, including extreme rainfall, floods, droughts, strong winds, and higher temperatures, all of which threaten the livelihoods of those with limited capacity to adapt.

In 2023, Tanzania recorded its warmest year since 1970, with a significant rise in nighttime temperatures, especially in August, September, and October. During these months, air temperature

[1] https://it.climate-data.org/

anomalies were recorded at 1.1°C, 1.0°C, and 1.2°C above normal, respectively. Similarly, the average minimum temperature anomalies were 1.4°C, 1.5°C, and 1.5°C, reflecting unusually warm nights. The average maximum temperature anomalies during this period were slightly lower, at 0.7°C, 0.5°C, and 0.9°C, indicating that nighttime temperatures increased more sharply than daytime ones.[2]

6.2.1.1 Winds

Tanga's daily mean wind speed was about 5.5 ms^{-1}. Monthly variations showed that the strongest wind speeds in Tanga occurred from June through September during the SE Monsoon, peaking at 3.7 ms^{-1} in July. Smaller peaks were observed in January at about 3.0 ms^{-1}. The months of March and November experienced minimum monthly mean wind speeds during the NE Monsoon.[3]

Zanzibar is more exposed to prevailing winds in the general circulation, whereas Dar es Salaam and Tanga are shielded by the islands of Zanzibar.

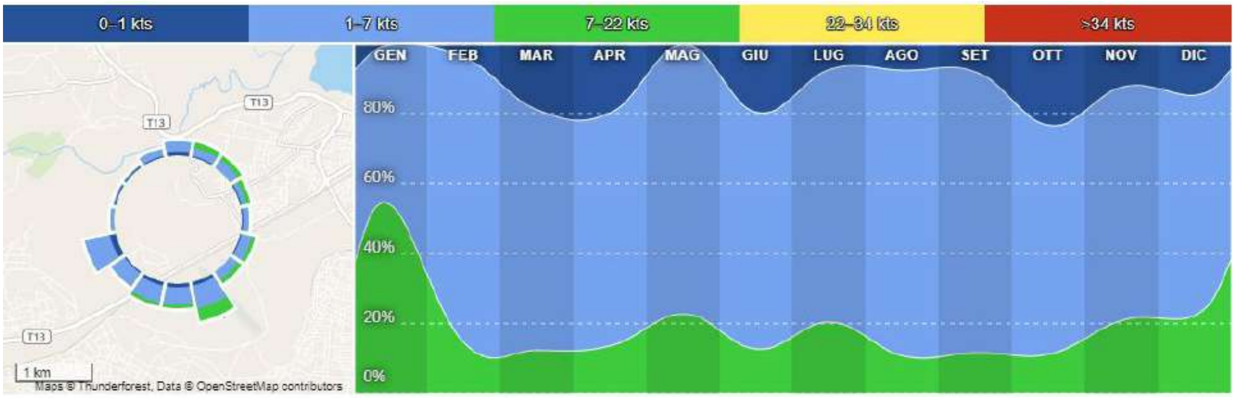


Figure 6- 4 – Monthly distribution of wind direction and intensity of Tanga[4]

Effect of breezes

Along tropical coastlines, sea breezes typically dominate during the day, while land breezes prevail at night. This pattern is due to pressure gradients caused by the differential heating and cooling of the land and water.

The few calm periods observed at 15:00 during the NE Monsoon (November to March) were due to sea breezes influencing the general surface circulation. In contrast, at 09:00, the general circulation is weakened by land breezes, resulting in more calm periods. Similarly, during the SE Monsoon (April to October), sea breezes strengthened the general circulation, while land breezes weakened it. However, the effects of sea and land breezes were generally weaker during the NE Monsoon because of the smaller temperature differences between the land and water during this season.[5]

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[2] Statement on the Status of Tanzania Climate in 2023, Tanzania Meteorological Authority (TMA)

[3] *Wind patterns of coastal Tanzania: Their variability and trends*, S.B. Mahongo et al., 2012

[4] https://it.windfinder.com/

[5] Wind patterns of coastal Tanzania: Their variability and trends, S.B. Mahongo, 2012

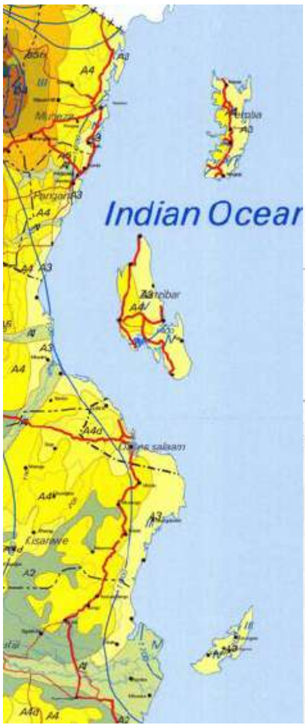
6.2.1.2 Geology and geomorphology

Most of the country lies on the Great African Plateau with altitudes ranging between 1,000 and 2,000 m above mean sea level, the exception being the narrow coastal belt.

The coastal plains are composed of both marine and terrestrial sediments. If we refer to the Geologic Time Scale, the ages of sediments range from Jurassic through Cretaceous to Tertiary and Quaternary.

Much of the coast is of Pleistocene and recent coral limestone. A belt inland from the coast, an area of continental and coastal deposition of Cretaceous and Tertiary period, includes limestone, sands and gravel. The marine rocks consist chiefly of marls, limestone and shells (see A4 and A3 in Figure 6- 5).

Tanzania is mostly underlain by rocks of igneous metamorphic origin, part of the crystalline complex that makes up the interior of Africa. Intense structural movements have caused a considerable variety of rock types.



PHYSIOGRAPHIC REGION				SOIL AREAS (as % of mapping unit)													
LANDSCAPE TYPE	DOMINANT PARENT ROCK/ MATERIALS	MAPPING UNIT (area km2)	TOPOGRAPHY (with soil area numbers)	AREA NUMBER	Reddish sandy soils (ORUSENGA)	Bleached sandy soils (ORUSENYI)	Reddish loamy to clayey soils (KIKUNGU)	Acid clay soils (ORUHAMA)	Calcareous clay soils (IBUSHI)	Hard pan soils (ITOGORO/IBAMBASI)	(Sandy) groundwater soils (IPWISHI)	Layered soils (LALAGO)	Cracking clays (MBUGA)	Salt affected soil (BUBUNI)	Vulcanic soils (KITIFU)	Organic soils	Shallow soils
Low altitude Coastal plains at 0–200 m	Stream deposits (Recent)	A1 4415	Flat	1								40					
				2									40				
				3										10			
				4							10						
	Stream deposits (Sub-recent)	A2 8822	Gently undulating	1	30												
				2		30											
				3						10							
				4									30				
	Limestone, marl & clay (Pleistocene)	A3 7635	Gently undulating	1													10
				2		60											
				3							10						
				4									20				
	(Plio-Pleistocene) Coastal sand & clay	A4 28718	Undulating	1	80												
				2		10											
				3							10						
	Coastal sands shallow over limestone, shale & marl	A4d 4681	Rolling to steeply dissected	1		10											
				2			50										
				3													30
				4								10					

Figure 6- 5 – Geological map of coastal Tanzania and islands[6]

6.2.1.3 Soil

The soil types of coastal areas in Tanzania include: recently deposited alluvium that is mostly found in river estuaries; dark clays on older alluvial deposits which are found along the Rufiji Delta and Tanga; and grey bottomland soils, found mainly in the coastal plains.

In the coastal area, the soils are predominantly sandy and coralline with poor moisture-holding capacity, extreme alkalinity and hard subsoil, resulting in poor drainage.

[6] Land resources map of Tanzania, EUROPEAN SOIL DATA CENTRE (ESDAC), 1988

6.2.1.4 Water resources

According to the report of UNEP (2001), the coast is strongly influenced by rivers that bring to it water, sediment, nutrients and pollutants. Tanzania is traversed by a number of rivers and streams. The Rufiji, one of the largest rivers in Africa, contributes 50% of the surface runoff. The river has an annual discharge of 1133 m^3/s.

The surface river flow regime and moisture conditions in the country correspond to the general rainfall pattern. The peak outflow from major rivers that discharge into the Indian Ocean occurs between March and May. Rivers and lakes start rising in November/December and experience a maximum in March–April, with a recession period from May to October/November.

Pemba Island and Tanga in Tanzania share a complex interplay of water resources. Pemba, being an island, primarily relies on rainfall for its freshwater needs, with groundwater sources playing a supplementary role. However, the island's porous geology often leads to rapid infiltration, making water availability inconsistent. Tanga, on the mainland, benefits from a mix of river systems and groundwater, but faces challenges due to increasing population, industrialization, and climate change impacting rainfall patterns. Both regions grapple with water scarcity during dry seasons, emphasizing the need for sustainable water management strategies, including rainwater harvesting, efficient irrigation, and protection of water bodies.

Groundwater resources

Groundwater potential in Tanzania, whose recharge is mainly from rainfall, varies from one locality to another and so does its development.

The country as a whole has a good potential of groundwater resources. With the exception of the Pangani river basin, groundwater development has mainly concentrated on shallow wells for domestic purposes.

The groundwater mineralisation process in various geological formations has resulted in differences in chemical water quality in different parts of the country. Along the coast and on islands, the groundwater is salty in most areas. In most cases, electrical conductivity exceeds 2000 S/cm thus making the water undrinkable and certainly unsuitable for irrigation. Such situations occur where boreholes are sunk into basement rocks. High levels of iron, colour, turbidity and COD (chemical oxygen demand) is a major problem in many water sources. Bacteriological quality of deep groundwater in the country is generally better than that of shallow wells and surface water. In most cases, the water does not need to be disinfected unless it has been contaminated, mostly with faecal matter.

6.2.1.5 Air quality

An air quality assessment was conducted within the project area to establish baseline conditions prior to project implementation. A field survey carried out in June 2024 measured Total Volatile Organic Compounds (TVOC), formaldehyde (HCHO), PM2.5, and PM10.

For the survey, a Temtop LKC-1000S+ 2nd Generation air quality monitor was used. This monitor is capable of measuring PM2.5, PM10, particulate matter, formaldehyde (HCHO), Total Volatile Organic Compounds (TVOC), temperature, and humidity.

The field survey was conducted at two sampling points. Their locations are shown in Figure 6- 6, while their GPS coordinates (WGS84 UTM Zone 37S) are reported in Table 6- 3.

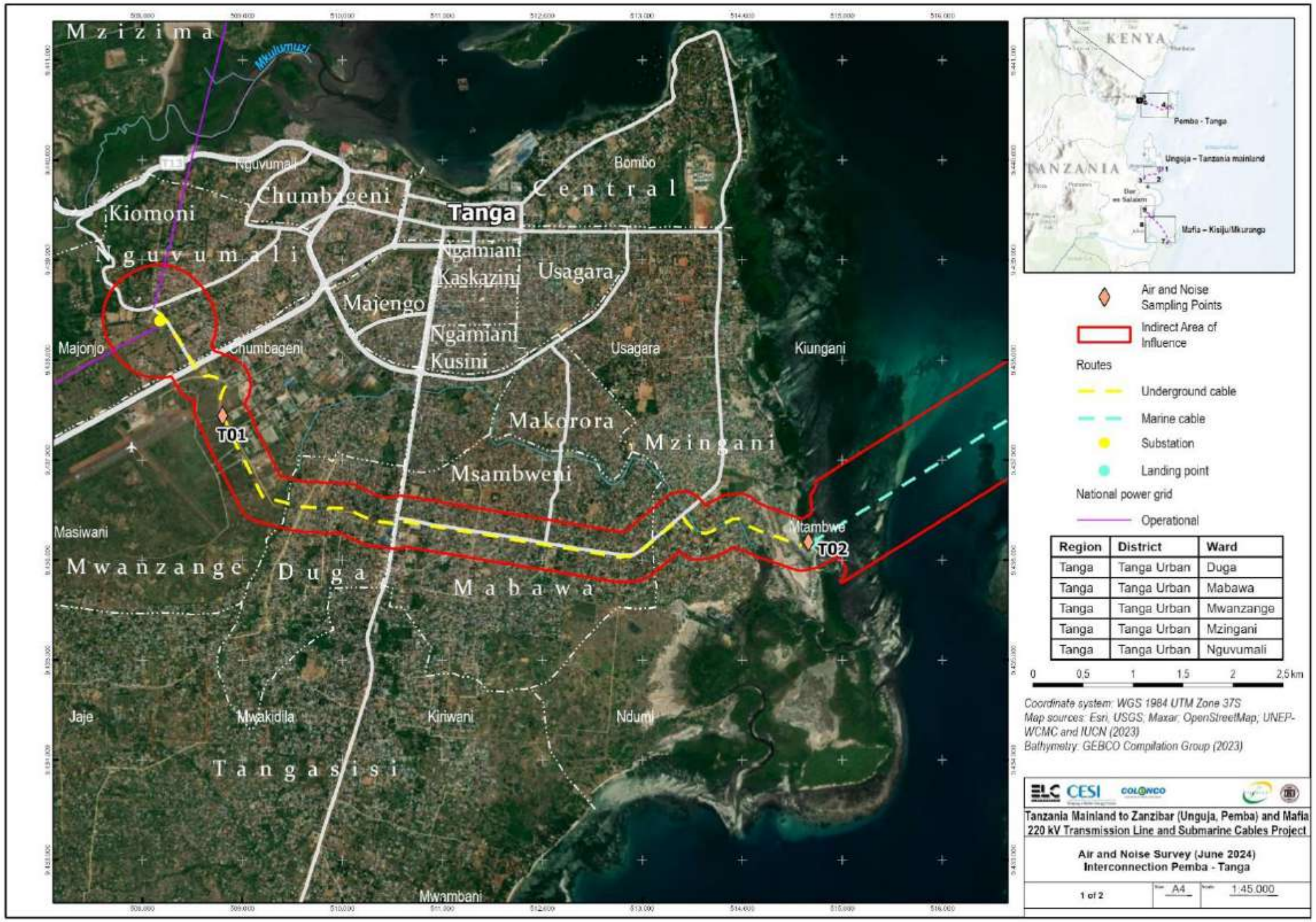


Figure 6- 6 – Air quality and noise sampling points

The following regulations were considered in interpreting the results:

- Environmental Management Act, 2004. The Environmental Management (Air Quality Standards) Regulations, 2007;
- International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines;
- World Health Organization's Air Quality Guidelines (AQG).

Results of the survey are presented in Table 6- 4.

Gaseous emissions and particulate matter remained within established standards, indicating that the air quality is generally good, and there are no major sources of pollution. Overall, the air quality in the project area is good, indicating satisfactory conditions with little or no risk from air pollution.

Word Health Organization proposes four steps of emissions reductions and a final target called air quality guideline (AQG) for ultrafine particles: PM2.5 (15 µg/m3), PM10 (45 µg/m3). Both limits are fully respected by the measured samples with slightly higher values in Tanga due to the closer urban centre.

The WHO does not explicitly provide HCHO limits for outdoor air in its guidelines. Instead, it focuses on indoor air quality, where exposure risks are higher due to limited ventilation and the presence of emission sources like construction materials. The recommended indoor limits are 0.1 mg/m^3 for short-term exposure and 0.2 mg/m^3 for long-term exposure, as set out in its 2010 guidelines.

For outdoor environments, regulatory approaches often reference workplace or industrial standards rather than public exposure limits, as ambient HCHO levels are typically much lower. Given this, indoor limits can be used as conservative benchmarks to evaluate outdoor exposure risks, recognizing they are designed for more confined settings.

The International Finance Corporation's general EHS guidelines on ultrafine particles pollution refer to the previous WHO thresholds, which were less stringent than the current ones.

The Environmental Management Regulations of 2007 fixes a maximum daily average of hourly values of 100 µg/m^3 for PM10. No information about other air pollutants is reported in these documents.

Total Volatile Organic Compounds (TVOCs) are addressed in the WHO Guidelines for Indoor Air Quality and the WHO Air Quality Guidelines for Europe. Although the thresholds are specified for individual volatile compounds, the combined total should not exceed 230 mg/m^3. This is significantly higher than the 0.04 mg/m^3 peak measured in the field.

Table 6- 3 – Air quality and noise sampling points and coordinates

ID	Description	Coordinates (WGS84, UTM 37S)		Date
		X	Y	
T01	Landing point	9437443	508803	08/06/2024
T02	Along the underground cable route, existing substation area	9436181	514662	08/06/2024

Table 6- 4 – Results of air quality survey (June 2024)

ID	Date	Hour	Temp.	Humidity	TVOC (mg/m^3)	HCHO (mg/m^3)	PM2.5 ($\mu g/m^3$)	PM10 ($\mu g/m^3$)	Particles (per/L)	Quality*
T01	08/06/2024	12:15	30°C	69%	0.04	0.01	5.9	9.7	875	Good
T02	08/06/2024	09:50	29°C	67%	0.04	0.01	12.3	20.7	1816	Moderate

*According to EPA standards

6.2.1.6 Noise quality

Excessive sound is recognized as environmental pollution under the Environmental Management Act, 2004. The Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015 prescribe the maximum permissible noise levels for places of entertainment located within residential areas. During daytime, from 6:00 am to 10:00 pm, the permissible noise level is 60 decibels, while during nighttime, from 10:00 pm to 6:00 am, it is 40 decibels. Emission of sound above these levels requires a permit from the National Environmental Management Council.

Noise assessments were conducted across the project area in June 2024, coinciding with the locations of the two air quality sampling points (see Table 6- 3). For conducting the survey, a sound level meter (Testo 815) with a windscreen was used, with the frequency analysis set to characteristic curve A. For each location, a calibrator was used to recalibrate the instrument directly on site.

The following regulations were considered in interpreting the results:

- Environmental Management Act, 2004. The Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015;
- International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines;
- World Health Organization's Environmental Noise Guidelines.

Results of the survey are presented in Table 6- 5. During the survey, baseline noise levels ranged from 31.3 to 72.8 dBA, primarily attributed to traffic on paved roads. The majority of recorded values and averages comply with the national daily limit for residential areas of 60 dBA. Traffic noise is also regulated by national legislation, with limits ranging from 78 to 83 dBA. Noise values taken in traffic roads comply with these limits. The noise limit of the IFC Guideline of 2007 of 55 dBA is not consistently respected. The exceedances of limits measured were caused by traffic noise and handicraft activities.

Table 6- 5 – Results of noise assessment survey (June 2024)

ID	Date	Hour	Min (dBA)	Max (dBA)	Average (dBA)	Remarks
T01	08/06/2024	12:15	37.4	58.1	47.8	Partly cloudy. Quiet environment, with people working and repairing a vessel by hand.
		12:20	44.8	55.1	50.0	
		12:25	41.7	52.7	47.2	
		12:30	39	54	46.5	
		12:35	41.3	56.7	49.0	
T02	08/06/2024	09:50	33.6	43.5	38.6	Partly cloudy. Dirt road in good condition. Sounds of motorbikes and people riding bikes. Music in the distance.
		09:55	37.6	56.3	47.0	
		10:00	36.5	68.3	52.4	
		10:05	34.3	72.8	53.6	
		10:10	36.5	72.5	54.5	
		10:50	41.9	50.6	46.3	
		10:55	39	45.9	42.5	
		11:00	41.6	46.9	44.3	
		11:05	42.3	49.5	45.9	

6.2.2 Biological Environment

6.2.2.1 Methodology

Before the site visit, a literature review and desktop activities were conducted to collect data for the following purposes:

- Define a list of flora and fauna species potentially present within the study area, including information on species taxonomy, national and global protection, and conservation status;
- Identify potential habitats present within the study area;
- Identify protected and internationally recognized areas of biodiversity importance within 20 km of the study areas;
- Assess the presence of potential Critical Habitats (CH) within the study area.

*6.2.2.1.1 **Literature review***

The literature review focused on the study area to document available information on the local and global distribution, conservation status, ecological niche, phenology, life cycle, and other aspects of species and ecological features of conservation concern. Both scientific literature and "grey" literature were considered to provide an overview of the biodiversity-sensitive elements potentially present in the area. The literature review included the following:

- The Bioregions: https://www.oneearth.org/bioregions/
- Key Biodiversity Areas (WDKBA): http://www.keybiodiversityareas.org/
- World Database on Protected Areas (WDPA): https://www.protectedplanet.net/
- Wetlands of International Importance: https://www.ramsar.org/
- The IUCN Red List of Threatened Species - Version 2024-1: https://www.iucnredlist.org/
- BirdLife International: https://www.birdlife.org/
- The World Flora Online Plant List: https://wfoplantlist.org/
- Fishbase: https://www.fishbase.in/

*6.2.2.1.2 **Wildlife survey***

Wildlife fieldwork was conducted within the study area by Ms. Arianna Longarini (ELC) and Ms. Federica Fonda (University of Trieste). The survey was carried out from June 3rd to June 9th, 2024, with the aim of evaluating the baseline conditions in the project area. Specifically, field studies were conducted to:

- Identify the presence of threatened fauna species (CR, EN, and VU according to the IUCN Red List) and endemic fauna species;
- Identify any species that are particularly vulnerable to the potential impacts of the proposed project;
- Identify current and potential threats to the wildlife and habitats within the project area.

Transects selection ensured representativeness across the project area and its various habitats. Details and coordinates (WGS84 UTM Zone 37S) of these transects are provided in Annex 5, while their location is shown in Figure 6- 7. Comprehensive photographic documentation was captured during the survey, encompassing faunal species, habitat characteristics, and any noteworthy disturbances.

The wildlife survey involved the following main field activities:

- **Vehicle-based survey:** this data collection method involves surveyors making observations and collecting data while travelling in a vehicle. Commonly used in wildlife studies, environmental assessments, bird surveys, roadkill monitoring and general biodiversity assessments, this approach involves driving along predetermined routes or transects. Surveyors observe and record information about the target species or environmental factors. To minimise disturbance to wildlife and the surrounding environment, the vehicle speed is kept low to allow for thorough observation and data collection.

The proposed routes of the transmission line roughly follow the roads. Baseline wildlife and habitat data were collected along the entire route, including:

- Documenting instances of roadkill, noting species and location using GPS coordinates.

- Making direct observations of birds and other wildlife, recording their locations, species and abundance (estimating abundance where accurate counts are not possible).

In those sections where the road crosses and/or is close to the proposed transmission line routes, the survey was more detailed and focused on additional aspects beyond those already mentioned:

- Bird (and other wildlife such as mammals) species diversity: start the survey maintain a slow and steady pace while driving along the designated route. Record information on species, approximate numbers, any notable behaviour or vocalisations, location and approximate distance from the road.

- **Transects**: these field survey activities involve the surveyor sampling wildlife in the field, walking a predetermined 500 m transect to collect habitat and wildlife data.

  This methodology involves conducting transect surveys, where surveyors systematically assess habitats and animals along designated paths. This approach provides valuable insights into the distribution, abundance and diversity of species in different habitats and landscapes.

  The surveyors recorded the presence and location of wildlife species encountered along the transect and note any direct or indirect sign of presence of animals, including: mammals, birds, herptiles and arthropods.

- Other opportunistic data: near and within project area, opportunistic data were collected on wildlife.

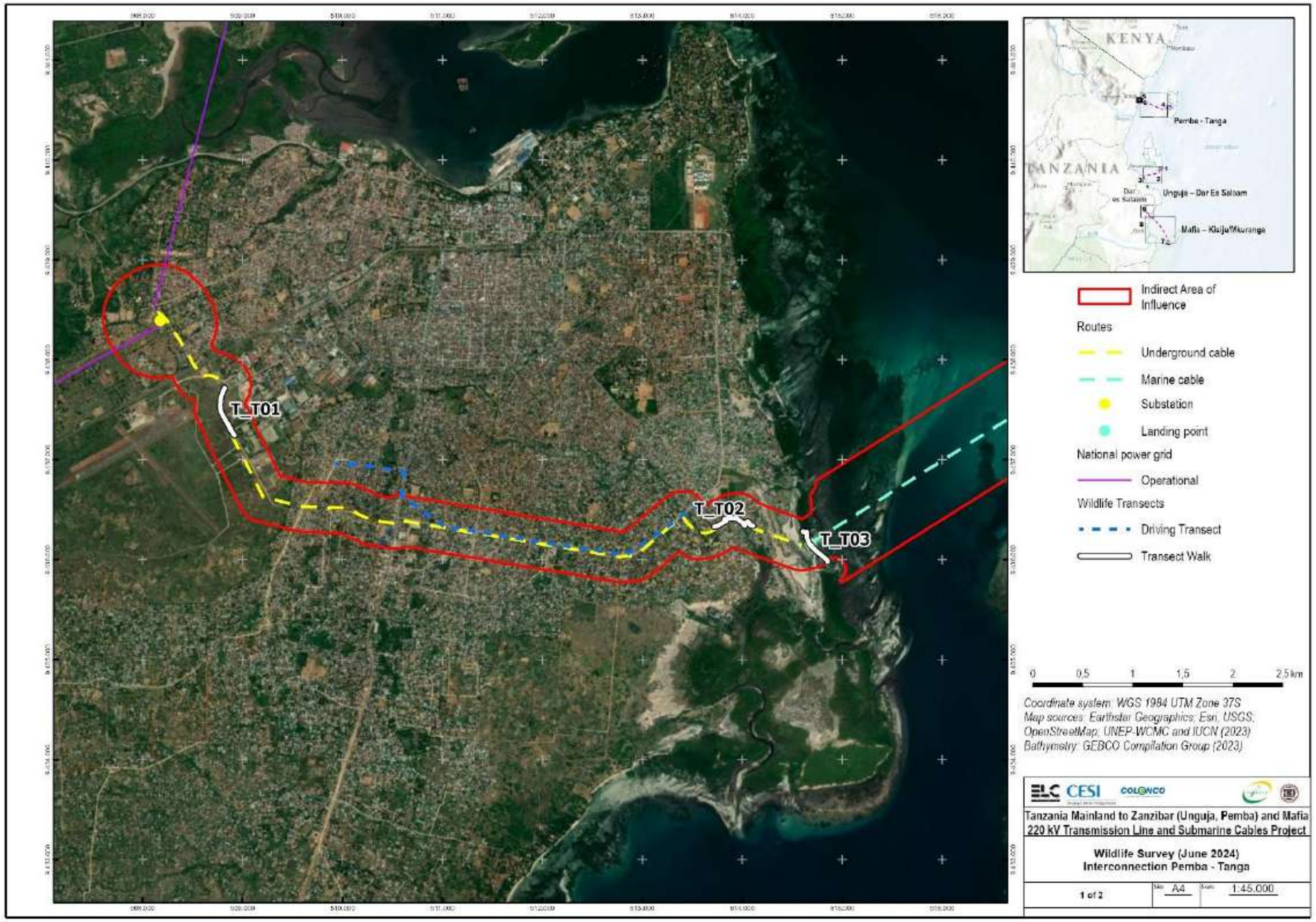


Figure 6- 7 – Wildlife survey transects

*6.2.2.1.3 **Flora and habitats survey***

Habitat and flora fieldwork was conducted within the study area by Prof. Dr. Emmanuel Nzunda (Sokoine University of Agriculture). The survey was carried out from June 3rd to June 9th, 2024, with the aim of evaluating the baseline conditions in the project area. Specifically, field studies were conducted to:

- Identify the presence of threatened flora species (CR, EN, and VU according to the IUCN Red List) and endemic flora species;
- Verify the habitats, with particular regard to natural habitats;
- Identify current and potential threats to the flora and habitats within the project area.

Transects and plots selection ensured representativeness across the project area and its various habitats. Details and coordinates (WGS84 UTM Zone 37S) of these transects are provided in Annex 5, while their location is shown in Figure 6-10. Comprehensive photographic documentation was captured during the survey, encompassing landscape features, vegetation composition, habitat characteristics, and any noteworthy disturbances.

The flora and habitat survey involved the following main field activities:

- **Transects**. These field survey activities involve the surveyor sampling vegetation in the field, walking a predetermined 500 m transect to collect habitat and vegetation data.

  The proposed methodology involves conducting transect surveys, where surveyors systematically assess habitats and plants along designated paths. This approach provides valuable insights into the distribution, abundance and diversity of species in different habitats and landscapes.

  Careful consideration is given to habitat diversity in determining the location of transects, with particular attention paid to sensitive habitats such as wetlands and riverine areas. Accessibility will also be considered and each transect will be located close to roads to facilitate implementation.

  During the transect surveys, surveyors collected data on plants and habitat. The surveyors involved meticulously recorded the following:

  1. Plant species: This includes trees, shrubs and herbaceous species encountered along the transect. Although the exact location of each plant species may not be possible, the surveyors will document their presence and estimate their abundance within the transect.
  2. Main habitats: The surveyors will consider each habitat type encountered within each transect. This information will provide insight into the extent and distribution of different habitats along the transect line.
  3. Abundance: For plant species, standardised abundance classes are used to document their relative abundance within each transect.
  4. Dominant species: Observations of the primary habitat type and any dominant species within each transect will be recorded.

By meticulously implementing this comprehensive data collection approach, the vegetation survey aims to provide a thorough understanding of the plant communities across different habitats within the project area. These findings will be invaluable in informing the environmental impact assessment and contributing to sound decision-making for the proposed transmission line project.

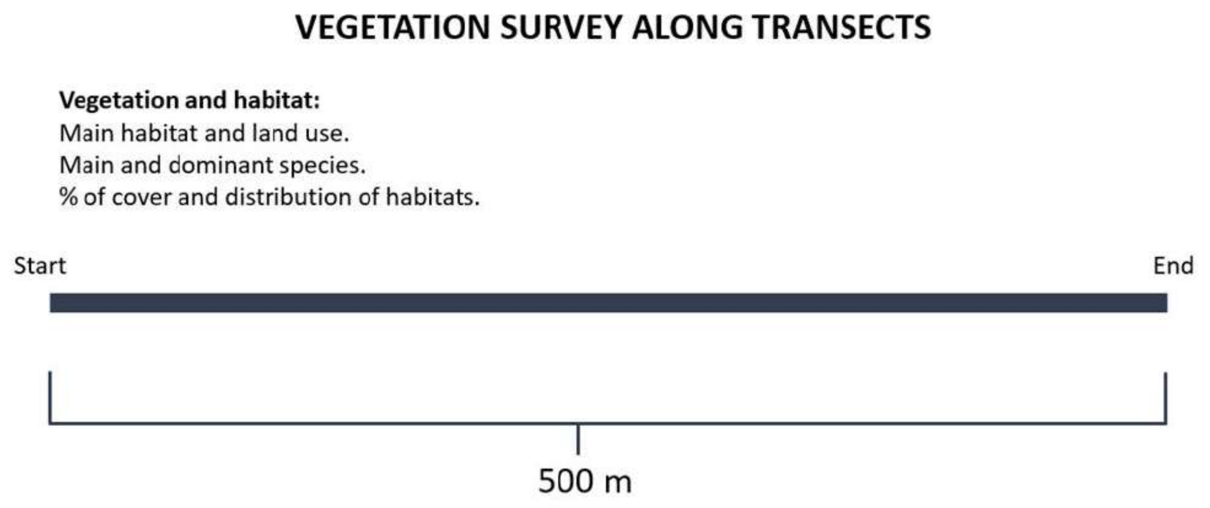


Figure 6- 8 – Scheme of the vegetation survey along transects

- **Vegetation plot** sampling is a systematic method used in ecology and environmental science to study and analyse plant communities in a given area. A 10x10 m vegetation plot is established at the start of each transect. The botanist has collected vegetation data including species name, abundance (% cover of the 10x10 m plot), habit, DBH and hight for trees, and local use of the plants.

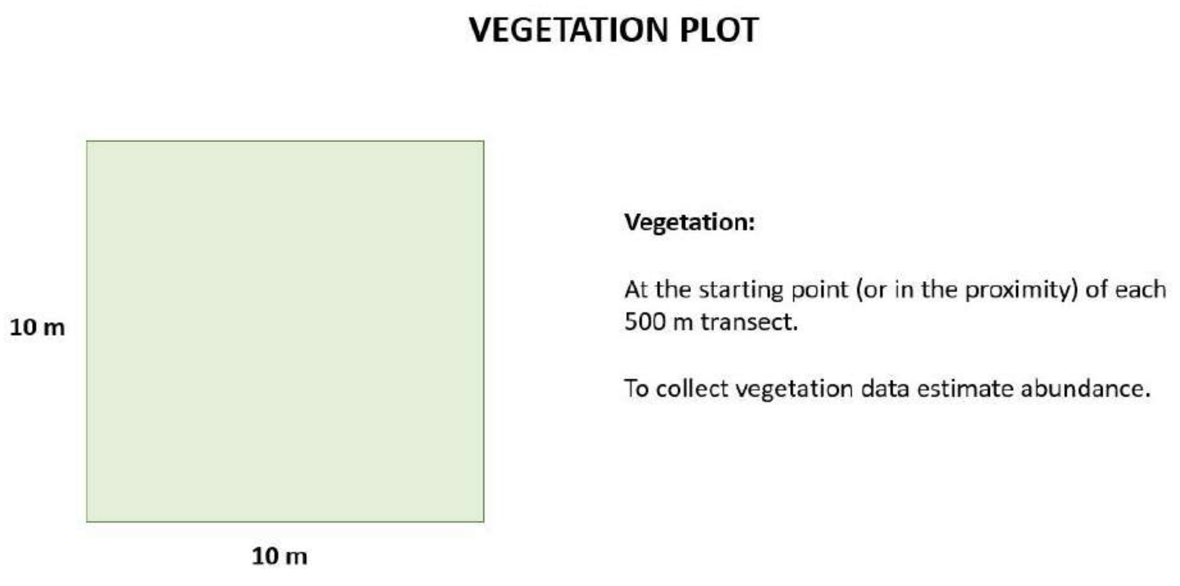


Figure 6- 9 – Scheme of vegetation plot

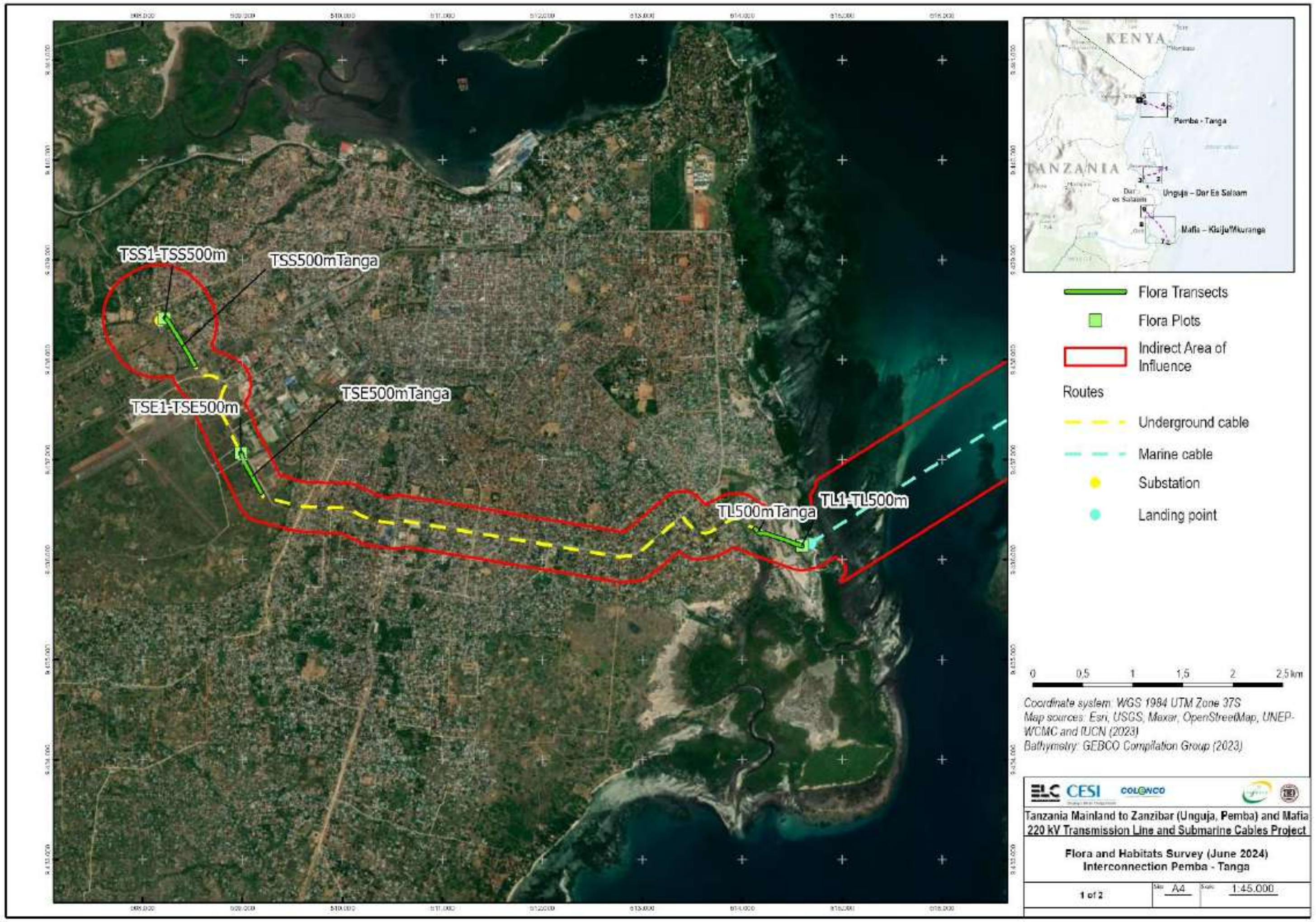


Figure 6- 10 – Flora and habitats survey transects

6.2.2.1.4 *Equipment*

A comprehensive array of essential equipment was used to facilitate the successful execution of all field activities:

1. Camera: the camera serves as an indispensable tool for capturing photographs during sampling activities, allowing for the meticulous documentation of various habitats and the presence or abundance of different species. By visually recording these crucial aspects, the camera enables accurate and thorough analysis, aiding in comprehensive assessments and conclusive findings.
2. Binoculars: specifically designed for enhanced visibility, binoculars play a pivotal role in the identification of bird species and other fauna. The capability to observe distant wildlife and closely inspect their distinctive features greatly contributes to accurate species identification, thereby enriching the overall data collection process.
3. GPS (Global Positioning System): employing advanced GPS technology, this essential device is instrumental in registering and precisely tracking survey points, transects, and species locations within the designated project area. The accurate geospatial data acquired through the GPS ensures the creation of reliable maps and facilitates data integration for informed decision-making.
4. Audio Recorder: designed to capture high-quality audio recordings, the audio recorder is of utmost importance in recording the vocalizations and calls of animals that may not be easily distinguishable through visual means. This invaluable tool significantly aids in identifying species and analysing behavioural patterns, contributing to a comprehensive understanding of the local fauna and flora diversity.
5. Field Guides: a collection of meticulously curated field guides serves as an invaluable resource for the team of ecologists and biologists. These guides provide comprehensive information on the local flora and fauna, enabling accurate species identification and aiding in the classification of various ecological components encountered during the survey.
6. Data Sheet: a structured data sheet is an essential element of the equipment, meticulously designed to systematically capture and organize vital information gathered during field activities. This includes details on species encountered, their habitat characteristics, abundance, and any other relevant ecological observations. The data sheet ensures the integrity and coherence of collected data, facilitating its later analysis and interpretation.

6.2.2.2 *Terrestrial habitats and biodiversity*

An evaluation of biodiversity in Tanzania using the International Union for the Conservation of Nature (IUCN) Red List classification system designates Tanzania as possessing the eleventh highest number of globally threatened species. As of January 2023, a total of 1,591 species have been classified as Critically Endangered, Endangered, or Vulnerable within Tanzania, representing the most threatened biodiversity on the African continent. This high number of threatened species likely reflects Tanzania's substantial portion of endemic species, alongside significant threats to their persistence. For instance, 360 reptile species are currently documented in Tanzania, with 85 classified as endemic. Similarly, 206 amphibian species are recognized, 86 of which are endemic. Notably, 27 reptile and 43 amphibian species have been discovered since the year 2000, suggesting a high likelihood of numerous undescribed species yet to be identified.

The following paragraphs discuss the terrestrial and freshwater species potentially present within the project area. Marine species potentially present within the project area will be covered in a separate section (paragraphs 6.2.2.3 and 6.2.2.4).

6.2.2.3 Terrestrial and freshwater fauna

As a result of a literature review, 904 species were identified as potentially occurring within the study area. This identification was based on their known distribution ranges and habitat suitability.

According to the IUCN Red List, 29 of these potentially present species occur in terrestrial and freshwater biomes and are considered threatened. The breakdown is as follows:

- 14 species are Vulnerable (VU);
- 7 species are Endangered (EN);
- 6 species are Critically Endangered (CR).

Among these threatened species (in descending order of the number of threatened species per taxon):

- 14 are bird species (4 VU, 6 EN, and 4 CR);
- 6 are mammal species (4 VU, 1 EN, and 1 CR);
- one is an amphibian species (VU);
- one is a crustacean species (VU).

The complete list of the IUCN species potentially present in the project area is presented in Annex 5.

6.2.2.3.1 ***Wildlife survey results***

During the Tanga survey, 14 bird species, two reptiles and 15 arthropods were observed directly along transects, during vehicle surveys and opportunistically (Table 6- 6 and Figure 6- 11). All species were classified as Least Concern on the IUCN Red List of Threatened Species, with two species not evaluated, and no threatened species were observed during the survey. *Milvus migrans* ssp. *parasitus, Apus affinis, Cecropis daurica, Ardea melanocephala, Egretta garzetta* and *Bubulcus ibis* are full migrant bird, while *Catopsilia florella*, *Vanessa cardui,* and *Junonia oenone* are migrant butterflies.

Table 6- 6 - Details and location of species observed during wildlife survey in Tanga. The IUCN conservation status refers to the global IUCN Red List. VBS: Vehicle-based survey; LC: Least Concern, NE: Not Evaluated.

Phylum	Class	Order	Family	Scientific Name	T_T01	T_T02	T_T03	VBS and Opportunistic observations	IUCN category	Population trend
CHORDATA	AVES	ACCIPITRIFORMES	ACCIPITRIDAE	*Haliaeetus vocifer*		x	x	x	LC	Stable
CHORDATA	AVES	ACCIPITRIFORMES	ACCIPITRIDAE	*Milvus migrans* ssp. *parasitus*	x		x	x	LC	Stable
CHORDATA	AVES	ACCIPITRIFORMES	ACCIPITRIDAE	*Gypohierax angolensis*			x	x	LC	Stable
CHORDATA	AVES	CAPRIMULGIFORMES	APODIDAE	*Cypsiurus parvus*				x	LC	Increasing
CHORDATA	AVES	CAPRIMULGIFORMES	APODIDAE	*Apus affinis*	x				LC	Increasing
CHORDATA	AVES	CICONIIFORMES	CICONIIDAE	*Ciconia microscelis*				x	LC	Stable
CHORDATA	AVES	CORACIIFORMES	MEROPIDAE	*Merops pusillus*	x				LC	Decreasing
CHORDATA	AVES	CORACIIFORMES	CORACIIDAE	*Coracias caudatus*	x				LC	Stable
CHORDATA	AVES	PASSERIFORMES	PYCNONOTIDAE	*Pycnonotus barbatus*	x				LC	Increasing
CHORDATA	AVES	PASSERIFORMES	HIRUNDINIDAE	*Cecropis daurica*	x				LC	Stable
CHORDATA	AVES	PELECANIFORMES	ARDEIDAE	*Ardea melanocephala*		x			LC	Increasing
CHORDATA	AVES	PELECANIFORMES	ARDEIDAE	*Bubulcus ibis*		x			LC	Increasing
CHORDATA	AVES	PELECANIFORMES	ARDEIDAE	*Egretta garzetta*			x		LC	Increasing
CHORDATA	REPTILIA	SQUAMATA	GEKKONIDAE	*Lygodactylus picturatus*				x	LC	Unknown
CHORDATA	REPTILIA	SQUAMATA	GEKKONIDAE	*Lygodactylus kimhowelli*				x	LC	Stable
ARTHROPODA	INSECTA	LEPIDOPTERA	PIERIDAE	*Catopsilia florella*	x				LC	Unknown
ARTHROPODA	INSECTA	HYMENOPTERA	APIDAE	*Xylocopa* sp.	x					
ARTHROPODA	INSECTA	LEPIDOPTERA	NYMPHALIDAE	*Telchinia serena*	x				LC	Unknown
ARTHROPODA	INSECTA	LEPIDOPTERA	NYMPHALIDAE	*Junonia oenone*	x				LC	Unknown
ARTHROPODA	INSECTA	LEPIDOPTERA	NYMPHALIDAE	*Junonia hierta*	x				LC	Unknown
ARTHROPODA	INSECTA	LEPIDOPTERA	NYMPHALIDAE	*Vanessa cardui*	x				LC	Unknown
ARTHROPODA	INSECTA	ODONATA	LIBELLULIDAE	*Trithemis annulata*		x			LC	Increasing

Phylum	Class	Order	Family	Scientific Name	T_T01	T_T02	T_T03	VBS and Opportunistic observations	IUCN category	Population trend
ARTHROPODA	INSECTA	ODONATA	LIBELLULIDAE	*Orthetrum stemmale*		x			LC	Unknown
ARTHROPODA	INSECTA	ODONATA	LIBELLULIDAE	*Crocothemis erythraea*		x			LC	Increasing
ARTHROPODA	INSECTA	ODONATA	LIBELLULIDAE	*Palpopleura lucia*		x			LC	Unknown
ARTHROPODA	MALACOSTRACA	DECAPODA	OCYPODAE	*Ocypode ceratophthalmus*			x		NE	-
ARTHROPODA	MALACOSTRACA	DECAPODA	OCYPODAE	*Austruca occidentalis*			x		NE	-
ARTHROPODA	MALACOSTRACA	DECAPODA	OCYPODAE	*Austruca*			x		-	-
ARTHROPODA	MALACOSTRACA	DECAPODA	OCYPODAE	*Gelasimus*			x		-	-
ARTHROPODA	MALACOSTRACA	DECAPODA	OCYPODAE	*Ocypode*			x		-	-

Xylocopa sp.

Junonia oenone

Milvus migrans ssp. parasitus

Merops pusillus

Trithemis annulata

Egretta garzetta

Ardea melanocephala

Lygodactylus picturatus

Figure 6- 11 - Some species observed during the wildlife survey in Tanga

6.2.2.4 Terrestrial and freshwater flora

As a result of a literature review, 144 species were identified as potentially occurring within the study area. This identification was based on their known distribution ranges and habitat suitability. None of these potentially present species is listed as threatened on the IUCN Red List.

This finding suggests a likely underestimation of true flora diversity within the study area. The scarcity of geospatial data for plant species in the IUCN Red List Database, compared to fauna data, likely contributes to this underestimation.

6.2.2.4.1 ***Flora and habitats survey results***

A flora and habitat survey was conducted in Tanga in June 2024.

The plots in Tanga were within areas with mangrove forest, grassland with scattered bushes and Built area (Figure 6- 12). The area within mangrove forest was near the TANESCO landing site. This was dominated by *Carex elata*, and had a total of 11 species including *Scoparia dulcis, Daphne alpina, Acanthospermum hiopum,* and *Cynodon dactylon.* Although this plot was surrounded by areas with mangrove forest, it was on a patch that does not get inundated and thus does not support mangrove trees. The plot on grassland with scattered bushes was predominantly covered by *Achyranthes aspera.* This plot included a total of 19 species including *Cynodon dactylon, Megathyrsus maximus, Mesosphaerum suaveolens* and *Heteropogon contortus.* The plot within the built area was close to the Majani mapana TANESCO substation at road side/TANESCO powerline/adjacent to farm dominated by *Cynodon dactylon*. This plot included a total of 23 species including *Asystasia gangetica, Megathyrsus maximus, Centrosema pubescens*, and *Richardia scabra.*

The transect adjacent to the landing site in Tanga extended into Grassland with scattered bushes in addition to the mangrove forest that was covered by the plot. This was about 70% modified habitat. A total of 22 species were recorded for this transect (10 common, 9 occasional, and 4 rare). *Lumnitzera racemosa* (5.0%) was conspicuously dominant species at the section that is suitable habitat for mangrove species. The other species were scattered without clear pattern of dominance. The transect near the Majani mapana substation had 35 species including 17 occasional, 9 rare, 7 common and 2 frequent species. There was not clear pattern of dominance by any species. This transect included a total of 26 species (12 common, 7 occasional, 3 rare, 3 frequent and 1 abundant). The abundant species was *Cynodon dactylon* (70% cover). For the list of species and other details of vegetation plots and transects, see Annex 5.

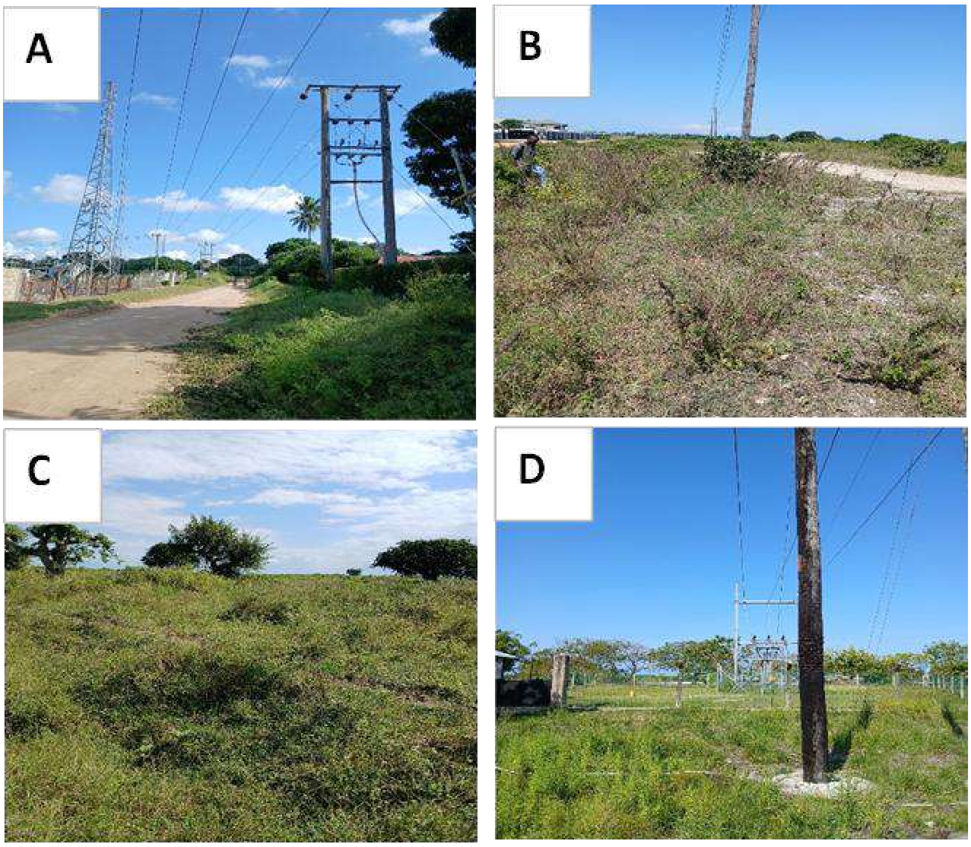


Figure 6- 12 - Pictures from plots and transects in Tanga. Vegetation plot near Tanga substation at Majani mapana (A), vegetation plot transect from area with grass with scattered bushes (B and C) and vegetation plot at TANESCO landing at Mnyanjani, Tanga (D)

Plant species have been integral to human societies for centuries, serving various purposes ranging from economic and medicinal to cultural and ecological roles. The diversity of plant uses underscores the importance of preserving botanical knowledge and biodiversity. Plants play a crucial role in traditional construction practices. For instance, species like *Carex elata* are often used for thatching roofs and making mats. Such uses highlight the economic importance of plants in local communities and their contribution to sustainable building practices. In traditional medicine, many plants are revered for their healing properties. *Scoparia dulcis* and *Acanthospermum hiopum* are notable examples, used to treat ailments such as diabetes and skin diseases, respectively. These plants exemplify the vital role of botanical resources in healthcare and the preservation of traditional medicinal knowledge. Ornamental plants like *Daphne alpina* are appreciated for their aesthetic value and multifunctionality. While enhancing the visual appeal of gardens, parts of these plants are also used in traditional remedies. This dual-purpose use showcases the intersection of beauty and utility in plant species.

Agricultural practices heavily rely on plant species for livestock fodder and other uses. *Cynodon dactylon*, commonly known as Bermuda grass, serves as an important fodder crop. Additionally, it possesses medicinal properties that aid in treating digestive issues in both humans and animals. Such species underscore the importance of plants in agriculture and animal husbandry. Ecologically, plants like *Carex elata* thrive in specific environments such as wetlands and play a significant role in habitat stabilization. Their presence ensures the maintenance of ecological balance and supports biodiversity. The ecological functions of plants are vital for the health of various ecosystems. The extensive utilization of these plant species illustrates the deep-rooted relationship between humans and plants. Each species contributes uniquely to cultural heritage, healthcare, agriculture, and ecological balance. Preserving such knowledge is essential for sustainable development and the continuation of these traditions.

Based on own observations and discussions with stakeholders involved in the survey (local guides and expert/professional field assistants), the plants found in the areas proposed for the development in this project are also found elsewhere within the surveyed landscapes and study areas. This observation has significant implications for the proposed development project.

6.2.2.5 Terrestrial habitats and ecosystems

The Tanzanian coastline exhibits a remarkable heterogeneity of habitats, characterized by a high species diversity typical of the tropical Indo-West Pacific biogeographic region. This paragraph provides a detailed examination of the ecosystems present in the project area, highlighting their ecological significance and current threats.

- **Mangrove forests**: Mangrove ecosystems in Tanzania are legally designated as state forest reserves, with documented occurrences along nearly the entire coastline[7]. The most extensive mangrove stands are found at river mouths and estuaries, distributed throughout the country from north to south7. Estimates suggest that mainland Tanzania possesses approximately 158,100 hectares of mangroves, contributing roughly 14% of the total mangrove cover in East Africa[8,9].

  These critical forests are primarily distributed within tidal inlets, estuaries, and creeks bordering the mainland and Zanzibar coastlines. The Rufiji Delta harbors the largest contiguous mangrove area, extending over 480 km^2 along 70 km of coast. Other significant mangrove regions are situated within the deltas and estuaries of the Ruvu, Pangani, and Wami rivers, as well as along the coastlines of Unguja, Pemba, and Mafia islands.[10]

  The mangrove flora of Tanzania comprises ten identified species. These include *Avicennia marina*, *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Heritiera littoralis*, *Lumnitzera racemosa*,

[7] Bunting, P.; Rosenqvist, A.; Hilarides, L.; Lucas, R.M.; Thomas, T.; Tadono, T.; Worthington, T.A.; Spalding, M.; Murray, N.J.; Rebelo, L-M. Global Mangrove Extent Change 1996 – 2020: Global Mangrove Watch Version 3.0. Remote Sensing. 2022.

[8] Nyangoko BP, Berg H, Mangora MM, Gullström M, Shalli MS. (2020). Community Perceptions of Mangrove Ecosystem Services and Their Determinants in the Rufiji Delta, Tanzania. DOI: 10.3390/su1301.

[9] Japhet E, Mangora MM, Trettin CC, Okello JA. (2019). Natural Recovery of Mangroves in Abandoned Rice Farming Areas of the Rufiji Delta, Tanzania. West. Indian Ocean J. Mar. Sci. 18 (2): 25–36. DOI: 10.4314/wiojms.v18i2.3.

[10] Tanzania Forest Services Agency (TFS). (n.d.). Tanzania's mangroves. Accessed April 10 2024. https://www.tfs.go.tz/index.php/sw/forests/tanzanias-mangroves

Pemphis acidula, *Rhizophora mucronata*, *Sonneratia alba*, *Xylocarpus granatum*, and *Xylocarpus moluccensis*[11].

Mangroves within the project area are located both inside and in the vicinity of the construction area in Tanga (see Figure 6- 13). For more detailed information, refer to Annex 6 – Mangrove Management Plan.

- **Coastal forests**: Encompassing roughly 700 km² of Tanzania's landmass, coastal forests are integral components of the globally recognized “Coastal Forests of Eastern Africa” biodiversity hotspot[12]. However, these ecologically rich ecosystems face significant threats. Despite their designation as a high conservation priority, coastal forest cover has declined by over a third since 1990[13], and this decline has continued in subsequent years. This alarming reduction is primarily attributed to anthropogenic activities such as agricultural expansion, charcoal production, and unsustainable logging for timber and firewood[14]. Management of these forests falls under the purview of the Tanzanian Forest Service Agency (TFS) under the Ministry of Natural Resources and Tourism (MNRT).

Figure 6- 14 presents the land cover of the project area, accompanied by the regional legend from the Land Cover Classification System, which includes 22 globally recognized classes. The most recent dataset used, Globcover (2005), offers a resolution of 300 meters, providing extensive global land cover data. The map employs color-coded classifications to distinguish various land uses: yellow represents rainfed croplands, light brown denotes mosaic vegetation/croplands, darker brown shades indicate mosaic grassland/shrublands, and various shades of green represent forested areas.

[11] Bosire, J O, Mangora, M M, Bandeira, S, Rajkaran, A, Ratsimbazafy, R, Appadoo, C and Kairo, J G. (2016). Mangroves of the Western Indian Ocean: status and management WIOMSA, Zanzibar Town, 161 p.

[12] Critical Ecosystem Partnership Fund, ‘Coastal Forests of Eastern Africa’. (2005). Accessed April 10 2024. https://www.cepf.net/our-work/biodiversity-hotspots/coastal-forests-eastern-africa

[13] Godoy, F. L., Tabor, K., Burgess, N. D., Mbilinyi, B. P., Kashaigili, J. J., & Steininger, M. K. (2012). Deforestation and CO_2 emissions in coastal Tanzania from 1990 to 2007. Environmental Conservation, 39(1), 62–71. http://www.jstor.org/stable/26319045

[14] Sumbi P, ‘The fate of unique species in Tanzania’s coastal forests hang in the balance’, The Conversation, 4 September 2018. Accessed April 10 2024. https://theconversation.com/the-fate-of-unique-species-in-tanzanias-coastal-forests-hangs-in-the-balance-102281

Figure 6- 13 – Mangroves near the project area

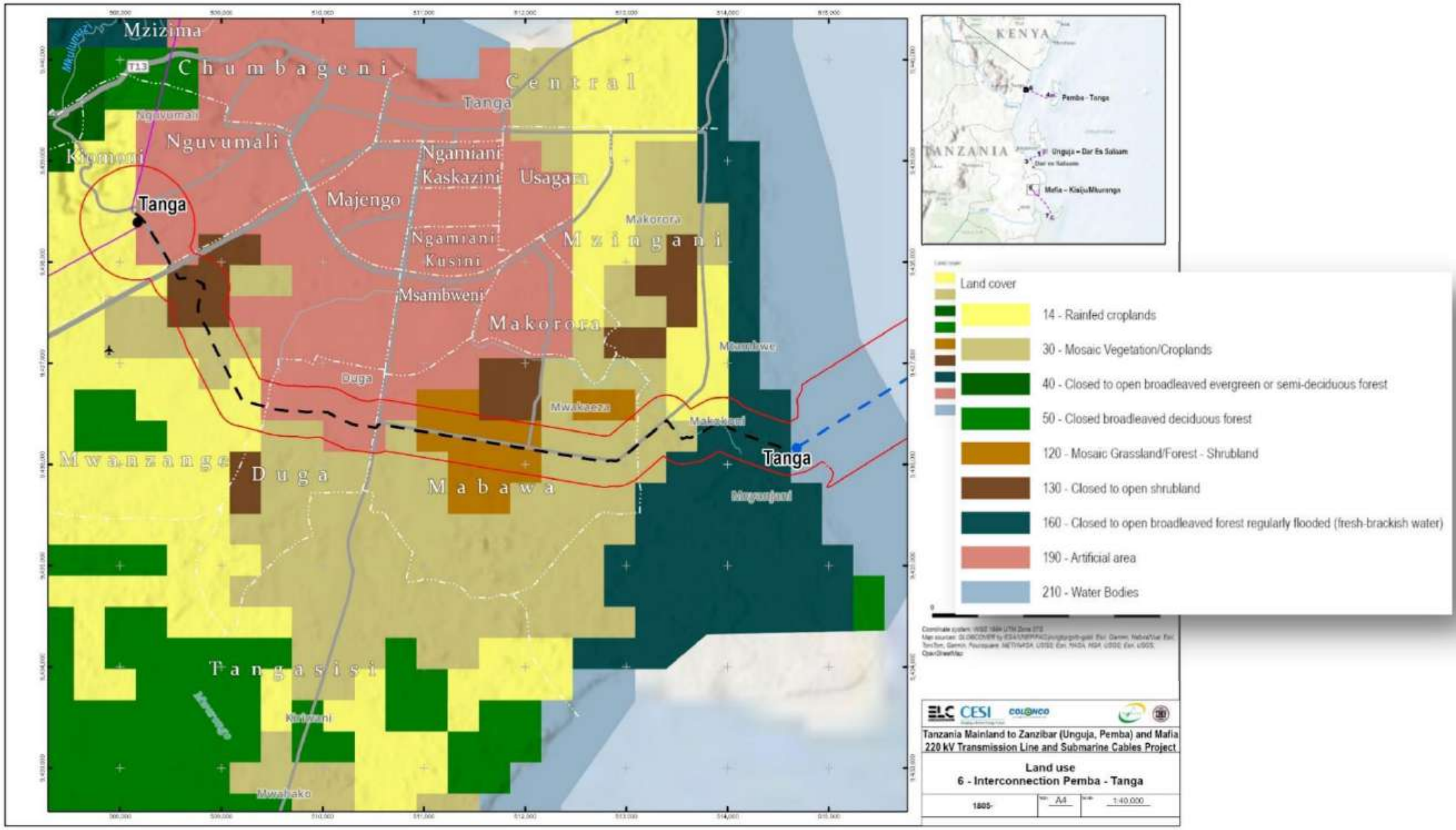


Figure 6- 14 – Land use of the project area

6.2.2.6 Terrestrial legally protected areas and important areas for biodiversity

6.2.2.6.1 ***Protected areas and important areas for biodiversity in the study area***

The project area intersects with the Mangrove Forest Reserve, located along the beach of the landing point. In Tanzania, Nature Forest Reserves, or NFRs, get the strictest protection under their National Forest Act. The government owns these reserves, and the Tanzania Forest Services Agency takes care of them. Unlike other forests, logging and hunting are completely off-limits in NFRs. Instead, they focus on scientific study, teaching people about nature, and tourism that does not harm the environment.

Legally protected areas and important areas for biodiversity are shown in Figure 6- 15 and Figure 6- 16.

No other terrestrial protected areas and/or important biodiversity areas are located within 15 km of the project area, specifically the Tanzania mainland portion of the interconnection project.

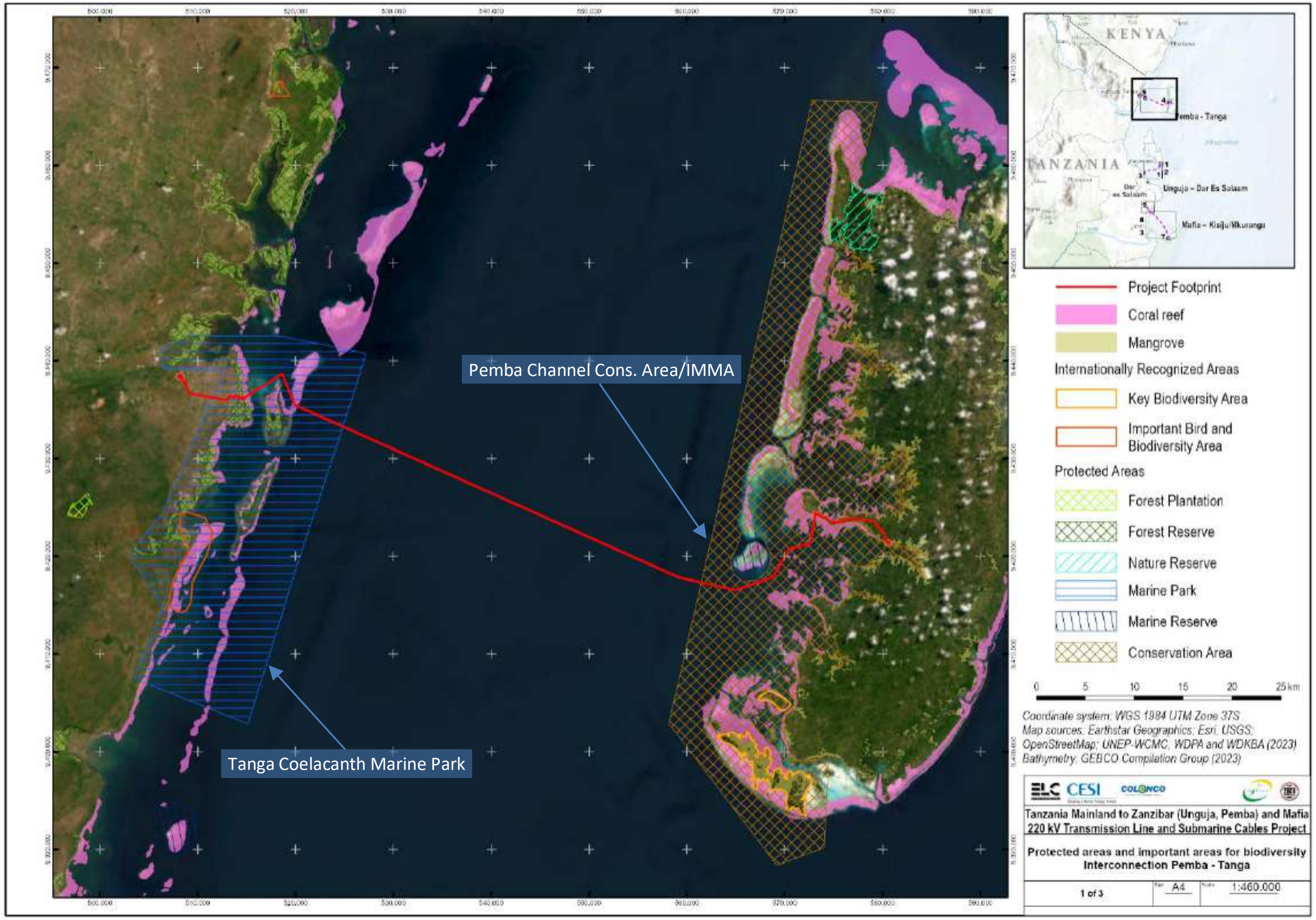


Figure 6- 15 – Legally protected areas and important areas for biodiversity (General view). Source: WDPA and WDKBA (April 2024)

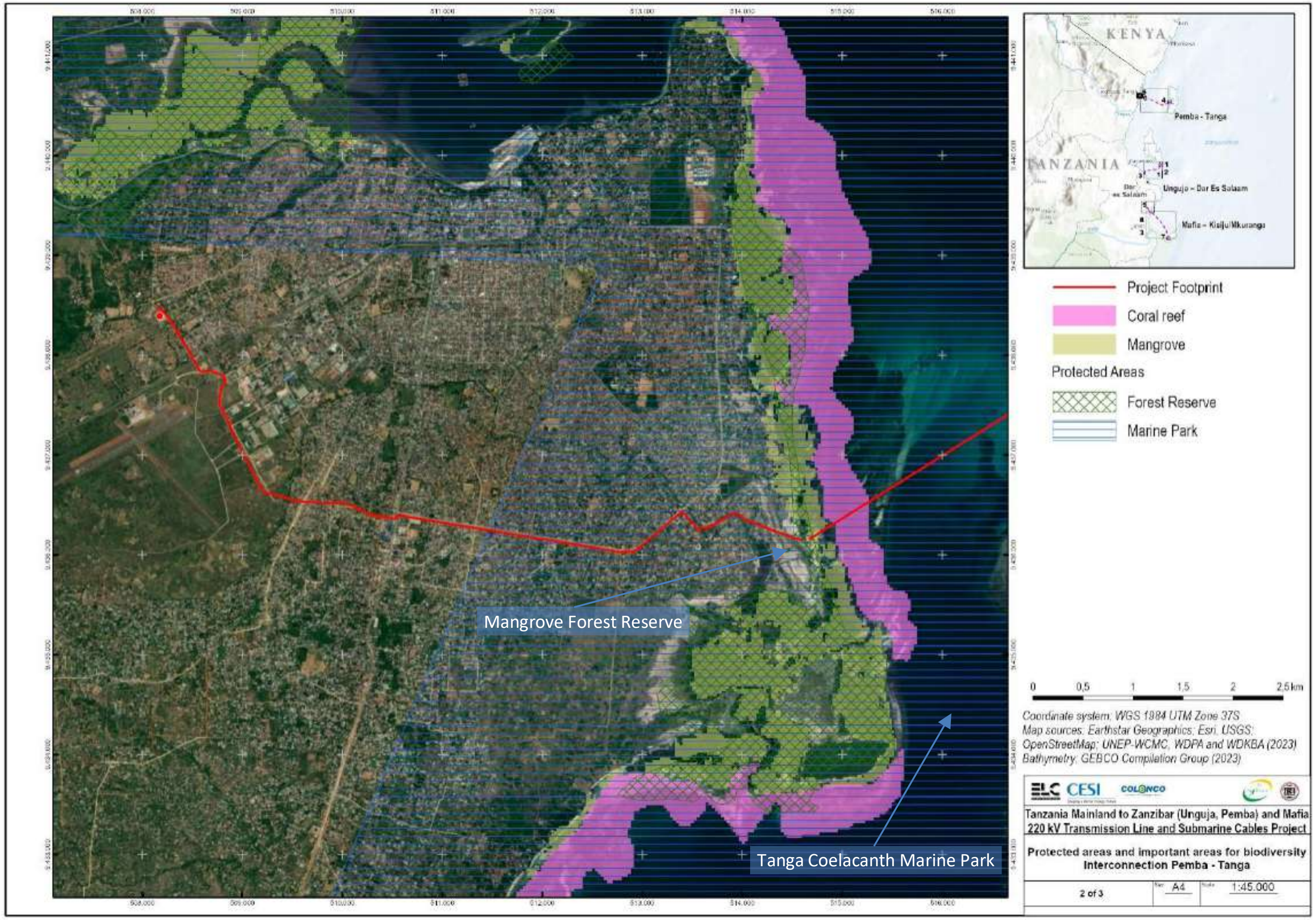


Figure 6- 16 – Legally protected areas and important areas for biodiversity (Tanga view). Source: WDPA and WDKBA (April 2024)

6.2.3 Socio-Economic Environment

6.2.3.1 Administrative Structure

Tanzania is a democratic unitary republic with both a national government and a devolved government of Zanzibar which has autonomy for non-union matters. There is local government in both Tanzania and Zanzibar. The United Republic of Tanzania there are 31 regions and 184 districts which are administrative entities in charge with maintaining law and order. Each district is then divided into smaller administrative units called wards; the administrative structure then extends down to villages and sub-villages. Villages are often headed by village councils or leaders who are responsible for local governance and administration. Local leaders at each level play important roles in representing their communities, addressing local needs, and facilitating development projects.

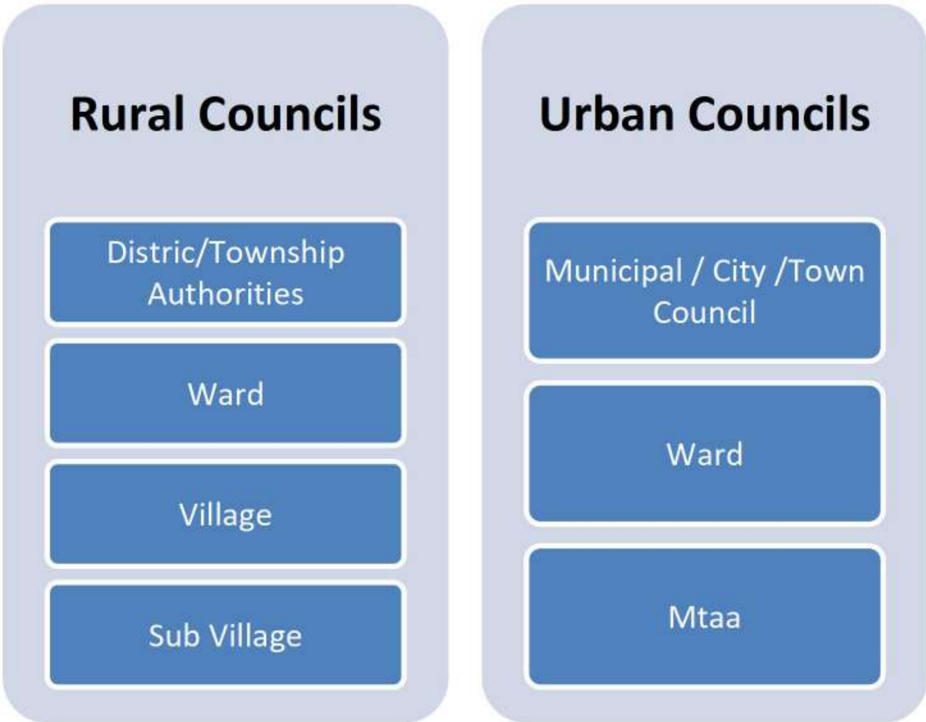


Figure 6- 17 – Tanzania Regions[15]

Tanga City Council is one of the eleven councils in the Tanga region. The council comprises 27 wards and 181 mitaa, which are organized into four divisions: Chumbageni, Ngamiani Kaskazini, Ngamiani Kati, and Pongwe. The project's alignment within Tanga has been carefully planned to minimize direct impacts on local communities.

Table 6- 7 – Wards crossed by the project

Region	District/City	Ward
Tanga	Tanga City	Mzingani
		Mabawa
		Duga
		Mwanzange
		Nguvumali
Pemba	Chake Chake	Ndagoni
		Wesha

[15] Sémhur, TUBS, Pikne (derivative work), CC BY-SA 3.0 <https://creativecommons.org/licenses/by-sa/3.0>, via Wikimedia Commons

6.2.3.2 Demography

Demography statistics of Tanga region are reported in Figure 6- 18. The population density varies across the region, with the highest concentration in the districts of Korogwe and Lushoto, each exceeding 270,000 inhabitants. The map also includes details on the overall population, gender breakdown, sex ratio, number of households, and average household size in the region.

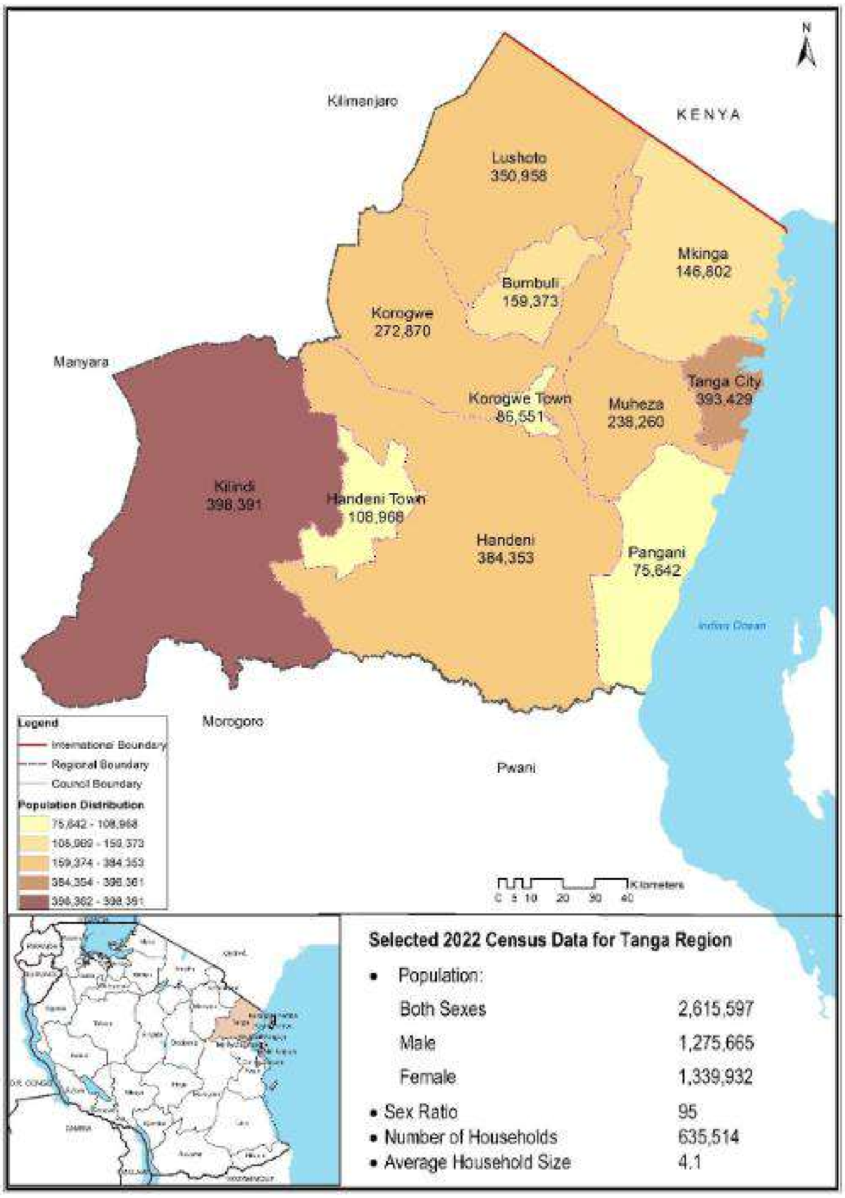


Figure 6- 18 – Population distribution by council, Tanga Region (National Census 2022)[16]

The table below provides population distributions by sex, sex ration, number of households, and average household size for Tanga City Council, the area affected by the project.

[16] The United Republic of Tanzania (URT), Ministry of Finance and Planning, Tanzania National Bureau of Statistics and President's Office - Finance and Planning, Office of the Chief Government Statistician, Zanzibar. The 2022 Population and Housing Census: Administrative Units Population Distribution Report; Tanzania, December 2022.

Table 6- 8 – Population in the wards crossed by the project (National Census 2022)16

Tanga City Council	Population			Sex Ratio	Number of Households	Average Household Size
	Both Sexes	Male	Female			
Nguvumali	17,249	8,675	8,574	101	4,556	3.8
Mzingani	15,621	7,453	8,168	91	4,033	3.9
Mwanzange	8,386	4,048	4,338	93	2,226	3.8
Mabawa	26,978	12,700	14,278	89	6,816	4.0
Duga	24,545	11,888	12,657	94	6,226	3.9

6.2.3.3 Land tenure system

Some 70 percent of the Tanzania Mainland land is Village Land supporting 80 percent of the population (farmers and pastoralists); 28 percent is Reserved land (forests, national parks, game reserves, river basins and wetlands and land put aside for public social and economic infrastructure); and 2 percent is general (mainly urban and over rural estates where rights of occupancy have been granted)[17].

Three categories of land are recognized i.e. **General Land, Village Land**, and **Reserved Land**.

1. **General land** is all land other than village land or reserved land and is regulated by the Land Act. This land is under the management of the Commissioner for Land. The Right of Occupancy may be granted to any citizen (individual or corporate) upon application for any designated use.
2. **Village land** is the land which has been declared to be village land under the Village Land Act Cap.114 R.E 2019. It consists of the land within the boundaries of a village registered under the Local Government (District Authorities) Act, the land designated as village land under the Land Tenure (Village Settlement) Act 1965, the land other than reserved land which the villagers have, during the twelve years prior to the year 1999, have been regularly occupying and using as village land. The administration and management of village land are vested in local government organs namely the Village Council, the Village Assembly, and Land Adjudication Committee. Customary Right of Occupancy is granted to occupiers.
3. **Reserved land** is that land reserved, designated, or set aside for conservation, national parks, marine parks, urban planning, road reserve, public recreation grounds, hazardous land and land reserved for public utilities. These lands are governed by several laws but the Commissioner for Land has ultimate powers of allocation of reserved land.

The Land Act and the Village Land Act recognize two forms of tenure namely, (i) the granted right occupancy and, (ii) customary right of occupancy which includes the deemed right of occupancy. Individuals and groups may hold land in general and village land.

Right of Occupancy is a type of Land holding based on the idea that all land is held by the state, and the president is the custodian of public land. Land is granted to individuals or groups or institutions for a period and under certain conditions relating to land use and rights of disposition. However, since most Tanzanians are African natives, land is held by them as a **Customary Right of Occupancy**. The grants in land differ from customary rights of occupancy in that whilst the former is held under a Certificate of Title the later does not necessarily require a Certificate of Title.

[17] Draft Land Policy, 2016

6.2.3.4 Economy and livelihood

The people living in the direct area of influence of the project practice a mix of fishing and agriculture activities as main means of livelihood. It is also confirmed the division of gender roles in fishing, where women or poor people who cannot afford a boat are dedicated to the collection of fish on the tidal area. In the project affected areas there is no evidence of seaweeds cultivations. Traditional fishing is practiced in all the selected landing points, being it the main source of cash income and food for the inhabitants. It is noticed that people acknowledge the importance of mangroves and do not use the area for the collection of firewood, which is collected in the common forest.

Tanga-Pwani Coastal Belt Livelihood Zone (TLZ 07) [18]

Famine Early Warning System Network gives a framework of the livelihood in the coastal areas from Tanga to Pwani, where villages are located along a strip of land covered by both mangroves and agricultural fields. Along this strip of land, the household economy rests on two main pillars: crop production and fishing. Fish are the main natural resource, and they provide all households living here with significant food and cash income. Livestock plays a minor role in the livelihood, due to the limited availability of grazing land, and it varies according to the degree of wealth of the households. Agriculture is based mainly on maize, paddy, cassava, fruits.

All the households living on the coast belt are engaged in fishing activities at different degree depending on the equipment owned. The well-off fishermen who own a boat can catch large quantity of fish and generate cash income, while the poor people can be part of a crew and be paid in cash of in fish for their own consumption. In addition to crop production, people from all households re-engaged in fishing in one way or another throughout the year. The degree to which fishing contributes to a household's income is related to its ownership of fishing equipment – especially boats – and its ability to hire others to help fish. Poorer households work on the boats of better off households, or absentee urban boat owners, who hire residents to manage their boats. They are paid in both cash and in fish, some of which is used for household consumption, and some of which is sold. Households with more fishing equipment use nets and bring in much larger quantities of fish, most of which is sold to generate cash income. Fishing is done mostly at night in the Indian Ocean, although some also dive for shell fish during the day. Only men are engaged in fishing.

Tanga

Tanga's coastal location makes fishing a significant livelihood. Fishermen use traditional boats and modern vessels to catch fish, octopus, and other seafood. These catches are either sold in local markets or exported. Many residents are involved in fish processing, drying, and trading activities, adding value to the raw catch and enhancing income.

The surveyors interviewed fishermen at the landing point. The area is used both by the fishermen from Tang and from Pemba. Fishing activities take place throughout the year. Boat ownership varies among the fishermen. Some own their vessels, while others rent them. Up to 18 people can share a single boat. Their primary catches consist of anchovies and red snappers. They also venture beyond the reefs to fish.

[18] FEWS NET Famine Early Warning System Network

Figure 6- 19 – Fishermen in Tanga

6.2.3.5 Health community

The survey indicates that 2.6% of the respondents in the household were found to be chronically ill while 15.8% of the group were mentally incapable. A large proportion (81.6%) of the surveyed respondents revealed to be healthy with no any cognitive impairments as shown in the table below.

Figure 6- 20 – Health condition for household head

Locations	Health Condition	Percentage
Tanga City Council	Chronically ill	2.6
	Mentally incapable	15.8
	Healthy	81.6

6.2.3.6 Health services

Health services in Tanga are designed to meet the diverse healthcare needs of both urban and rural populations, offering a comprehensive range of care through a mix of public and private providers. At the heart of this system is Bombo Regional Hospital, the main referral facility, which provides primary and secondary care alongside specialized services such as surgery, obstetrics, and pediatrics. To further enhance accessibility, smaller district hospitals, health centers, and dispensaries are strategically located throughout the region, ensuring that even those in more remote areas can receive essential medical attention.

In recent years, Tanga has seen a notable rise in private clinics and pharmacies, which complement the public healthcare sector by offering outpatient care and specialized treatment options. Health initiatives in the region prioritize combating infectious diseases like malaria, tuberculosis, and HIV/AIDS, while also expanding maternal and child health programs. Despite these significant advancements, challenges persist, particularly in rural communities, where shortages of medical personnel, equipment, and funding continue to affect the quality and availability of healthcare services.

In Tanga City, health services are more concentrated and accessible due to the urban environment. The city's healthcare landscape include:

- 1 Regional Referral Hospital: Bombo Regional Hospital, the largest and most equipped facility in the city, offering comprehensive and specialized care.
- 2 District Hospitals: Providing general health services, with some specialized departments to serve broader healthcare needs.
- 10+ Health Centers: These centers offer a range of services, including maternal and child health, outpatient care, and minor procedures.
- 50+ Dispensaries and Clinics: Dispensaries are widely distributed and provide basic healthcare services, vaccinations, and medications. Private clinics also play a significant role, offering outpatient care, diagnostic services, and specialized consultations.

In addition to these public facilities, Tanga City is experiencing growth in the number of private clinics, pharmacies, and diagnostic centers. This expansion enhances the availability of healthcare services and helps to alleviate the patient load on public facilities, ultimately benefiting the entire community.

6.2.3.7 Labor

This chart shows the composition of a Tanga City Council surveyed household by occupation or profession. Result shows that Commerce has the highest representation at 28.9% amongst surveyed PAPs in Tanga City Council while Community services such as Pastor and Sheikhs, Mechanics Charcoal making and remittances accounts to 2.6% for each. Other occupations made 7.9% of the all PPAs surveyed in Tanga City Council.

The data gives insight into the diverse professional backgrounds of Tanga City Council Selected PAPs, with a strong representation from commerce and agriculture, followed by various other trades and services. This diversity likely reflects the economic makeup of the city this council represents.

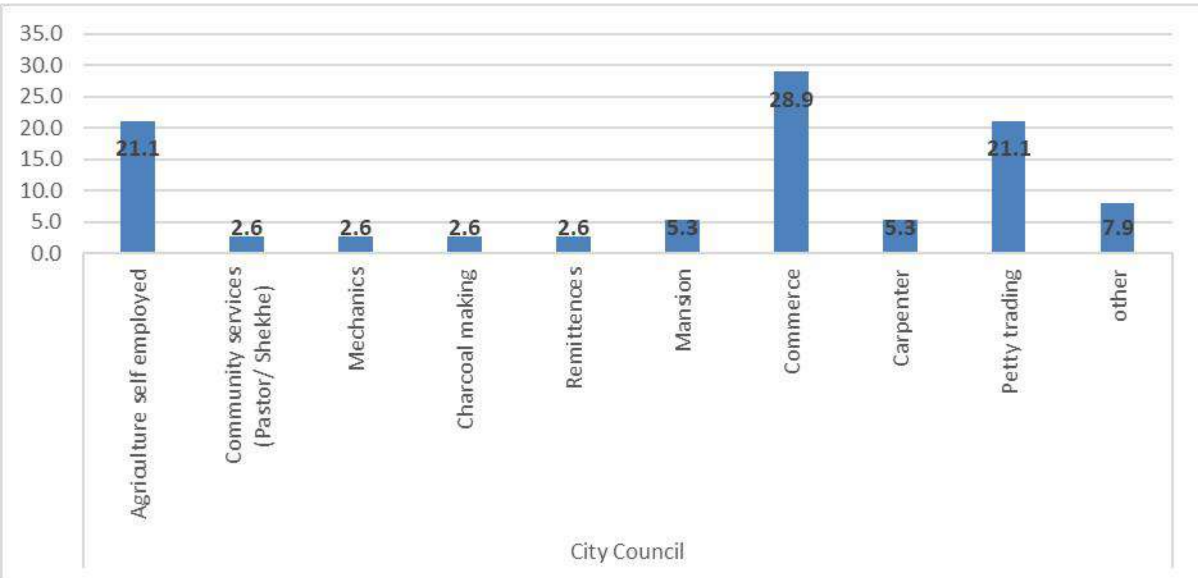


Figure 6- 21 – Respondent's occupation

6.2.3.8 Energy

The result appears reflect the primary energy sources used by the respondents of Tanga City Council and the corresponding percentages for each source. A majority of the respondents, 55.3 percent in Tanga City Council relies on charcoal as their primary energy source. This indicates that over half of the residents use charcoal for their energy needs, possibly for cooking and heating while a smaller portion of the respondents, 18.3 uses gas. Additionally, over a quarter of the surveyed respondents, 25.3 percent depends on wood as their primary energy source. This is also a significant proportion, indicating that a notable segment of the population uses wood, which might be due to its availability and affordability.

This distribution suggests a heavy reliance on traditional biomass fuels (charcoal and wood), with a relatively smaller but notable usage of gas. This could later imply a need for initiatives to promote cleaner and more sustainable energy sources within the community as shown in table below.

Figure 6- 22 – Source of energy

Location	Energy Source	Percentage
Tanga City Council	Charcoal	55.3
	Gas	18.4
	Wood	26.3

6.2.3.9 Water and sanitation

The data on sources of drinking water in project area households show a significant reliance on house-based water solutions. With 27 household having houses with a water tap, this indicates that a substantial portion of PAPs having direct access to a reliable and convenient water supply within their homes. Public water taps are the next most common source, utilized by 17 households. This suggests that while some households benefit from direct water access in their homes, a significant number still depend on public water sources.

Other sources, such as drilled wells at home (3 households), public hand-dug wells (6 households), and public drilled wells with hand pumps (2 households), are less common. These options may be used by those who do not have access to indoor plumbing or public water taps. Buying water is the least frequent source, used by only 1 household, indicating that this is a rare and possibly supplementary method rather than a primary source.

Table 6- 9 – Source of water services

Source of drinking water	Frequency
Drilled well at home	3
House with a water tap	27
Public water tap	17
Public hand dug well	6
Public drilled with hand pump	2
Buying	1

6.2.3.10 Gender dimension

The team conducted consultations with affected women in the project area.

The women who sell food and beverages (fish, bananas, fruit juice) near the beach at the proposed Tanga landing point were interviewed to understand the livelihood along the landing point. Their shops also offer money transfer services through a system called Tigopesa. Additionally, some women collect firewood for home use. These women operate at the beach year-round.

The women reported a positive impact on their business during the previous submarine cable project, as the workers purchased food and other goods from them. They noted that beach activity decreases during Ramadan and peaks in July. The women expressed optimism about the project, believing it will boost the economy and increase their sales. However, they voiced concerns that the influx of people from different countries could lead to cultural contamination.

In addition to small business women collect wood in the area close to the beach and the collect crabs and squid in the tidal area.

Figure 6- 23 – Women with business activities in Tanga

6.2.3.1 Infrastructures

Tanga Port

Tanga Port is situated on the northern coast of Tanzania on the south side of Tanga Bay; it is the second principal port of Tanzania (*Figure 6- 24*), strategically located to serve the northern regions of Tanga, Kilimanjaro, Arusha, Manyara, the lake zone, and neighboring countries of Kenya, Rwanda, Burundi, and southern Uganda. It has a natural and well-sheltered bay. The main shipping companies are CMA CGM, ESL, Maersk, Safmarine, and WEC.

Tanga Port comprises a deep-water jetty for bulk carriers, an outer anchorage in Tanga Bay and an inner anchorage abreast the town. The town of Tanga, the administrative center of the District of Tanga, is situated about 1 mile SW of Ras Kazone. A 354km highway links it to the port of Dar es Salaam in the south.

Tanga Bay may be entered by the Southern Channel, which is formed between Yambe Island and Niule Reef. It has a minimum depth of 7.9m and is available for vessels of moderate draft. The average tide is 3.3m.

Ship Channel, between Niule Reef and Fungu Nyama, is the principal entrance to Tanga Bay; it has depths of more than 18.3m. A buoy is moored on the south extremity of the shoal water extending South from Funga Nyama. Ship Channel is marked by lighted buoys. Within the harbor are two lighterage wharves, with depths alongside from 2.4 m to 3.8 m. Ro-ro vessels, with a maximum draft of 4m, may berth at the new lighterage quay in the east end of the harbor. Vessels may anchor at stream buoys.

There are 12 anchorage berths which accommodate drafts from 5.0 m to 12.5 m. Vessels up to 29500 dwt, with a maximum loa of 200m, a maximum draft of 12.5 m, and a maximum beam of 30 m, can anchor offshore. Currently there are two offshore pipelines with 12” are used for handling liquid bulk (oil products). Also, at Totten Island there is a Conventional Buoy Mooring (CBM) for handling of liquefied petroleum gas (LPG) by means of flexible hoses connected to submarine pipelines.

Pilotage is compulsory and is available during daylight hours only. Ships should report their ETA via the agent at least 2 hours prior to arrival. A pilot ladder is required on the port side during the Northeast monsoon and on the starboard side during the Southwest monsoon.

Vessels of all classes may anchor in Tanga Bay, in depths of 11 m to 18 m. The inner harbor provides safe anchorage for vessels up to 180 m in length and a draft of 8.2 m. The range lights exhibited from the eastern extremity of Totten Island and throughout the inner harbor are close together and serve as anchorage leads.

A prohibited area extends about 0.3 miles ENE from the head of the inner harbor. No craft may enter the area except with the written permission of the Harbor Authority. Depths less than charted have been reported in Tanga port. Mariners are advised to consult the local authorities for the latest information.

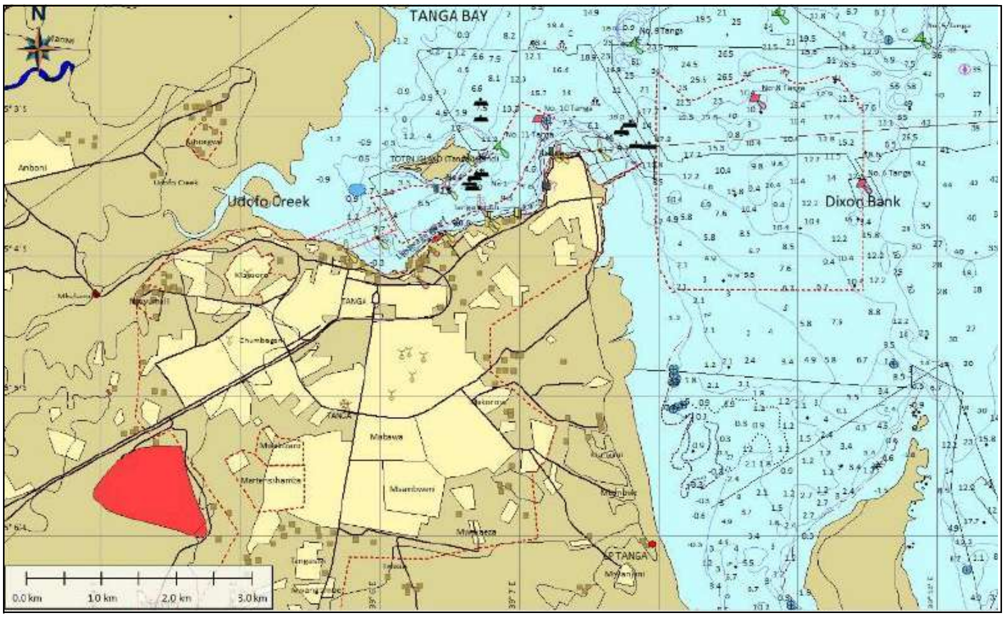


Figure 6- 24 – Tanga Port Approach (Ad.CH.)

Table 6- 10 – Tanga Port Contact Information

Contact Information	
The Port Master, Tanzania Ports Authority (TPA) Bandari House P. O. Box 443, Tanga, Tanzania Tel: +255 (27) 2643078 Fax: +255 (27) 2642360 **pmtanga@ports.go.tz**	Port: Call sign: Signal Station VHF channels 12 and 16 Pilots: VHF channel 16

Figure 6- 25 – Commercial shipping at Tanga harbor

6.2.3.2 Tourism

Tourism is one of the most thriving activities in Tanzania with vast attractions comprising Serengeti, Ngorongoro and white sand beaches in Zanzibar, a rich diversity of cultures, scenic places, and the highest mountain – Kilimanjaro. Tanzania has both comparative and competitive advantages that attract tourists in search of authentic new experiences and those seeking to escape to nature. Based on these attractions and Government efforts to market and implement its tourism policy and strategic plans, Tanzania has shown a tremendous growth with number of international visitors increased by 57.7 percent to 1,454,920 in 2022, from 922,692 recorded in 2021. Consequently, international tourism earnings increased to USD 2,527.8 million in 2022, from USD 1,310.3 million in 2022[19].

The interconnection project has been selected in order to avoid touristic spots and attraction, in addition to this, the option to construct terrestrial underground cables resulted to benefit the landscape. The project, being mostly underground will not affect the landscape of the shore and neither the terrestrial one, keeping intact the original visual landscape.

6.2.3.1 Terrestrial archaeology and cultural heritage

Tanzania has 7 World Heritage site in the Country. Two sites are set in the coastal areas, namely Ruins of Kilwa Kisiwani/Ruins of Songo Mnara and the Stone Town in Zanzibar. All the sites are outside the project area of interest, as shown by the following picture.

[19] The 2022 international visitors' exit survey report. National Bureau of Statistics of Tanzania

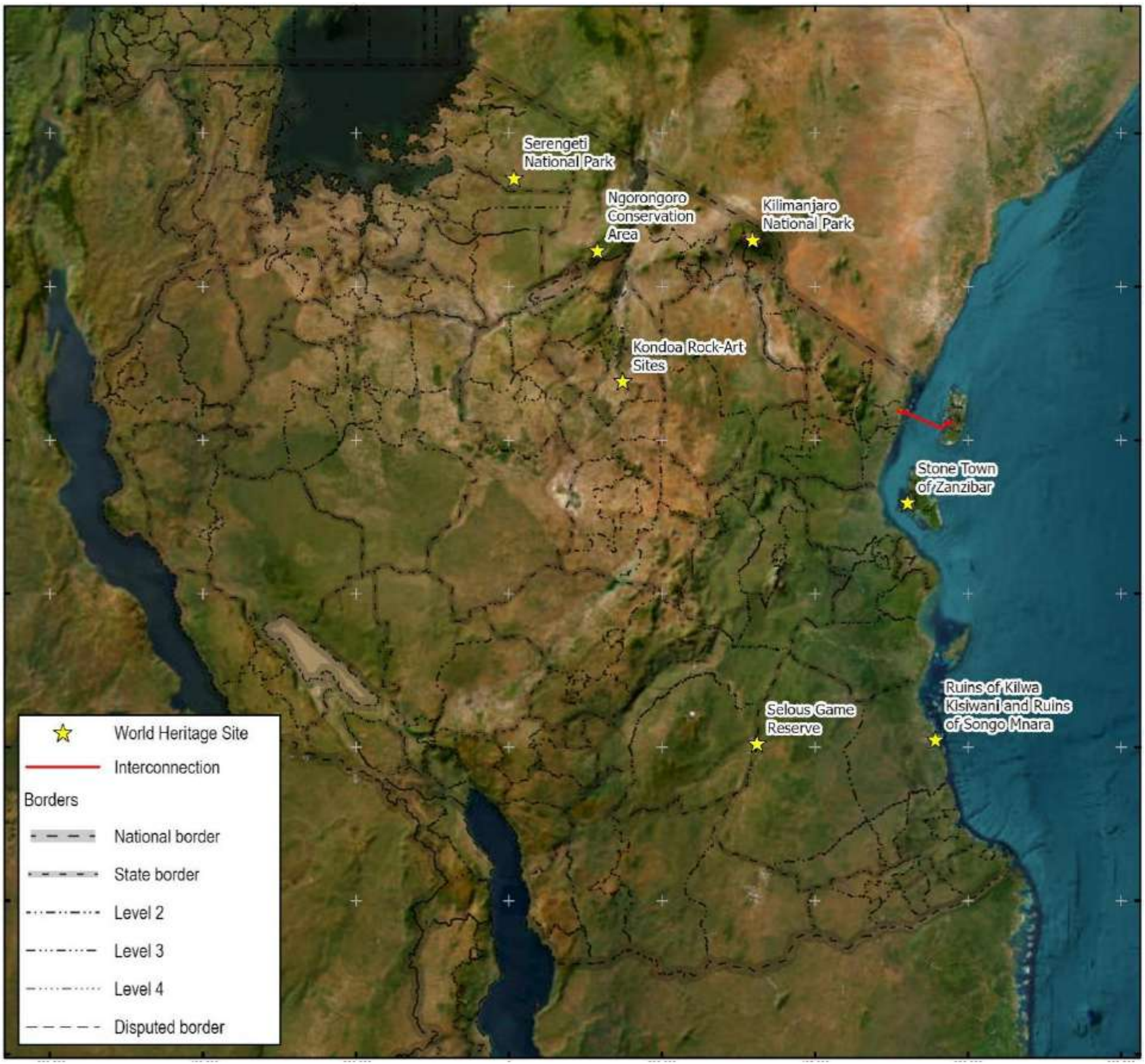


Figure 6- 26 – Location of UNESCO World Heritage Sites in Tanzania

6.2.3.2 Ecosystem services

The critical role of coastal and marine ecosystem services, particularly for impoverished communities in developing countries, is widely recognized. Tanzania exemplifies this dependence, as its marine ecosystems contribute 30% of GDP[20]. Sustainable management of this natural capital, particularly coastal and marine ecosystems, is therefore crucial for poverty reduction and economic development.

Using the categories of the Millennium Ecosystem Assessment[21], the most important ecosystem services in the study area are included in the following table.

[20] Lange, G. M., & Jiddawi, N. (2009). Economic value of marine ecosystem services in Zanzibar: Implications for marine conservation and sustainable development. Ocean & Coastal Management, 52(10), 521-532.

[21] Millennium ecosystem assessment, M. E. A. (2005). Ecosystems and human well-being (Vol. 5, p. 563). Washington, DC: Island press.

Table 6- 11 – Summary of the ecosystem services present in the project area

Category	Ecosystem Services	Project Area (DAoI)
Provisioning services	Fishing and fishing-related activities	Practiced
	Seaweed farming	Not Practiced
	Mangrove harvesting for fuel, timber, and other products	Not Practiced
Cultural and education services	Tourism and related activities	Not Practiced
	Education and research related to the marine environment	Not Practiced
Regulating services	Habitat provisioning for fisheries and other species	Present
	Waste water assimilation	Present
	Natural hazard protection: storm protection and beach control	Present

Despite its clear economic importance, the marine ecosystem faces serious degradation from both human and natural causes. These include uncontrolled tourism development, rapid population growth, overfishing and destructive fishing practices, over-harvesting of mangroves, dumping of untreated wastewater from urban areas, and periodic coral bleaching events.

6.3 Offshore Baseline

6.3.1 Physical Environment

6.3.1.1 Surface water temperature

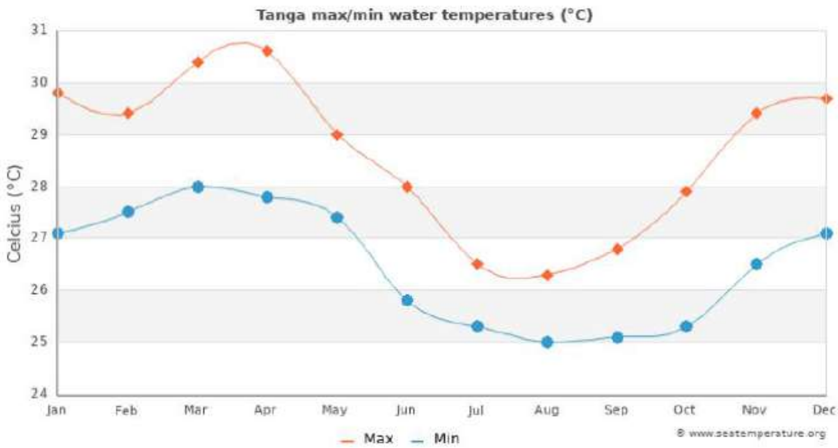
The measurements for the water temperature provided by the daily satellite readings provided by the NOAA. The temperatures given are the sea surface temperature (SST).

Coastal sea surface temperatures exhibit pronounced seasonality. During the summer months (July-September), SSTs average around 25°C. Conversely, shallow areas experience significantly higher temperatures (28-29°C) during the north-east monsoon season (January-March).

The upper mixed layer (UML), characterized by well-mixed water, also demonstrates seasonal variability in depth. The UML reaches its shallowest point (20 meters) in March and November, while depths of up to 100 meters are observed during June and July. These variations are attributed to seasonal fluctuations in wind speed and direction.

Tanga's coastal waters exhibit fluctuations in warm water depth. Warm water exceeding 25°C can sometimes reach depths greater than 200 meters. Conversely, cooler temperatures below 20°C can be found at shallower depths, around 120 meters, during other periods.

The picture below shows the range of monthly Tanga water temperature derived from many years of historical sea surface temperature data. According to this data, the warmest water temperature is in April with an average around 29.1°C. The coldest month is August with an average water temperature of 25.6°C.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min °C	27	27.3	28	27.5	27.4	25.8	25.3	25	25.1	25.3	26.5	27.1
Max °C	29.7	29.1	30.1	30.7	29.1	28	26.5	26.3	26.8	27.9	29.3	29.5
Min °F	81.6	81.9	83.2	82.8	82	79.3	78	77.5	77.8	78.6	80.8	81.7
Max °F	84.3	83.7	85.3	86	83.7	81.5	79.2	78.8	79.5	81.2	83.6	84.1

Figure 6- 27 – Range of monthly water temperature of Tanga[22]

[22] https://www.seatemperature.org/africa/tanzania/tanga.htm

6.3.1.2 Bathymetry

The continental shelf of Tanzania is narrow (less than 5km) except in the vicinity of relatively shallow Mafia and Zanzibar channels, where the shelf reaches widths of around 40–60km. The continental shelf includes the three large offshore islands of Unguja, Pemba, and Mafia. While Pemba is separated from the Tanzania mainland by a deep channel (Pemba Channel, ~850m wd), Unguja and Mafia are separated by a relatively shallow channel whose depth is less than 65m (the Zanzibar and Mafia Channels). The continental slope is steep (average 1.5–2.0°, locally >4.5°) especially along the southern part of the coastline of mainland Tanzania and less steep near the major islands and along the northern part of the coastline.

At the **Tanga landing area** the continental shelf is 5km wide with very shallow waters characterized by a wide sand bank and foul area with reported depths ranging from 2m to elevation up to 0.3m. Several submerged fringing and patch reefs surround Yambe Island and Fungu Niule Shoal with the sea extending from 950m to 1750m in width between Yambe Island outer reef and the foul area around Fungu Niule Shoal. Water depths ranging from 30m to 5m in this area (Figure 6- 28). The shelf break is approximately defined at 50m wd by a sheltered reef slope and it increases rapidly to about 200m wd with a mean gradient of about 10° (Figure 6- 30).

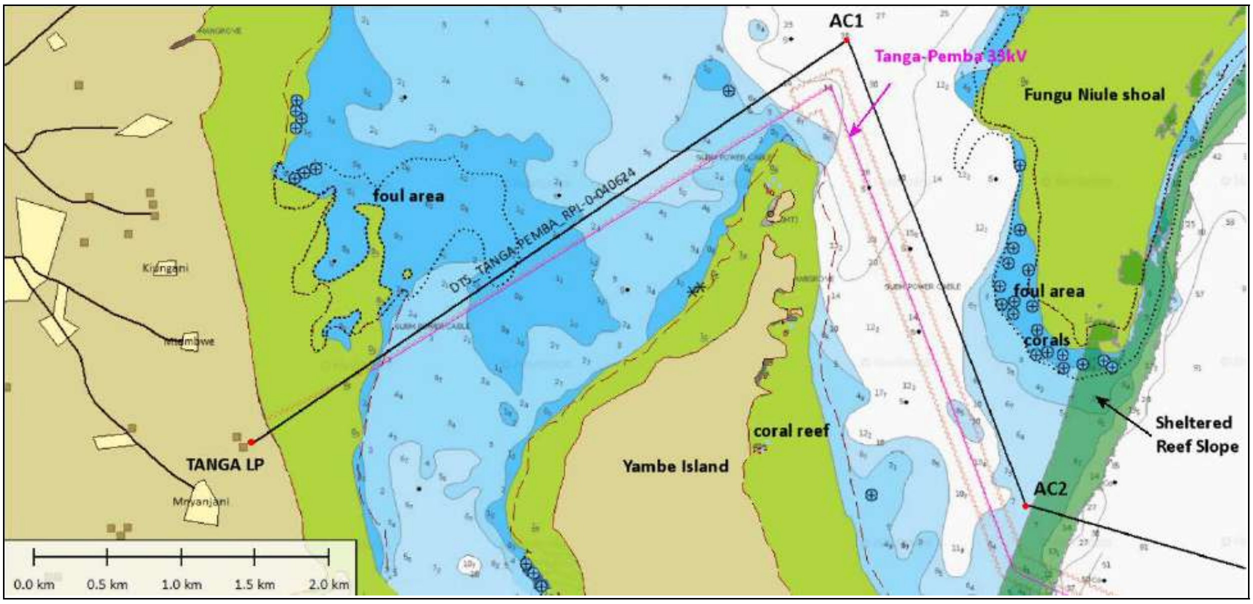


Figure 6- 28 – Continental shelf at Tanga landing area (mod. from Navionics®)

Tanga and Pemba Islands are separated by the **Pemba Channel** that is probably the result of graben faulting (Figure 6- 29): it is a 800-850m deep channel NNE–SSW oriented, about 50km wide, showing generally gentle slopes (Figure 6- 30). The seabed slopes have been computed from GEBCO gridded bathymetric file: at Pemba Island slope, moderate to steep gradients are present (Figure 6- 30): at the approach seabed section to the landing area from about 650m to 50m wd the maximum gradients are about 13°.

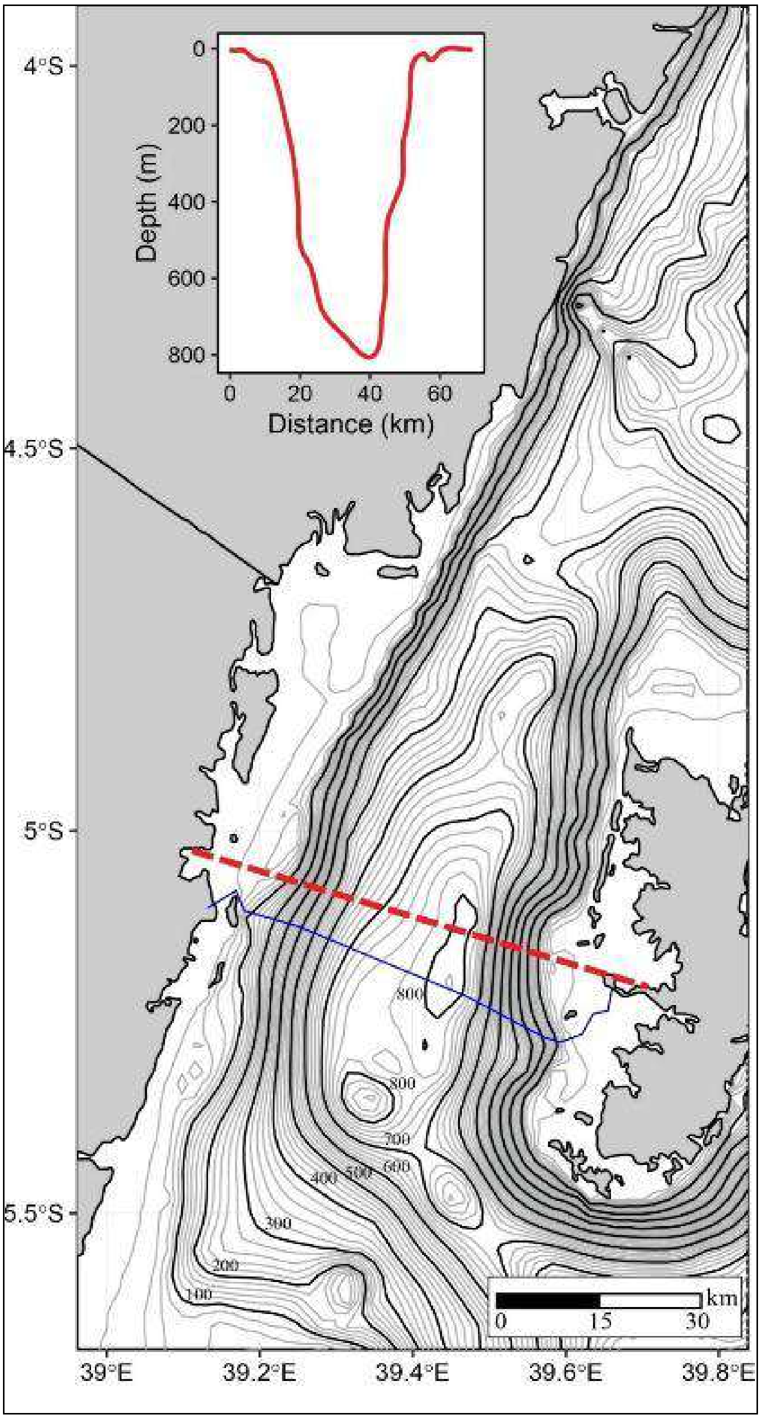


Figure 6- 29 – Pemba Channel bathymetry and cross profile (DTS route in blue; mod. from Masumbuko et al. 2019)

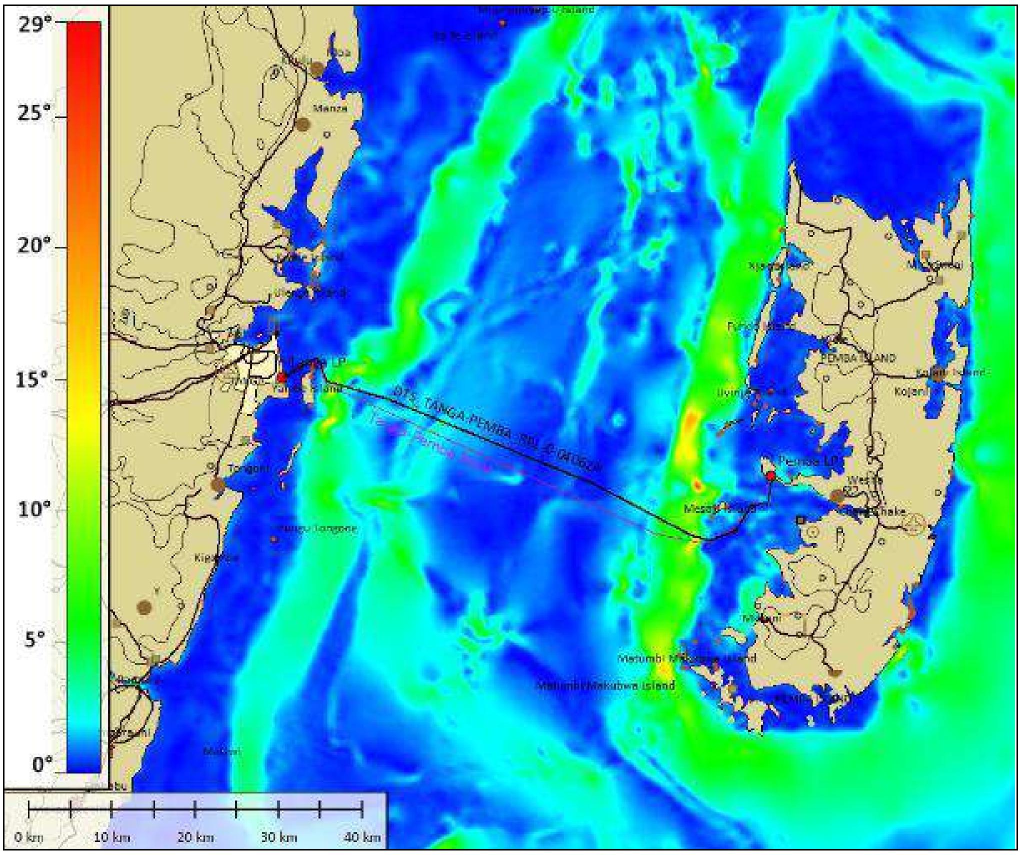


Figure 6- 30 – Pemba Channel seabed gradients (DTS route in blue; mod. from Ad.CH. and GEBCO)

6.3.1.3 Marine and coastal geomorphology

The most prominent primary coastal type along Tanga coast is patchy reef coast, either with fossil reef terraces and islands or with sand spits (Figure 6- 31). Most of the three primary coastal types also host sheltered tidal inlets, estuaries, and creeks. Tidal inlets, estuaries, and creeks are all associated with well-developed mangrove forests and, in some instances, they are also sites of urban and port development.

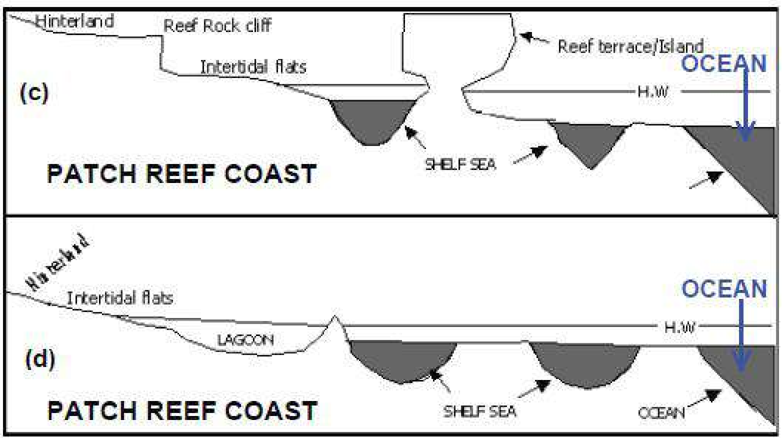


Figure 6- 31 – Shore sections showing the most prominent coastal type in Dar es Salaam Coast (ASCLME, 2012)

The seaward part of Tanga coastal zone consists of coral islands, shoals, and partly sand-covered reefs up to approximately 10 km from the mainland. In the immediate vicinity of Tanga approach the main features are Yambe Island and Tanga sandbank. Yambe Island is a bush-covered island formed of emerged reef limestones that rise to approximately 8 m. The island is edged by low cliffs deeply undercut at its base by wave forces [23] (Figure 6- 32).

Figure 6- 32 – Yambe Island (https://www.tanzaniatourism.com/)

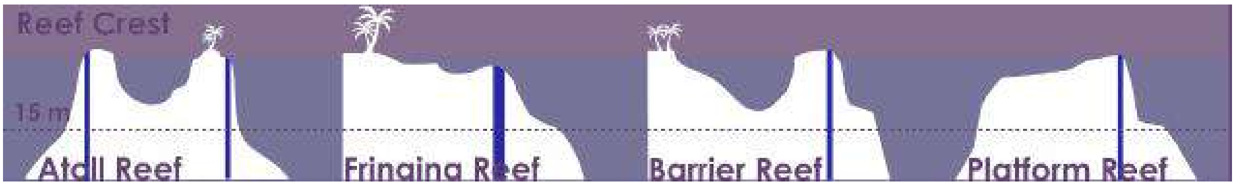
Figure 6- 33 shows the geomorphologic classes at the DTS areas as downloaded from the coral reef database Allen Coral Atlas together with the DTS routes (in red). The Allen Coral Atlas is a global-scale coral reef habitat mapping project that uses Planet Dove 3.7 m resolution daily satellite imagery (in combination with wave models and ecological data) to create consistent global coral reef habitat maps. The atlas maps twelve Global Geomorphic Zones down to 15 m water depth:

- Reef Slope. A submerged sloping area extending seaward from the reef crest (or flat) towards the shelf break. Windward facing, or any direction if no dominant prevailing wind or current exists:

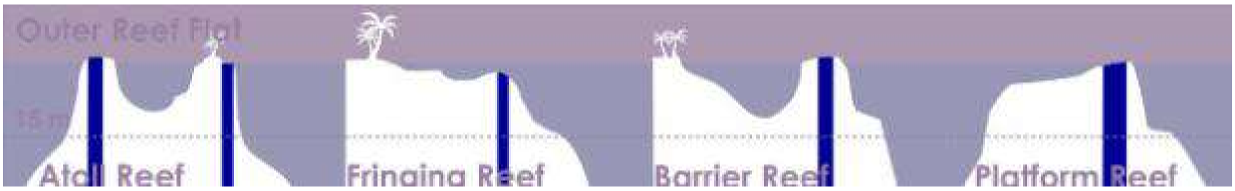
- Sheltered Reef Slope. Any submerged, sloping area extending into deep water but protected from strong directional prevailing wind or current, either by land or by opposing reef structures:

- Reef Crest. Zone marking the boundary between the reef flat and the reef slope, generally shallow and characterized by highest wave energy absorbance:

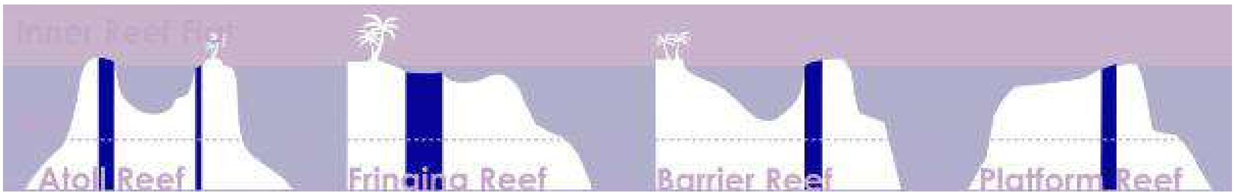
[23] Cooke, HJ (1974). The Coastal Geomorphology of Tanga, Tanzania. Geographical Review, Vol. 64, No. 4 (Oct, 1974), pp. 517-535. Published by: American Geographical Society



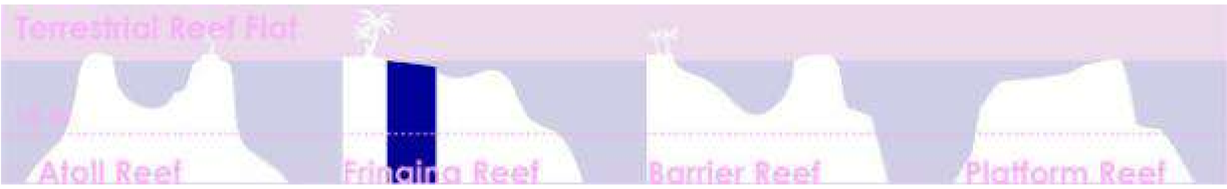
- Outer Reef Flat. A levelled (near horizontal) broad and shallow carbonate platform, displaying distinct wave-driven zonation, adjacent to the seaward edge of the reef:



- Inner Reef Flat. A low energy, sediment-dominated, horizontal to gently sloping platform behind the outer reef flat:

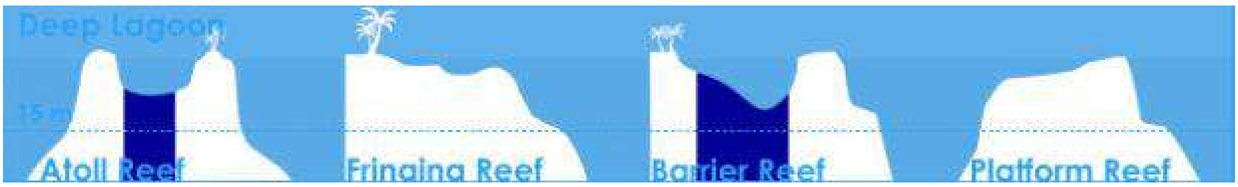


- Terrestrial Reef Flat. A broad, flat, shallow to semi-exposed area fringing reef flat found directly attached to land at one side. It is subject to freshwater run-off, nutrients and sedimentation:



- Back Reef Slope. A complex, interior - often gently sloping - reef zone occurring behind the reef flat. Of variable depth (but deeper than reef flat and more sloped), it is sheltered, sediment-dominated and often punctuated by coral outcrops:

- Deep Lagoon. Any sheltered broad body of water, fully to semi-enclosed by reef, with a variable depth (but deeper than approx. 5m and shallower than surrounding ocean) and a soft bottom dominated by reef-derived sediment:



- Shallow Lagoon. Any fully to semi-enclosed, sheltered, flat-bottomed sediment-dominated lagoon area, shallower than approximately 5 m:

- Plateau. Any deeper submerged (approximately > 5 m), hard-bottomed, horizontal to gently sloping (gradients less than approximately 10°), seaward facing reef platform:

- Patch Reef. Any small, detached to semi-detached lagoonal coral outcrop arising from a sheltered, sandy-bottomed area:

- Small Reef. Refers to any detached (stand-alone) reef, surrounded by deep water and too small (generally less than approximately 1km²) to show a central depression and/or other clear geomorphologic zonation (e.g., crest, flat, backreef) besides a reef slope:

The project route appears to intersect with various geomorphic zones, including inner reef flat, terrestrial reef flat, shallow lagoon, deep lagoon, and sheltered reef slope.

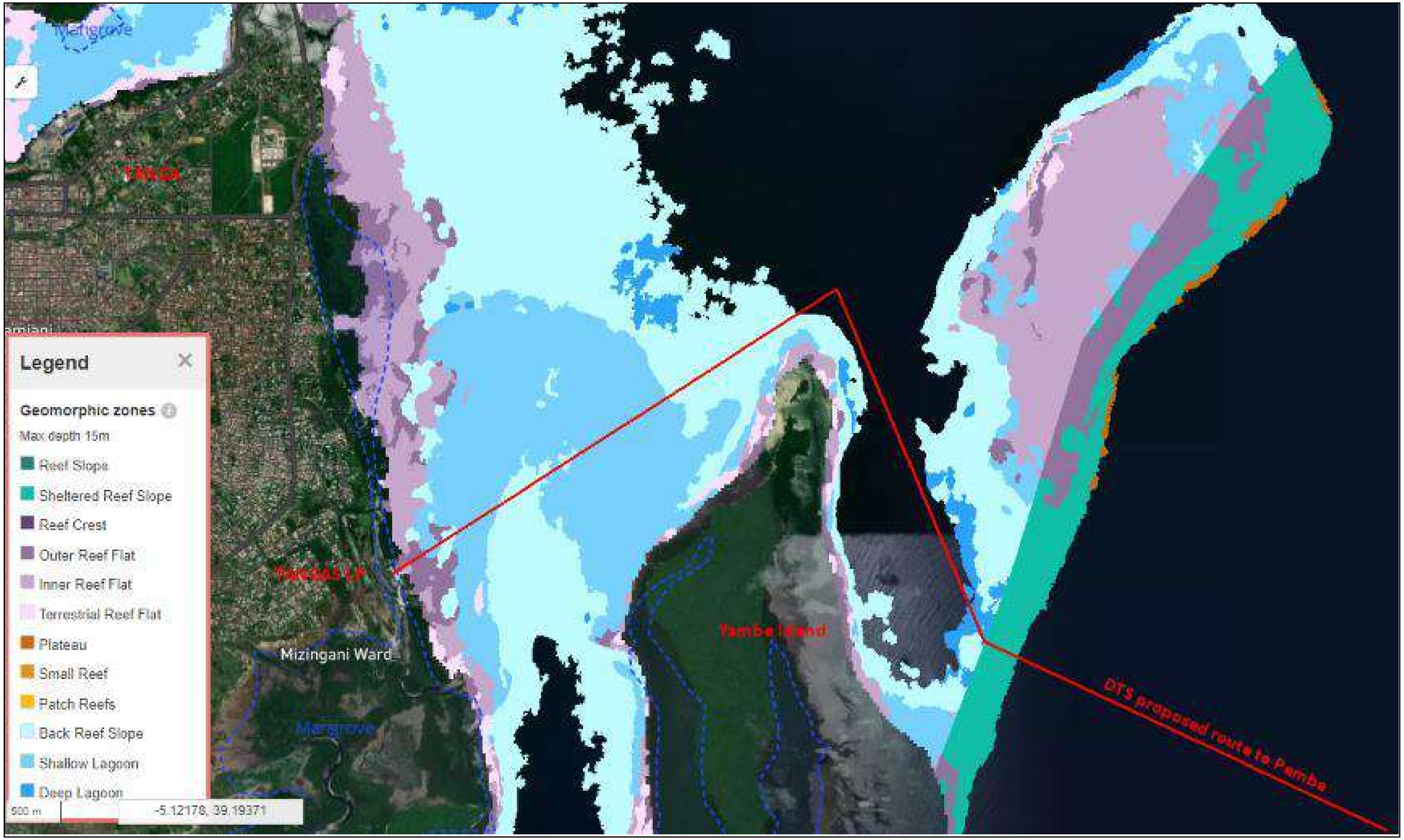


Figure 6- 33 – Geomorphic map at Tanga approach (mod. from Allen Coral Atlas 2022)

6.3.2 Biological Environment

6.3.2.1 Marine habitats and biodiversity

6.3.2.1.1 Marine fauna

As a result of a literature review, 1,778 species were identified as potentially occurring within the study area. This identification was based on their known distribution ranges and habitat suitability.

According to the IUCN Red List, 112 of these potentially present species occur only in marine biomes and are considered threatened. The breakdown is as follows:

- 73 species are Vulnerable (VU);
- 20 species are Endangered (EN);
- 12 species are Critically Endangered (CR).

Among these threatened species (in descending order of the number of threatened species per taxon):

- 63 are fish species (30 VU, 21 EN, and 12 CR);
- 43 are coral species, all classified as VU;
- 8 are echinoderm species (4 VU and 4 EN);
- 7 are mammal species (4 VU and 3 EN).

It is important to note that these numbers exclude seabirds, which are addressed in paragraph 6.2.2.3 along with terrestrial and freshwater fauna.

The complete list of the IUCN species potentially present in the project area is presented in Annex 5.

6.3.2.1.2 Marine flora

As a result of a literature review, 12 species were identified as potentially occurring within the study area, considering a 50 km buffer. This identification was based on their known distribution ranges and habitat suitability. However, only one of these potentially present species, the *Zostera capensis* (VU), is listed as threatened on the IUCN Red List.

This finding suggests a likely underestimation of true flora diversity within the study area. The scarcity of geospatial data for plant species in the IUCN Red List Database, compared to fauna data, likely contributes to this underestimation.

6.3.2.1.3 Marine survey methodology

Marine survey was conducted within the study area by Prof. Dr. Nsajigwa Emmanuel Mbije (Sokoine University of Agriculture) from June 3rd to June 7th, 2024, in Pemba Island and from 8rd to June 9th, 2024, in Tanga. The survey was conducted to assess marine biodiversity in the project areas, taking into account IFC Performance Standard No. 6 and AfDB OS6, which aim to ensure the conservation and management of biological resources. As this standard addresses the protection and conservation of biodiversity, with a focus on modified, natural and critical habitats, and the management of ecosystem services, the assessment considered the requirements of the Environmental Management Act (EMA) No. 20 of 2004, the Forestry Act of 2002 and the Wildlife Conservation Act No. 5 of 2009, and whether the relevant national standards of the National Environmental Management Council (NEMC) were met. The Convention on

International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the IUCN Red List of Threatened Fauna and Flora were useful in grouping wildlife into more meaningful categories.

Five data collection techniques have been employed for the marine survey:

i. Surveys of planktons using towing standard plankton net,

ii. Surveys of marine benthos using Eckman grab through skin dives along line transect,

iii. Surveys of marine benthos (corals community including fish) through dives along line transect,

iv. Opportunistic recording of organisms,

v. Interview with key informants to determine familiar marine organisms in the study area.

Benthic survey on subtidal areas

In addition to the normal snorkelling surveys, the area of the project sites to be surveyed has been divided into benthic regions. In these areas, pairs of divers descended to the predetermined reef location using a 50-metre tape measure. Observation of the marine resources were based on English et al. (1994)[24] to describe the substratum.

Fish Surveys (reef areas)

Surveys are conducted by pairs of divers swimming along the 50-metre tape on either side of the pipe, as used in the benthic survey. Species included in the survey are visually and numerically dominant, have no cryptic behaviour, are easily identified underwater and are associated with reef habitats. The survey teams swim slowly along each transect recording a tally of target fish species encountered 2.5 metres either side and 5 metres above the line on a pre-drawn dive slate. Furthermore, a visit was made to a fish landing site for surveying types of species caught.

General invertebrate and observational survey method

This survey method was used in conjunction with the 50 metre LIT benthic survey where a second diver in the survey team takes the readings while the first diver completes the LIT. The 10-metre survey line was deployed at the selected reef site. The same was done in other non-reef areas.

Plankton surveys

The Continuous Plankton Recorder (CPR) has been used to sample plankton within the marine project area. The CPR was towed at a depth of approximately 10 metres. Water passed through the CPR and plankton were filtered onto a slow-moving band of silk (270-micron mesh size) and covered with a second silk. The silk and plankton were then wound into a storage tank containing formalin. On return to the laboratory, the silk was removed from the mechanism and divided into samples representing 10 nautical miles (19 km) of tow.

Occurrence, distribution and abundance of threatened coastal species

The species found were checked against the List of East African (LEAP) database and various updated CITES and IUCN Red List summaries.

Marine water quality

[24] English, S. Wilkinson, C. and Baker, V. (eds.) 1994. Survey Manual for Tropical Marine Resources, 2nd Edn. Australian Institute of Marine Science, Townsville. 390 pp.

For marine water quality, data were collected on visibility, temperature, and salinity.

Opportunistic surveys

Surveys in the intertidal and subtidal areas were conducted to record any human activity observed, including zebu grazing. Where possible, local villagers were also interviewed to determine how they were using the mangroves and whether they were using them sustainably or unsustainably.

Figure 6- 34 - Snorkeling activities during the survey

6.3.2.2 ***Marine survey results***

Along the proposed submarine cable route in Tanga, 4 underwater transects were conducted. During the survey, the depth ranged from 1 to 25 m below sea level and the percentage cover of benthic categories was 75% sand, 8% seagrass and 17% soft coral. Coral reef was observed in the northern part of Yambe Island.

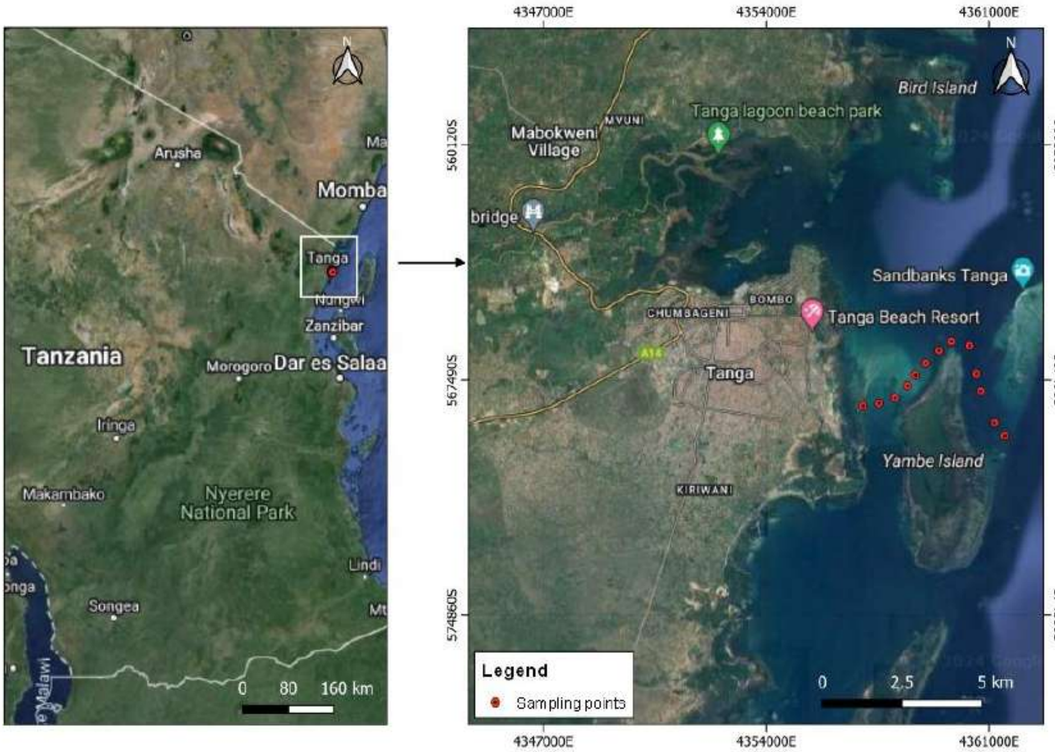


Figure 6- 35 - Map of Tanga sampling area for the propose routing of marine cable

The main macrofauna identified in the area were the fire urchins *Astropyga radiata* (Figure 6- 36). No coral reefs with fish were visible along the proposed route.

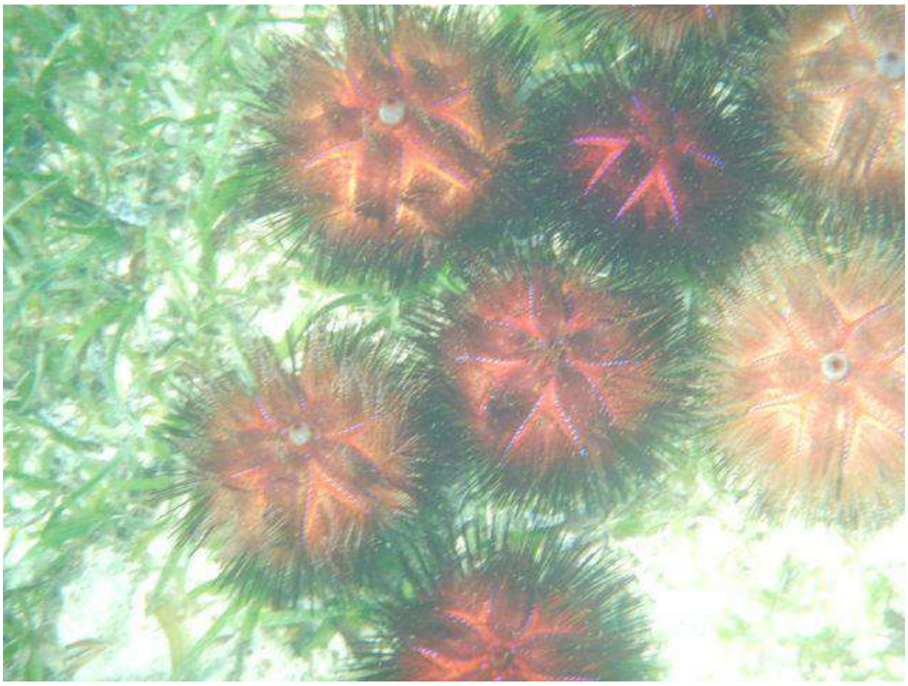


Figure 6- 36 - Fire urchin Astropyga radiata at Yambe reef in Tanga

Data on zooplancktons and phytoplanktons surveyed are reported in Table 6- 12.

Table 6- 12 - Data on zooplanktons and phytoplanktons

Phytoplanktons		
Name of Species/Genus	**Group**	**Counts/Litre**
Strombidium sp.	Dinoflagellata	76,122
Gyrodinium sp.	Dinoflagellata	194,000
Trichodesmium spp.	Cyanobacteria	185,456
Chaetoceross spp.	Diatoms	246,000
Thalassiothrix spp.	Diatoms	109,342
Bacteriastrum spp.	Diatoms	68,919
Pseudonitszchia spp.	Diatoms	287,561
Leptocylindrus spp.	Diatoms	54,123

Zooplanktons		
Name	**Group**	**Count/L**
Temora turbida	Copepoda	176
Acartia sp.	Copepoda	294
Eucanus spp.	Copepoda	45
Temora stilifera	Copepoda	129
Acrocalanus gibber	Copepoda	236

Oithina sp.	Copepoda	292
Centrophages furcata	Copepoda	292
Oncacea spp.	Copepoda	89

Water quality data are reported below.

Table 6- 13 - Data on pH, temperature and salinity

Salinity	Temperature	pH
$35.1^{0}/_{00}$	27.2°C	8.2

6.3.2.2.1 ***Marine habitats and ecosystems***

The Tanzanian coastline is a hotspot of marine biodiversity, characterized by a rich mosaic of marine ecosystems. This section delves into a detailed examination of these ecosystems within the project area, emphasizing their ecological significance and current threats. These marine habitats encompass coral reefs, seagrass meadows, and seaweed beds, each contributing uniquely to the overall health and functioning of the coastal zone.

- **Coral reefs**: Confined to shallow tropical and subtropical waters (25°S - 25°N), they represent ecosystems of critical ecological importance[25]. They boast exceptional biodiversity, with estimates suggesting thousands of resident species, solidifying their position as one of the most diverse marine environments[26]. Furthermore, these ecosystems are recognized for their significant economic value[27,28].

  The Tanzanian coastline is adorned with well-developed coral and barrier reefs, exhibiting variations in species diversity. These reefs are estimated to house 150 coral species belonging to 13 families. A rich assemblage of ecologically and commercially valuable fauna thrives within these reefs, including an estimated 8,000 invertebrate species, 1,000 fish species, 5 marine turtle species, and numerous seabirds. Importantly, over 500 commercially valuable fish and invertebrate species call these coral reefs home.[29]

[25] Hoegh-Guldberg, O., 1999. Climate change, coral bleaching and the future of the world's coral reefs. Mar. Freshwater Res. 50, 839–866. http://dx.doi.org/10.1071/MF99078.

[26] Paulay, G., 1997. Diversity and distribution of reef organisms. In: Life and Death of Coral Reefs. pp. 198–229.

[27] Costanza, R., Arge, R., De, Groot.R., Farberk, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., Neill, R.V.O., Paruelo, J., Raskin, R.G., Suttonkk, P., van den, Belt M., 1997. The value of the world's ecosystem services and natural capital. Nature 387, 253–260. http://dx.doi.org/10.1038/387253a0.

[28] Alongi, D.M., 2012. Carbon sequestration in mangrove forests. Carbon Manag. 3, 313–322. http://dx.doi.org/10.4155/cmt.12.20

[29] Nairobi Convention. (n.d.). Tanzania country profile: Biodiversity. Access April 15 2024. https://www.nairobiconvention.org/tanzania-country-profile/tanzania-biodiversity-2/

However, coral reef ecosystems in Tanzania and East Africa face mounting pressure from human activities[30]. Research suggests that unprotected reefs are particularly susceptible to the detrimental effects of interacting stressors, which can trigger dramatic ecological shifts[31,32].

- **Seagrass meadows**: Seagrasses are marine angiosperms with terrestrial origins, thriving in both the intertidal and subtidal zones. They exhibit the most extensive geographic distribution among coastal blue carbon habitats, with high abundance across tropical, temperate, and polar regions on all continents.[33,34] This diverse plant group displays a variation in morphological characteristics, yet they share a common feature: a vast underground root-rhizome system that anchors them to the substrate. This below-ground network stabilizes sediments[35,36] and facilitates carbon sequestration[37].

  Despite their global presence, seagrass meadows occupy a relatively small portion of the ocean floor, covering less than 0.2% of the global seabed[38]. However, they are estimated to contribute significantly to the ocean's carbon budget by burying roughly 10% of the annually produced organic carbon[39].

  Along the Tanzanian coastline, particularly near the Tanga coast and within estuaries and deltas of major rivers like Ruvu, Wami, and Rufiji, extensive seagrass meadows flourish. While a comprehensive understanding of their total coverage and species composition is yet to be fully established, these submerged ecosystems play a vital role in maintaining coastal health. Their root

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[30] Obura, D. (2002). Status of coral reefs in Eastern Africa: Kenya, Tanzania, Mozambique and South Africa.

[31] Hughes, T. P., Rodrigues, M. J., Bellwood, D. R., Ceccarelli, D., Hoegh-Guldberg, O., McCook, L., ... & Willis, B. (2007). Phase shifts, herbivory, and the resilience of coral reefs to climate change. Current biology, 17(4), 360-365.

[32] McClanahan, T. R. (2000). Recovery of a coral reef keystone predator, Balistapus undulatus, in East African marine parks. Biological Conservation, 94(2), 191-198.

[33] Green, E., and Short, F. T. (2003) World atlas of seagrasses University of California Press, Berkley, USA.

[34] Marbá, N., Krause-Jensen, D., Masqué, P., and Duarte, C. M. (2018). Expanding Greenland seagrass meadows contribute new sediment carbon sinks Scientific Reports 8, 14024.

[35] Ganthy, F., Sottolichio, A., and Verney, R. (2011). The stability of vegetated tidal flats in a coastal lagoon through quasi in-situ measurements of sediment erodibility Journal of Coastal Research Special Issue 64, 1500–1504.

[36] Terrados, J., and Duarte, C. M. (2000). Experimental evidence of reduced particle resuspension within a seagrass (*Posidonia oceanica* L.) meadow Journal of Experimental Marine Biology and Ecology 243, 45–53.

[37] Trevathan-Tackett, S. M., Jeffries, T. C., Macreadie, P. I., Manojlovic, B., and Ralph, P. (2020). Long-term decomposition captures key steps in microbial breakdown of seagrass litter Science in the Total Environment 705, 135806.

[38] Duarte, C. M., Middelburg, J. J., and Caraco, N. (2005). Major role of marine vegetation on the oceanic carbon cycle. Biogeosciences 2, 1–8.

[39] Cebrian, J. (1999). Patterns in the fate of production in plant communities The American Naturalist 154, 449–468.

systems act as efficient filters for sediments, preventing smothering of delicate coral reefs. Additionally, seagrass beds serve as crucial foraging grounds for fish populations and represent a primary food source for marine megafauna like turtles and dugongs, thereby significantly contributing to the overall productivity of the ecosystem.

- **Seaweed beds**: Seaweeds are fundamental components of marine ecosystems, serving as primary producers[40]. They predominantly exist in attached forms on hard substrates, such as rocks, hard corals, or mangrove roots, in areas with moderate wave action[41]. Within coral reef communities, seaweeds play a crucial role by integrating ecological functions. They provide essential shelter, nursery grounds, and food sources for diverse reef inhabitants.[42,43,44] Similar to seagrass meadows, seaweed beds offer critical habitat in the Tanzanian coastal zone, supporting a rich assemblage of microorganisms and fish populations.

  Seaweed farming has emerged as a significant economic activity, particularly in Zanzibar, providing employment opportunities, especially for women[45]. This sustainable practice offers a dual benefit. Seaweed farms act as ecological analogs to their wild counterparts, mitigating coastal erosion by attenuating wave energy. Additionally, seaweed aquaculture contributes to mitigating the effects of ocean acidification and deoxygenation by increasing both water pH and oxygen levels.

6.3.2.3 Marine legally protected areas and important areas for biodiversity

*6.3.2.3.1 **Protected areas and important areas for biodiversity in Tanzania***

Tanzania set ambitious goals at the September 2003 World Parks Congress in Durban to increase marine protected area coverage to 10% by 2012 and 20% by 2025[46], current coverage remains at around 3.05%. This indicates a significant gap between targets and achievement.

[40] Khan, M.S.K., Hoq, M.E., Haque, M.A., Islam, M.M., Hoque, M.M., 2016. Nutritional evaluation of some seaweeds from the Bay of Bengal in contrast to inland fishes of Bangladesh. IOSR J. Environ. Sci. Toxicol. Food Technol. 10 (11), 59–65.

[41] Isa, H.M., Abu Hena, M.K., Idris, M.H., Rosli, Z., Ismail, J., 2017. Biomass and habitat characteristics of Epiphytic Macroalgae in the Sibuti Mangroves, Sarawak, Malaysia. Trop. Life Sci. Res. 28 (1), 1–21.

[42] Prathep, A., 2005. Spatial and temporal variations in diversity and percentage cover of macroalgae at Sirinart Marine National Park, Phuket province. Thailand Sci. Asia 31, 225–233.

[43] Fong, P., Paul, V.J., 2011. In: Dubinsky, Z., N., Stambler (Eds.), Coral reef algae. In: Coral Reefs: An Ecosystem in Transition., Springer, Dordrecht, pp. 241–272. http://dx.doi.org/10.1007/978-94-007-0114-4_17.

[44] Prathep, A., Pongparadon, S., Darakrai, A., Wichachucherd, B., Sinutok, S., 2011.

Diversity and distribution of seaweed at Khanom-Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province, Thailand. Songklanakarin J. Sci. Technol. 33 (6), 633–640.

[45] Hedberg, N., von Schreeb, K., Charisiadou, S., Jiddawi, N. S., Tedengren, M., & Nordlund, L. M. (2018). Habitat preference for seaweed farming–A case study from Zanzibar, Tanzania. Ocean & Coastal Management, 154, 186-195.

[46] Ruitenbeek J., Hewawasam I., and Ngoile M., Blueprint 2050: Sustaining the Marine Environment in Mainland Tanzania and Zanzibar 2005. IBRD/World Bank, Washington, DC. pp 125.

For areas under the jurisdiction of mainland Tanzania, the declaration of marine parks and marine reserves are governed by the Marine Parks and Reserves Act, No.29 of 1994. To protect the marine biodiversity the Government of Tanzania established the Marine Park and Reserves unit in 1994 with Mafia Island Marine Park as the first marine park. In Zanzibar (including Pemba), marine protected areas are designated under separate legislation specific to Zanzibar. Unlike terrestrial national parks, marine protected areas allow for multiple resource uses. They do not remove existing residents or, in principle, forbid current or future use of resources within their boundaries[47].

6.3.2.3.2 *Protected areas and important areas for biodiversity in the study area*

The project area intersects with the following marine protected areas and important biodiversity areas:

- Tanga Coelacanth Marine Park

Additionally, other marine protected areas are located close (within a 15 km buffer) to the project area:

- Ulenge Island and Kwale Island Marine Reserves, part of the Tanga Marine Reserves, located about 6.5 and 9 km north from the marine cable route, respectively.

These areas, represented in Figure 6- 15 and Figure 6- 16, are described below.

<u>Tanga Coelacanth Marine Park</u>

Tanga Coelacanth Marine Park (TACMP) is located on the northern coast of Tanzania, extending 100 km from the north of the Pangani River estuary to the village of Mafuriko, north of Tanga City. The park covers an area of approximately 552 km², including 85 km² of land and 467 km² of aquatic habitats. Key features of TACMP include the bays of Tanga City and Mwambani, the Tongoni estuary and the three small islands of Toten, Yambe and Karange.

TACMP is renowned for the presence of the CITES-listed Coelacanth, *Latimeria chalumnae*, the iconic and rare 'living fossil' fish that was rediscovered in the coastal waters off Tanzania in 2003. The park also provides habitat for other threatened species such as dugongs, sea turtles and migratory waterbirds. In particular, the last sighting of a dugong in the region was in 2006 off Kigombe.

In addition to its role in species conservation, the TACMP has highly productive and diverse fisheries and rich coral reef communities. The continental shelf off the Tanga region covers approximately 2,090 km² and is relatively narrow, ranging from 5-10 km wide between Tanga and Pangani to over 40 km wide near the Kenyan border.

<u>Tanga Marine Reserves</u>

Kwale, Mwewe, Kirui, and Ulenge Islands Marine Reserves, collectively referred to as the Tanga Marine Reserve System (TMRs), were officially designated as marine reserves in June 2010. These reserves are located between Tanga Bay and the Kenyan border.

All mangrove species found in Tanzania are present within the TMRs. Sonneratia alba is the dominant species seaward, while Rhizophora mucronata predominates in wave-protected areas. The mangrove trees in the TMRs are heavily exploited for firewood, charcoal, timber, and poles, showing signs of overexploitation and deterioration.

[47] Tanzania. Ministry of Natural Resources and Tourism. (2001). Guidelines & Procedures for Undertaking Environmental Impact Assessment in Marine Parks and Reserves in Tanzania.

The TMRs are associated with bays. For instance, Tanga Bay and Kwale Bay are linked with Ulenge Marine Reserve, while Kwale Bay and Manza Bay are associated with Kwale Marine Reserve. Mwewe Marine Reserve is located within Moa Bay, and Kirui Marine Reserve is just north of Moa Bay. Therefore, conservation actions and usage of the islands are inevitably connected to these bays. Seagrass beds are the main feature of the bays and shallow waters adjacent to the TMRs. Coral growth in the bays is limited due to sedimentation, freshwater input, and unsuitable substrates for coral settlement. Sparse and scattered coral reef patches are found in Kwale and Manza Bays, with more concentrated patches in the deeper parts of Moa Bay. Continuous coral reefs occur seaward of Ulenge, Kwale, and Kirui Islands.

A small population of dugongs is believed to exist in the Mbayae-Kigomeni area, just east of Kirui Island and south of the Kenyan border, where they were sighted in 1994 and 2004. Ulenge and Kwale Island Marine Reserves are part of the important bird area, IBM 35, as defined by BirdLife International[48]. This area is home to a diverse bird fauna, including Greater Sand Plover, Curlew Sandpiper, Crab Plover, and various migrating waders. While mangrove and coral reefs in the reserves are not currently endangered, they are considered threatened by human activities and factors related to climate change.[49]

6.3.3 Socio-Economic Environment

6.3.3.1 Marine archaeology and cultural heritage

The underwater heritage of Tanzania includes bodies of water such as oceans, lakes, rivers, and wells. Presently, only 40 shipwrecks along Tanzania's coast have been documented. There are numerous unexplored underwater cultural remains in Tanzania, including both ancient and modern shipwrecks, aircraft, and submerged or dry maritime infrastructures such as harbours, lighthouses, navigation aids, and cities. Additionally, there are submerged prehistoric coastal settlements (like fish traps and weirs, salt pans), submerged lakeside settlements (crannogs), riverine and swamp systems with associated sites and remains (such as ships, indigenous watercraft, and settlements), and land-based sites with maritime-related iconographies (rock paintings and engravings). Advances in diving technology have made these sites more accessible and, consequently, more vulnerable to human destruction.

The Tanzania Maritime and Underwater Cultural Heritage Programme started in 2009 with the aim to empower Tanzanians establish the Tanzanian Maritime Cultural Heritage (MUCH) Unit. Among other things, the programme imparts skills and knowledge to programme participants so that they are able to record, document and monitor underwater cultural heritage sites. With both technical and financial assistance from the CIE-Centre for International Heritage Activities, UNESCO and the Netherlands Government, the TMUCH team has implemented various projects in Zanzibar and Kilwa Kisiwani.[50]

To date, no records of underwater cultural heritage have been found in the area surrounding the cable route.

[48] Baker N.E. and Baker, E.M. (2002) Important Bird Areas in Tanzania. A first inventory. Wildlife Conservation Society of Tanzania, Dar es Salaam, Tanzania.

[49] BIOPHYSICAL SURVEY IN THE NEWLY GAZETTED MARINE RESERVES OF TANGA, C. A. Muhando, 2011

[50] Maritime and Underwater Cultural Heritage Survey, Mafia Island, Tanzanian Maritime and Underwater Cultural Heritage Program, 2012

6.3.3.2 Marine traffic

Traffic routes are shown in the Admiralty Charts when approaching Tanga port, at Tanga Port, Zanzibar Port and Dar es Salaam Port. Recommended tracks are also indicated on charts (Figure 6- 37).

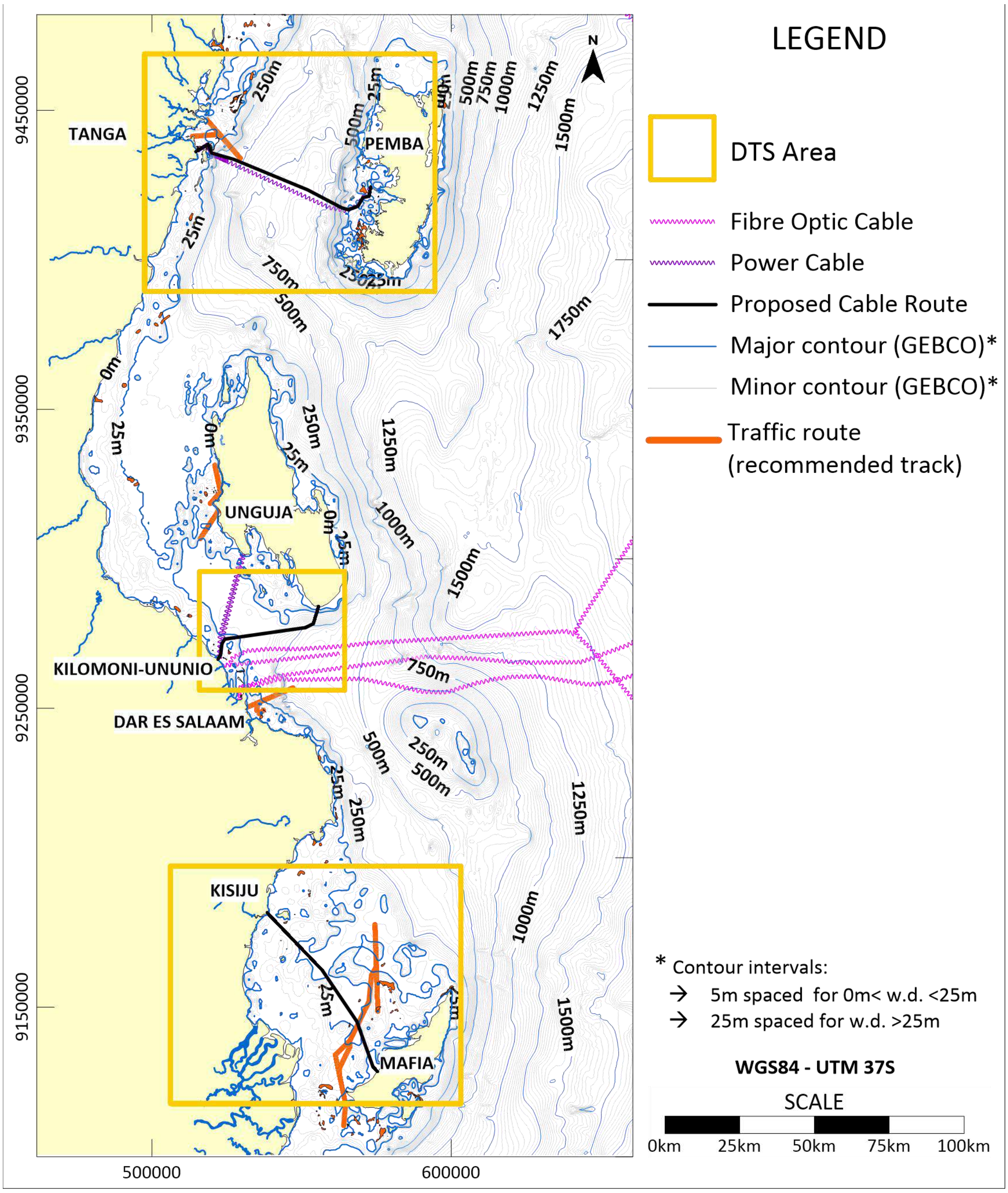

Figure 6- 37 – Traffic Routes - recommended tracks from Ad.CH.

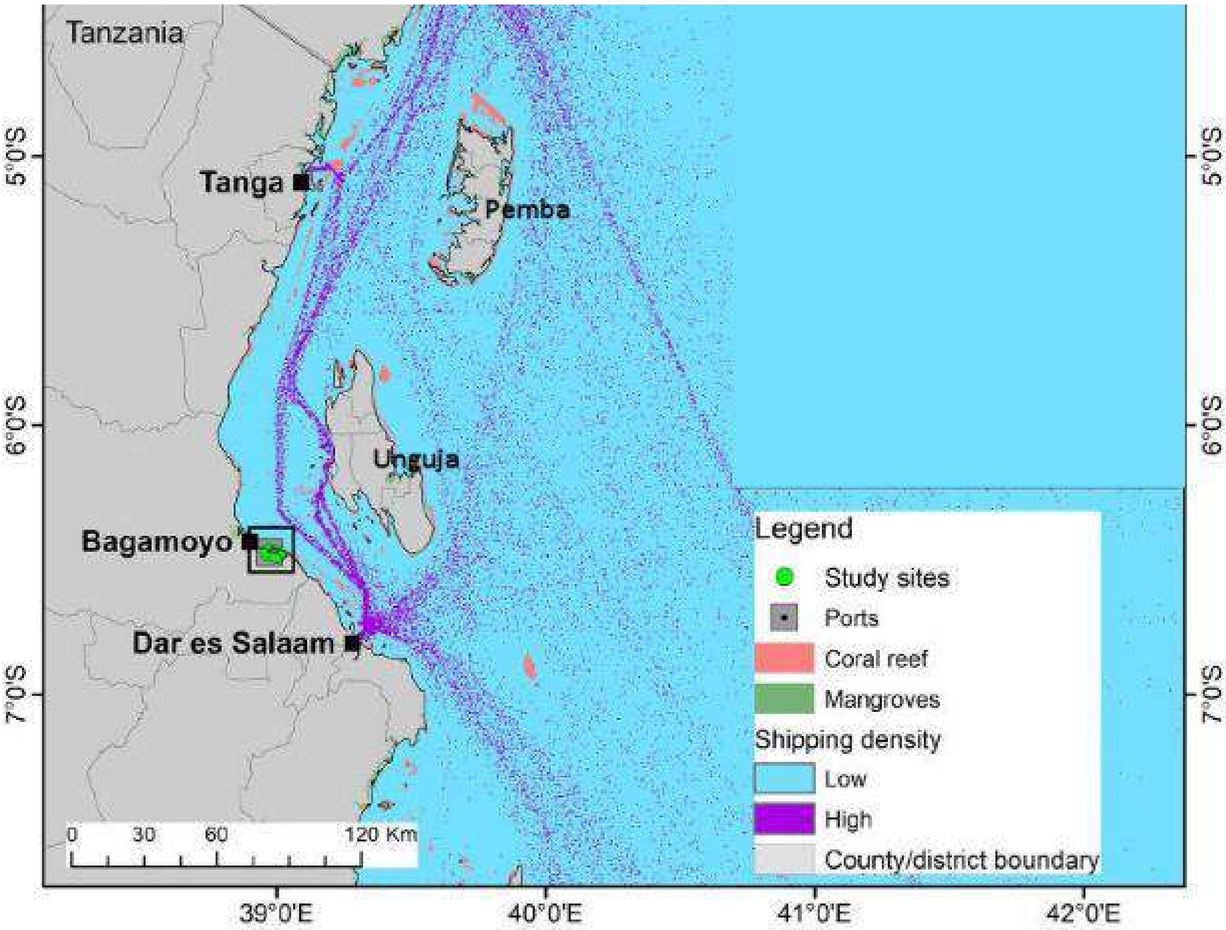

Figure 6- 38 – Shipping density in central and northern Tanzania (mod. from Thoya et al., 2022)

Tanzania mainland is regularly connected with Pemba and Zanzibar Islands through ferry boats.

The main operating companies are Azam Marine (https://azammarine.com/) and Zan Fast Ferries (https://zanfastferries.co.tz/), and the ferry route connections are:

- Dar es Salaam – Pemba
- Zanzibar (Unguja) – Pemba (Mkoani)
- Pemba – Tanga

6.4 Critical Habitat

Critical Habitat is a concept developed by the International Finance Corporation (IFC) in its Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Resources. The concept aims to identify areas of high biodiversity value where development would be particularly sensitive and require special attention. According to the International Finance Corporation (IFC, 2019) Guidance Note 6 and the AfDB OS6 (2023) "Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources", Critical Habitats (CH) are areas of high biodiversity value that contain at least one or more of the five values identified in PS6 and AfDB OS 6, and/or other recognised high biodiversity values.

According to the AfDB's Environmental and Social Operational Safeguard 6 (OS6) the Critical Habitat (CH) is defined as a subset of both natural and modified habitat that has high biodiversity value and deserves particular attention. The CH is fundamentally based on the following seven criteria:

(a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent regional or national approaches.

(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.

(e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

IFC PS6 will be considered to establish whether critical habitat requirements are triggered and, if so, measures will be set out to ensure compliance with these.

Critical Habitat Assessment

An assessment using available and collected data was undertaken to identify the possible existence of Critical Habitats (CHs) within the project area and in the Indirect Area of Influence (IAoI) in accordance with the criteria outlined in the IFC PS6 and AfDB Operational Safeguard 6.

Criterion 1: Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent regional or national approaches.

The evaluation considered the presence of species classified as Endangered (EN) or Critically Endangered (CR) based on global criteria established by the International Union for Conservation of Nature (IUCN). The assessment took into account data collected in the field by experts and the secondary data, such as the IUCN spatial data.

The assessment of the critical habitat for these species followed specific criteria outlined in Guidance Note 6 (GN72) of the IFC 2019 guidelines:

a) areas that support globally important concentrations of an IUCN Red-listed EN or CR species (> 0.5% of the global population AND > 5 reproductive units of a CR or EN species);

b) areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN70(a);

c) as appropriate, areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species. The thresholds outlined in Criterion 1 (a) were utilized to evaluate all fauna and flora species classified as Endangered (EN) or Critically Endangered (CR), as determined by IUCN criteria.

In order to apply the thresholds identified in Criterion 1 (a) an “Ecologically Appropriate Area of Analysis” (EAAA) has been identified. It has been identified as a 500-meter zone surrounding the project footprint for the terrestrial part and a 1-km buffer surrounding the project footprint from the coast and along the proposed marine route to a depth of 40 m. For the proposed substation, it was considered a 1-km buffer and for the deep see areas, it has been identified as an area of 10 kilometres surrounding the project footprint.

During the field work, no species classified as Endangered (EN) or Critically Endangered (CR) were detected.

However, the project area hosts a high number of sensitive species, which require careful consideration and conservation measures to ensure their protection.

The results of the critical habitat assessment for species potentially present in the area, for Criterion 1 are reported in Table 6- 14 and Table 6- 15. Species categorized as potentially present, as determined by literature data, are designated as triggering “Potential Critical Habitat”.

Table 6- 14 – Critical habitat assessment for criterion 1 in Tanga

Taxon	Scientific Name	Common Name	IUCN category	Population trend	Endemic/RR	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Mammal	*Bdeogale omnivora*	Sokoke Dog Mongoose	VU	Decreasing	Endemic/RR	28493	4.7	142.465	No	No
Mammal	*Taphozous hildegardeae*	Hildegarde's Tomb Bat	EN	Decreasing	Endemic/RR	43854	4.7	219.27	No	No
Mammal	*Colobus angolensis* ssp. *palliatus*	Peter's Angolan Colobus	VU	Decreasing	-	83534	4.7	417.67	No	No
Mammal	*Diceros bicornis* ssp. *minor*	South-eastern Black Rhino	CR	Stable	-	2377379	4.7	11886.9	No	No
Mammal	*Smutsia temminckii*	Temminck's Pangolin	VU	Decreasing	-	7124300	4.7	35621.5	No	No
Bird	*Geokichla guttata*	Spotted Ground-thrush	VU	Decreasing	Endemic/RR	22948	4.7	114.74	No	No
Bird	*Acrocephalus griseldis*	Basra Reed-warbler	EN	Stable	-	199722	4.7	998.61	No	No
Bird	*Ardeola idae*	Madagascar Pond-heron	EN	Decreasing	-	2235347	4.7	11176.74	No	No
Bird	*Falco concolor*	Sooty Falcon	VU	Decreasing	-	3252881	4.7	16264.41	No	No
Bird	*Bucorvus leadbeateri*	Southern Ground-hornbill	VU	Decreasing	-	4867695	4.7	24338.48	No	No
Bird	*Trigonoceps occipitalis*	White-headed Vulture	CR	Decreasing	-	6010952	4.7	30054.76	No	No

Taxon	Scientific Name	Common Name	IUCN category	Population trend	Endemic/RR	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Bird	*Gyps rueppelli*	Rüppell's Vulture	CR	Decreasing	-	6484039	4.7	32420.2	No	No
Bird	*Torgos tracheliotos*	Lappet-faced Vulture	EN	Decreasing	-	8489782	4.7	42448.91	No	No
Bird	*Gyps africanus*	White-backed Vulture	CR	Decreasing	-	10465302	4.7	52326.51	No	No
Bird	*Necrosyrtes monachus*	Hooded Vulture	CR	Decreasing	-	10763444	4.7	53817.22	No	No
Bird	*Terathopius ecaudatus*	Bateleur	EN	Decreasing	-	14022203	4.7	70111.02	No	No
Bird	*Sagittarius serpentarius*	Secretarybird	EN	Decreasing	-	14023897	4.7	70119.49	No	No
Bird	*Polemaetus bellicosus*	Martial Eagle	EN	Decreasing	-	14887144	4.7	74435.72	No	No
Bird	*Aquila rapax*	Tawny Eagle	VU	Decreasing	-	17570827	4.7	87854.14	No	No
Amphibian	*Afrixalus sylvaticus*	-	VU	Decreasing	Endemic/RR	7963	4.7	39.815	No	No
Reptile	*Bitis gabonica*	Gaboon Viper	VU	Decreasing	-	4466870	4.7	22334.35	No	No
Crustacean	*Potamonautes infravallatus*	-	VU	Decreasing	Endemic/RR	7629	4.7	38.145	No	No
Insect	*Amanipodagrion gilliesi*	-	CR	Decreasing	Endemic/RR	3087	4.7	15.435	No	No
Insect	*Parodontomelus arachniformis*	Northern Forest Grasshopper	VU	Decreasing	Endemic/RR	7904	4.7	39.52	No	No

Taxon	Scientific Name	Common Name	IUCN category	Population trend	Endemic/RR	Estimated extent of occurrence EOO (km²)	EAAA (km²)	0.5% of EOO (km²)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Insect	*Mecostibus minor*	Little Shortheaded Grasshopper	VU	Decreasing	Endemic/RR	21232	4.7	106.16	No	No

Table 6- 15 – Critical habitat assessment for Criterion 1, deep see area of the interconnection Tanga-Pemba Island

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km²)	EAAA (km²)	0.5% of EOO (km²)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Coral	*Acropora aculeus*	-	VU	16470964	502.4	82354.82	No	No
Coral	*Acropora hemprichii*	-	VU	3928345	502.4	19641.73	No	No
Coral	*Acropora horrida*	-	VU	19255903	502.4	96279.52	No	No
Coral	*Acropora pharaonis*	-	VU	4241706	502.4	21208.53	No	No
Coral	*Acropora solitaryensis*	-	VU	12902231	502.4	64511.16	No	No
Coral	*Acropora verweyi*	-	VU	16236286	502.4	81181.43	No	No
Coral	*Acropora willisae*	-	VU	11616092	502.4	58080.46	No	No
Coral	*Alveopora allingi*	-	VU	17567972	502.4	87839.86	No	No
Coral	*Alveopora daedalea*	-	VU	7697560	502.4	38487.8	No	No
Coral	*Alveopora fenestrata*	-	VU	14534405	502.4	72672.03	No	No
Coral	*Isopora brueggemanni*	-	VU	11107426	502.4	55537.13	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Coral	*Isopora cuneata*	-	VU	14778578	502.4	73892.89	No	No
Coral	*Montipora calcarea*	-	VU	6296432	502.4	31482.16	No	No
Coral	*Montipora caliculata*	-	VU	15846161	502.4	79230.81	No	No
Coral	*Montipora stilosa*	-	VU	2224514	502.4	11122.57	No	No
Coral	*Leptoseris incrustans*	-	VU	15473151	502.4	77365.76	No	No
Coral	*Pavona cactus*	-	VU	19640428	502.4	98202.14	No	No
Coral	*Pavona decussata*	Cactus Coral	VU	19374134	502.4	96870.67	No	No
Coral	*Pavona venosa*	-	VU	17551805	502.4	87759.03	No	No
Coral	*Anomastraea irregularis*	-	VU	2865324	502.4	14326.62	No	No
Coral	*Horastrea indica*	-	VU	824639	502.4	4123.195	No	No
Coral	*Duncanopsammia peltata*	-	VU	17843396	502.4	89216.98	No	No
Coral	*Turbinaria mesenterina*	-	VU	20441656	502.4	102208.3	No	No
Coral	*Turbinaria reniformis*	-	VU	19290541	502.4	96452.71	No	No
Coral	*Turbinaria stellulata*	-	VU	17474353	502.4	87371.77	No	No
Coral	*Euphyllia cristata*	-	VU	13709125	502.4	68545.63	No	No
Coral	*Galaxea astreata*	-	VU	18016579	502.4	90082.9	No	No
Coral	*Cycloseris curvata*	-	VU	9175539	502.4	45877.7	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Coral	*Heliopora coerulea*	Blue Coral	VU	19092118	502.4	95460.59	No	No
Coral	*Acanthastrea hemprichii*	-	VU	11804395	502.4	59021.98	No	No
Coral	*Lobophyllia ishigakiensis*	-	VU	13319970	502.4	66599.85	No	No
Coral	*Astraeosmilia connata*	-	VU	2076987	502.4	10384.94	No	No
Coral	*Catalaphyllia jardinei*	-	VU	12800662	502.4	64003.31	No	No
Coral	*Echinopora robusta*	-	VU	270713	502.4	1353.565	No	No
Coral	*Favites spinosa*	-	VU	2574827	502.4	12874.14	No	No
Coral	*Leptoria irregularis*	-	VU	6989135	502.4	34945.68	No	No
Coral	*Paragoniastrea deformis*	-	VU	1102629	502.4	5513.145	No	No
Coral	*Paramontastraea serageldini*	-	VU	1895610	502.4	9478.05	No	No
Coral	*Pectinia africana*	-	VU	1732362	502.4	8661.81	No	No
Coral	*Pectinia lactuca*	Lettuce Coral	VU	15822827	502.4	79114.14	No	No
Coral	*Pachyseris rugosa*	-	VU	15900457	502.4	79502.29	No	No
Coral	*Physogyra lichtensteini*	-	VU	17204206	502.4	86021.03	No	No
Coral	*Porites nigrescens*	-	VU	17704996	502.4	88524.98	No	No
Echinoderm	*Actinopyga echinites*	Deep Water Redfish	VU	15262149	502.4	76310.75	No	No
Echinoderm	*Actinopyga miliaris*	Harry Blackfish	VU	18557080	502.4	92785.4	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Echinoderm	*Holothuria fuscogilva*	-	VU	21300941	502.4	106504.7	No	No
Echinoderm	*Holothuria lessoni*	Golden Sandfish	EN	14710969	502.4	73554.85	No	No
Echinoderm	*Holothuria nobilis*	Black Teatfish	EN	3667576	502.4	18337.88	No	No
Echinoderm	*Holothuria scabra*	Golden Sandfish	EN	17310985	502.4	86554.93	No	No
Echinoderm	*Stichopus herrmanni*	Curryfish	VU	13818713	502.4	69093.57	No	No
Echinoderm	*Thelenota ananas*	Pineapple Sea Cucumber	EN	15843082	502.4	79215.41	No	No
Fish	*Aetobatus ocellatus*	Spotted Eagle Ray	VU	22704230	502.4	113521.2	No	No
Fish	*Alopias pelagicus*	Pelagic Thresher	EN	1.32E+08	502.4	661950.7	No	No
Fish	*Alopias superciliosus*	Bigeye Thresher	VU	29441107	502.4	147205.5	No	No
Fish	*Carcharhinus albimarginatus*	Silvertip Shark	VU	8879891	502.4	44399.46	No	No
Fish	*Carcharhinus amblyrhynchos*	Grey Reef Shark	EN	5939684	502.4	29698.42	No	No
Fish	*Carcharhinus amboinensis*	Pigeye Shark	VU	4128514	502.4	20642.57	No	No
Fish	*Carcharhinus falciformis*	Silky Shark	VU	1.74E+08	502.4	869466	No	No
Fish	*Carcharhinus leucas*	Bull Shark	VU	9018499	502.4	45092.5	No	No
Fish	*Carcharhinus limbatus*	Blacktip Shark	VU	9993880	502.4	49969.4	No	No
Fish	*Carcharhinus longimanus*	Oceanic Whitetip Shark	CR	2.01E+08	502.4	1004859	No	No
Fish	*Carcharhinus melanopterus*	Blacktip Reef Shark	VU	5899769	502.4	29498.85	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Fish	*Rhizoprionodon acutus*	Milk Shark	VU	7178979	502.4	35894.9	No	No
Fish	*Triaenodon obesus*	Whitetip Reef Shark	VU	7786143	502.4	38930.72	No	No
Fish	*Himantura uarnak*	Coach Whipray	EN	2445015	502.4	12225.08	No	No
Fish	*Pastinachus ater*	Broad Cowtail Ray	VU	3821128	502.4	19105.64	No	No
Fish	*Taeniurops meyeni*	Blotched Fantail Ray	VU	12682407	502.4	63412.04	No	No
Fish	*Urogymnus asperrimus*	Porcupine Ray	VU	12963832	502.4	64819.16	No	No
Fish	*Distichodus petersii*	-	VU	53411	502.4	267.055	Yes	Potential
Fish	*Epinephelus fuscoguttatus*	Brown-marbled Grouper	VU	16382449	502.4	81912.25	No	No
Fish	*Epinephelus polyphekadion*	Camouflage Grouper	VU	16995083	502.4	84975.42	No	No
Fish	*Nebrius ferrugineus*	Tawny Nurse Shark	VU	4753671	502.4	23768.36	No	No
Fish	*Pseudoginglymostoma brevicaudatum*	Shorttail Nurse Shark	CR	90749	502.4	453.745	Yes	Potential
Fish	*Hemipristis elongata*	Snaggletooth Shark	VU	9208446	502.4	46042.23	No	No
Fish	*Istiophorus platypterus*	Sailfish	VU	2.26E+08	502.4	1129939	No	No
Fish	*Kneria uluguru*	-	VU	24803	502.4	124.015	Yes	Potential
Fish	*Bolbometopon muricatum*	Green Humphead Parrotfish	VU	14366801	502.4	71834.01	No	No
Fish	*Carcharodon carcharias*	White Shark	VU	73428654	502.4	367143.3	No	No
Fish	*Isurus oxyrinchus*	Shortfin Mako	EN	2.23E+08	502.4	1112876	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Fish	*Isurus paucus*	Longfin Mako	EN	1.85E+08	502.4	925938.3	No	No
Fish	*Lethrinus mahsena*	Sky Emperor	EN	3336366	502.4	16681.83	No	No
Fish	*Mobula alfredi*	Reef Manta Ray	VU	24878909	502.4	124394.5	No	No
Fish	*Mobula birostris*	Oceanic Manta Ray	EN	29041132	502.4	145205.7	No	No
Fish	*Mobula kuhlii*	Shorthorned Pygmy Devil Ray	EN	10281668	502.4	51408.34	No	No
Fish	*Mobula mobular*	Spinetail Devil Ray	EN	25749929	502.4	128749.6	No	No
Fish	*Mobula mobular*	Spinetail Devil Ray	EN	1.75E+08	502.4	874041.3	No	No
Fish	*Mobula tarapacana*	Sicklefin Devil Ray	EN	2.05E+08	502.4	1025599	No	No
Fish	*Mobula thurstoni*	Bentfin Devil Ray	EN	1.93E+08	502.4	964451.1	No	No
Fish	*Mola mola*	Ocean Sunfish	VU	57061177	502.4	285305.9	No	No
Fish	*Oxymonacanthus longirostris*	Harlequin Filefish	VU	13160512	502.4	65802.56	No	No
Fish	*Myliobatis aquila*	Common Eagle Ray	CR	2379105	502.4	11895.53	No	No
Fish	*Nothobranchius albimarginatus*	-	EN	654	502.4	3.27	Yes	Potential
Fish	*Nothobranchius insularis*	-	EN	232	502.4	1.16	Yes	Potential
Fish	*Nothobranchius korthausae*	-	EN	534	502.4	2.67	Yes	Potential
Fish	*Nothobranchius luekei*	-	EN	683	502.4	3.415	Yes	Potential
Fish	*Nothobranchius palmqvisti*	-	VU	1674	502.4	8.37	Yes	Potential

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Fish	*Nothobranchius rubripinnis*	-	EN	683	502.4	3.415	Yes	Potential
Fish	*Nothobranchius ruudwildekampi*	-	VU	1098	502.4	5.49	Yes	Potential
Fish	*Carcharias taurus*	Sand Tiger Shark	CR	8018428	502.4	40092.14	No	No
Fish	*Odontaspis ferox*	Smalltooth Sand Tiger	VU	7833948	502.4	39169.74	No	No
Fish	*Aplocheilichthys lacustris*	Kibiti Lampeye	VU	30348	502.4	151.74	yes	Potential
Fish	*Pristis pristis*	Largetooth Sawfish	CR	433179	502.4	2165.895	No	No
Fish	*Pristis zijsron*	Green Sawfish	CR	557033	502.4	2785.165	No	No
Fish	*Rhincodon typus*	Whale Shark	EN	1.71E+08	502.4	856814.5	No	No
Fish	*Rhina ancylostoma*	Bowmouth Guitarfish	CR	5182344	502.4	25911.72	No	No
Fish	*Rhynchobatus australiae*	Bottlenose Wedgefish	CR	4194844	502.4	20974.22	No	No
Fish	*Rhynchobatus djiddensis*	Whitespotted Wedgefish	CR	522768	502.4	2613.84	No	No
Fish	*Acroteriobatus leucospilus*	Greyspot Guitarfish	EN	162155	502.4	810.775	No	No
Fish	*Rhinoptera jayakari*	Oman Cownose Ray	EN	2639550	502.4	13197.75	No	No
Fish	*Sphyrna lewini*	Scalloped Hammerhead	CR	31183576	502.4	155917.9	No	No
Fish	*Sphyrna mokarran*	Great Hammerhead	CR	31445728	502.4	157228.6	No	No
Fish	*Stegostoma tigrinum*	Zebra Shark	EN	7621266	502.4	38106.33	No	No
Fish	*Hippocampus histrix*	Thorny Seahorse	VU	14550778	502.4	72753.89	No	No

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	0.5% of EOO (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Mammal	*Balaenoptera borealis*	Sei Whale	EN	3.16E+08	502.4	1580643	No	No
Mammal	*Balaenoptera musculus*	Blue Whale	EN	2.08E+08	502.4	1039528	No	No
Mammal	*Sousa plumbea*	Indian Ocean Humpback Dolphin	EN	493077	502.4	2465.385	No	No
Mammal	*Dugong dugon*	Dugong	VU	6183796	502.4	30918.98	No	No
Mammal	*Smutsia temminckii*	Temminck's Pangolin	VU	7124300	502.4	35621.5	No	No
Mammal	*Physeter macrocephalus*	Sperm Whale	VU	3.47E+08	502.4	1736407	No	No

Criterion 2: Habitat of significant importance to endemic or restricted-range species.

The presence of endemic or restricted-range species were considered, i.e., for terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 km^2. The threshold for Criterion 2 is the following: Areas that regularly hold ≥ 10% of the global population size AND ≥ 10 reproductive units of a species.

No endemic and restricted species were observed during the field surveys.

The results of the critical habitat assessment for species potentially present in the area, for Criterion 2 are reported in Table 6- 15 and Table 6- 16. Species categorized as potentially present, as determined by literature data, are designated as triggering “Potential Critical Habitat”.

Table 6- 16 - Critical habitat assessment for Criterion 2 in Tanga

Taxon	Scientific Name	Common Name	IUCN category	Population trend	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	10% of EOO (km^2)	EAAA is ≥ 10% of EOO	Critical Habitat
Amphibian	*Afrixalus sylvaticus*	-	VU	Decreasing	7963	4.7	796.3	No	No
Bird	*Geokichla guttata*	Spotted Ground-thrush	VU	Decreasing	22948	4.7	2294.8	No	No
Insect	*Amanipodagrion gilliesi*	-	CR	Decreasing	3087	4.7	308.7	No	No
Insect	*Parodontomelus arachniformis*	Northern Forest Grasshopper	VU	Decreasing	7904	4.7	790.4	No	No
Insect	*Mecostibus minor*	Little Shortheaded Grasshopper	VU	Decreasing	21232	4.7	2123.2	No	No
Crustacean	*Potamonautes infravallatus*	-	VU	Decreasing	7629	4.7	762.9	No	No
Mammal	*Bdeogale omnivora*	Sokoke Dog Mongoose	VU	Decreasing	28493	4.7	2849.3	No	No
Mammal	*Taphozous hildegardeae*	Hildegarde's Tomb Bat	EN	Decreasing	43854	4.7	4385.4	No	No

Table 6- 17 - Critical habitat assessment for Criterion 2, deep sea area of the interconnection Tanga-Pemba Island

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	10% of EOO (km^2)	EAAA is ≥ 10% of EOO	Critical Habitat
Fish	*Distichodus petersii*	-	VU	53411	502.4	5341.1	No	No
Fish	*Kneria uluguru*	-	VU	24803	502.4	2480.3	No	No
Fish	*Nothobranchius albimarginatus*	-	EN	654	502.4	65.4	Yes	Potential

Taxon	Scientific Name	Common Name	IUCN category	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	10% of EOO (km^2)	EAAA is ≥ 10% of EOO	Critical Habitat
Fish	*Nothobranchius insularis*	-	EN	232	502.4	23.2	Yes	Potential
Fish	*Nothobranchius korthausae*	-	EN	534	502.4	53.4	Yes	Potential
Fish	*Nothobranchius luekei*	-	EN	683	502.4	68.3	Yes	Potential
Fish	*Nothobranchius palmqvisti*	-	VU	1674	502.4	167.4	Yes	Potential
Fish	*Nothobranchius rubripinnis*	-	EN	683	502.4	68.3	Yes	Potential
Fish	*Nothobranchius ruudwildekampi*	-	VU	1098	502.4	109.8	Yes	Potential
Fish	*Aplocheilichthys lacustris*	Kibiti Lampeye	VU	30348	502.4	3034.8	No	No

Criterion 3: Habitat supporting globally or nationally significant concentrations of migratory or congregatory species.

An evaluation was conducted to consider the presence of habitat that supports significant concentration of migratory or congregatory species.

The project area intersects with the Kisiju Key Biodiversity Area, an internationally recognized area of importance for biodiversity. Indeed, Kisiju Key Biodiversity Area (KBA) is a site of international significance, recognized for its crucial role in biodiversity conservation. It meets the established criteria and thresholds for identifying important biodiversity sites, such as Important Bird and Biodiversity Areas.

To gauge the significance of the project area for migratory and congregatory species, specific thresholds were applied, as outlined in Guidance Note 6 GN78 of the IFC 2019 guidelines. These thresholds included areas known to sustain a significant portion (≥ 1 percent) of the global population of migratory or congregatory species at any stage of their life cycle, as well as areas that reliably support at least 10 percent of a species' global population during periods of environmental stress.

Although the project are does not directly overlap with the identified IBAs, a precautionary approach was taken. All migratory or congregatory species detected during the survey were identified evaluated according to the aforementioned thresholds. The Indirect Area of Influence (IAoI) was compared with the extent of occurrence (EOO) of each species, when possible, representing the global population estimate. If the IAoI encompassed ≥ 1% of the EOO for a species, it was considered potentially triggering Critical Habitat status (Table 6- 18).

EOOs were not available for all species, particularly for migratory butterflies. However, the arthropod species present are known to be widespread and not of particular conservation concern. Marine species and sea turtles are widely distributed. This means that, despite the lack of specific spatial data for some species, the screening results indicated that no species met the criteria for potential triggering of critical habitats under Criterion 3.

Table 6- 18 - Assessment for species potentially triggering Critical Habitat according to Criterion 3

Taxon	Species Name	IUCN category	Population trend	Movement pattern	Estimated extent of occurrence EOO (km^2)	IAoI km^2	1% of EOO (km^2)	Critical Habitat
Bird	*Apus affinis*	LC	Increasing	Full Migrant	Unknown	512	-	-
Bird	*Ardea cinerea*	LC	Unknown	Full Migrant	136000000	512	1360000	No
Bird	*Ardea melanocephala*	LC	Increasing	Full Migrant	26000000	512	260000	No
Bird	*Bubulcus ibis*	LC	Increasing	Full Migrant	394000000	512	3940000	No
Bird	*Cecropis daurica*	LC	Stable	Full Migrant	75400000	512	754000	No
Bird	*Egretta garzetta*	LC	Increasing	Full Migrant	151000000	512	1510000	No
Bird	*Eurystomus glaucurus*	LC	Stable	Full Migrant	19900000	512	199000	No
Bird	*Merops superciliosus*	LC	Stable	Full Migrant	12500000	512	125000	No
Bird	*Milvus migrans ssp. parasitus*	LC	Stable	Full Migrant	115653659	512	1156537	No
Bird	*Numenius phaeopus*	LC	Decreasing	Full Migrant	Not available	512	-	-
Bird	*Streptopelia semitorquata*	LC	Increasing	Full Migrant	26000000	512	260000	No
Reptile	*Caretta caretta*	VU	Decreasing	Full Migrant	Population area extends over entire oceans around the world	512	-	-
Reptile	*Chelonia mydas*	EN	Decreasing	Full Migrant	Has a circumglobal distribution	512	-	-
Reptile	*Dermochelys coriacea*	VU	Decreasing	Full Migrant	Are distributed circumglobally	512	-	-
Reptile	*Eretmochelys imbricata*	CR	Decreasing	Full Migrant	Has a circumglobal distribution	512	-	-
Reptile	*Lepidochelys olivacea*	VU	Decreasing	Full Migrant	Has a circumtropical	512	-	-

Taxon	Species Name	IUCN category	Population trend	Movement pattern	Estimated extent of occurrence EOO (km²)	IAoI km²	1% of EOO (km²)	Critical Habitat
					distribution			
Fish	*Bolbometopon muricatum*	VU	Decreasing	Full Migrant	Indian Ocean - eastern, Indian Ocean - western, Pacific - eastern central, Pacific - northwest, Pacific - western central	512	-	-
Insect	*Catopsilia florella*	LC	Unknown	Full Migrant	Not available	512	-	-
Insect	*Junonia oenone*	LC	Unknown	Full Migrant	Not available	512	-	-
Insect	*Vanessa cardui*	LC	Unknown	Full Migrant	Not available	512	-	-

Criterion 4: Highly threatened or unique ecosystems.

For this criterion, ecosystems that are at risk of significantly decreasing in area or quality, have a small spatial extent and protected areas were taken into consideration.

The project area and surrounding regions contain both mangrove forests and coral reefs, and each of these ecosystems triggers the designation of critical habitat under IFC Criterion 4. Mangroves, with their unique and diverse ecosystems, provide vital breeding and nursery grounds for numerous marine species, protection against coastal erosion and natural disasters, significant carbon sequestration and support the livelihoods of local communities. Similarly, coral reefs are biodiversity hotspots that host an immense variety of marine life, support fisheries, protect coastlines from wave action and contribute to local economies through tourism. Both ecosystems are highly vulnerable to human activities and environmental change, making their conservation critical to maintaining ecological balance and the essential services they provide. Therefore, under IFC Criterion 4, the presence of these critical habitats requires strict protection and sustainable management measures in the project area.

Criterion 5: Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in Criteria 1 to 4.

This criterion encompasses the presence of areas with landscape features that may be associated with evolutionary processes, or with distinct species populations that warrant special conservation consideration due to their unique evolutionary lineage. However, the study area lacks landscape features known to influence evolutionary processes leading to the formation of regional species configurations and ecological characteristics. In particular, no species or subpopulations within the project area exhibit significant isolation, spatial heterogeneity, or an abundance of environmental gradients. In addition, the area is not recognised for its importance in climate change adaptation or as a biological corridor.

Based on these considerations, it is concluded that the project area does not support critical evolutionary processes and, consequently, no Critical Habitat is expected to be present for this criterion.

7 IMPACT ASSESSMENT

7.1 Foreword

The analysis of potential impacts of the interconnection project is conducted in this document both for environmental (physical and biological) aspects and for socio-economic aspects.

It is worth highlighting that submarine cables are linear infrastructures with relatively high deployment speed and small local footprint.
Concerning the terrestrial component of the project, according to the analysis of alternatives, underground cables will be adopted and, therefore, the relevant impacts have been considered consequently.

The impact assessment has considered the following environmental and social components potentially impacted by the Project, according to the baseline analysis, depending on the domain considered: terrestrial or marine.

TERRESTRIAL DOMAIN

Environmental impacts on Physical Environment

- Air quality
- Geology, geomorphology and soil
- Hydrogeology and hydrology
- Noise
- Electromagnetic fields
- Landscape and visual amenities

Environmental impacts on Biological Environment

- Flora and vegetation
- Fauna and habitats
- Protected areas

Socio Economic Impacts

- Economy employment, income and working conditions
- Land and livelihoods
- Infrastructure and public services
- Community health and safety
- Occupational health and safety

MARINE DOMAIN

Environmental impacts on Physical Environment

- Meteorology and physical oceanography
- Seabed geology and geomorphology

Environmental impacts on Biological Environment

- Noise
- Flora and vegetation
- Fauna and habitats
- Protected areas

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

- Construction Phase
- Operation Phase

7.2 Methodology for impact assessment

The impact evaluation includes the following steps:

- The identification of project-related activities during construction and operation phases;
- The identification of the environmental and socio-economic aspects that should be taken into account;
- The determination of potential impacts (negative and positive) that the project can have on the identified environmental and socio-economic aspects;
- The assessment and the evaluation of potential impacts, at qualitative and/or quantitative level;
- The identification of the mitigation measures that could minimize negative impacts and/or enhance benefits.

The impact factors identified during the analysis of the project and through the definition of the project phases and project actions are assessed in their relevance, using a scoring system based on the following criteria.

- **Duration (D)**: is the duration of the impact factor and can vary from short to long according to the following definitions:
    - Short: when the duration is shorter than a month;
    - medium-short: when the duration is between one and six months;
    - medium: when the duration is between six months and one year;
    - medium-long: when the duration is between one and three years;
    - long: when the duration is over three years.

- **Frequency (F)**: is the frequency with which the impact factor manifests itself:
    - sporadic;
    - moderately frequent: if it consists of a few events evenly or randomly distributed over time;
    - frequent: if it consists of numerous events evenly or randomly distributed over time;
    - highly frequent: if it consists of a high number of events evenly or randomly distributed over time;
    - continuous: if the event has no interruption over time.

- **Spatial extent (E)**: is the geographical area within which the impact factor can exert its effects:
    - project footprint: the impact factor is confined within the facilities owned or exclusively controlled by the project;
    - local: the impact factor extends to the areas or communities neighboring the project site (within 1 km);
    - regional: the impact factor extends to an area beyond the surroundings of the project site and to regional physical (airshed – watershed, etc.) or administrative boundaries (within 10 km);
    - beyond regional: the impact factor extends throughout several regions or to the entire country (within 100 km);
    - global: the impact factor extends beyond national borders or has a global reach

- **Intensity (I)**: is a measure of the physical, biological, economic or social severity of the impact factor:
  - negligible: the impact factor is generated in quantities that cannot be easily detected or perceived and that are unlikely to be able to cause any detectable change in the target environmental or social components;
  - low: the impact factor is generated in quantities that can be detected or perceived but whose effects are unlikely to cause tangible changes in the target environmental or social components;
  - medium: the impact factor is generated in quantities that are well within legal standards or accepted practices and/or whose effects are likely to cause tangible changes in the target environmental or social components;
  - high: the impact factor is generated in quantities that are at the limit of legal standards or accepted practices and/or whose effects are likely to cause serious impairment in the target environmental or social components;
  - very high: the impact factor is generated in quantities that are at risk of exceeding the limits of legal standards or accepted practices and/or whose effects are likely to cause very serious to catastrophic damage to the target environmental or social components
- **Sensitivity (S)**: The sensitivity of an environmental or social component is typically evaluated on the basis of the presence/absence of some features which define both the current degree of the environmental or socio-economic quality and the susceptibility to environmental or social changes of the component:
  - Low
  - Medium-low
  - Medium
  - Medium-high
  - High
- **Reversibility (R)**: is the property of an impact to diminish its magnitude over time and to eventually recede entirely:
  - Reversible in the short term: if the initial condition of the component will be restored within one week after the end of the impact factor and/or the restoration activities;
  - Reversible in the short-mid-term: if the initial condition of the component will be restored within one month after the end of the impact factor and/or the restoration activities;
  - Reversible in the mid-term: if the initial condition of the component will be restored within one year after the end of the impact factor and/or the restoration activities;
  - Reversible in the long term: if the initial condition of the component will be restored within 10 or more years after the end of the impact factor and/or the restoration activities;
  - Irreversible: if it is not possible to predict the restoration of the initial conditions.

Each of the parameters listed above can have a value between 1 and 5. The severity of the impact is determined through an Impact Factor Score (IFS) which is the sum of the 4 initial parameters (Duration, Frequency, Spatial Extent and Intensity), hence it can assume a value between 5 and 20.

The **Impact Value (IV)**, which represents the impact magnitude or significance, is then calculated by multiplying the Impact Factor Score by the Sensitivity (S) and by the value of the Reversibility (R), i.e. IV = IFS x S x R.

The additional step consists in assessing the effectiveness of the mitigation measures to reduce or eliminate the negative impact. The mitigation measures will be defined with reference to the mitigation hierarchy. The effectiveness of the mitigation measures defined in the environmental and social management plan should assessed using expert judgement and the findings from the previous application of the measures to similar projects. The definitions of the **mitigation effectiveness** are:

- None: the impact cannot be mitigated
- Low: the measures can reduce the impacts up to 20% of the expected magnitude
- Medium: the measures can reduce the impacts up to 40% of the expected magnitude
- Medium-high: the measures can reduce the impacts up to 60% of the expected magnitude
- High: the measures can reduce the impacts up to 80% of the expected magnitude

The Mitigation effectiveness is measured on a scale 1 – 0,2 (1 = minimum effectiveness; 0,2 = maximum effectiveness).

The assessment of positive impacts is based on the same parameters of the assessment of the negative impacts, with the only difference that the mitigation measures are replaced by enhancement measures, or measures to maximize the potential positive impacts.

The **residual impact** is obtained multiplying the impact value (IV) by the mitigation effectiveness (or the enhancement effectiveness in the case of positive impacts).

The scale of the residual impact resulting from the calculation described above ranges from 0,8 to 500. The impact value is then scaled in 5 levels by dividing the entire distribution of values obtained in 5 homogeneous classes of values.

The negative impacts and residual negative impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	
0,8 - 33,0	Negligible	
33,1 - 76,0	Low	
76,1 - 136,0	Medium	
136,1 - 228,0	High	
228,1 - 500,0	Very High	

The positive impacts and the residual positive impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	
0,8 - 33,0	Negligible	
33,1 - 76,0	Low	
76,1 - 136,0	Medium	
136,1 - 228,0	High	
228,1 - 500,0	Very High	

The methodology described above allows for an analytical assessment of impacts caused by individual impact factors over individual components, based on expert's judgement and defined scoring system. Impacts are therefore presented in separate tables for negative and positive impacts.

Impact assessment is provided for the physical, biological and socio-cultural environment and is also differentiated between the two phases of project development (construction and operation phase) and between terrestrial and marine domain.

7.3 Terrestrial domain

7.3.1 Impacts on physical environment: construction phase

7.3.1.1 Air quality

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

- Earthworks: clearing, grubbing and excavation are expected to generate dust.
- Opening of access roads for the excavation of cable trenches.
- 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 (SO_2), nitrogen oxides (NO_x) 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.
- Possible fugitive emissions of Sulphur hexafluorides (SF_6), a strong greenhouse gas. Sulphur hexafluorides is used as an insulator for electrical switching equipment, cables (tubular conductors) and transformers. If gas-insulated equipment is installed and used at the substations, SF_6 may escape as fugitive emission during manufacturing, use, maintenance and disposal.

These emission sources involve two different types of potential direct negative impacts on air quality:

- An increase in atmospheric concentrations of particulate matter due to dust diffuse emissions;
- An increase in atmospheric concentrations of air pollutants such as carbon monoxide (CO), nitrogen oxides (NO_X), sulphur dioxide (SO_2), and particulate matter (PM) from exhaust emissions. Other chemical pollutants expected to be emitted in lower quantities are volatile organic compounds (VOC).

Construction activities involving dust production and use of vehicles and machinery activities will be highly frequent throughout the construction period and will lead to an impact of medium-long duration.
Dust and exhaust emissions will be mostly released in the proximity of construction areas in Tanga (Tanzania mainland) and Ras Mkumbuu - Wesha (Pemba Island); these emissions will be released at the ground level and are characterized by a low buoyancy and low dispersion; they typically do not reach distances greater than 1 km from the emissions sources. Thus, their impacts are expected to have a local spatial extent.

In light of the temporary nature of the emission sources and their limited dispersion and with due consideration to existing baseline levels, dust and exhaust emissions related to the Project construction phase are considered to result in negative impacts of low Intensity.

The submarine cable landing point at Mnyanjanito, Tanga (Tanzania mainland side) is located on a coastal semi-urban area, where air quality is moderately good; recorded levels of PM10 and PM2.5 are lower than national and international threshold concentration for particulate matter. The 8 km long underground cable connecting landing point to the existing Majani Mapana substation will cross the densely populated area of Tanga and therefore worse air quality conditions are expected.

From the submarine cable landing point in Ras Mkumbuu (Pemba Island) to the Wesha substation, the underground cable will pass through a rural area with some settlements, where air quality is good according to the recorded levels of particulate matter.
Beyond project workers, a lot of receptors are present in the project area, both in the city of Tanga (Tanzania mainland) and in different villages between Ras Mkumbu landing point and Wesha substation (Pemba Island): therefore, the sensitivity of air quality component is judged high.

The impact on air quality during the construction phase is evaluated of low importance. The application of appropriate mitigation measures listed below (dust suppression measures, introduction of speed limits, regular maintenance of vehicles and machinery, etc.) will help reducing significantly dust emission and partially also exhaust emissions.

The residual impact on air quality during the construction phase is thus considered negligible.

<u>Mitigation measures</u>

The Project will implement the following mitigations measures specific for the management of diffuse dust 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 minimise 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. All stockpile materials with high risk to produce airborne dust will be covered, in particular during windy periods.

The Project will adopt the following best practices for the management of exhaust gases:

- Use of best available technologies for equipment and machineries;
- Regular maintenance and inspection of vehicles, equipment and machineries will be performed in accordance with manufacturer instructions;
- Vehicles and machinery will be turned off when not in use;
- In case of using SF_6 as a gas insulator, the Contractor must only use equipment with low leakage rate in order to prevent any potential risk of SF_6 emission;

Monitoring actions would be undertaken for air quality parameters in case the value exceeds the limit value fixed by the national standard and the standards of WHO.

7.3.1.2 Geology, geomorphology and soil

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, production of waste 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 underground cable trenches, transit of heavy machinery and presence of construction equipment potentially resulting in soil disturbance and degradation.

It is important to note that existing public roads will be used during the construction phase and if needed other additional access roads will be developed in order to provide access to heavy equipment in the area crossed by the transmission lines.

The above activities might induce the following potential direct negative impacts on soil and subsoil quality, assessed hereinafter:

- *Potential soil and subsoil contamination* (namely alteration of soil and subsoil quality characteristics): Phenomena of soil and subsoil contamination due to accidental fuel spills from machinery and vehicles used during construction are considered highly unlikely, given that all suitable precautions to avoid such situations will be put in place (primarily regular maintenance of equipment and machinery). Potential contaminations associated to welding and metalworking considered negligible.
- *Soil disturbance and degradation* (erosion, modification of morphology, compaction);
- *Land yake*: 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.

Considering the accidental nature of potential soil contamination and the nature of potential spills, and taking into account standard design measures to prevent accidental soil pollution to be implemented by the Project, the intensity of this impact is considered negligible.

The adoption of underground cable allows to reduce the soil disturbance and degradation during the construction activities, that will be limited to the trenches' excavation and soil compaction due to the transit of heavy vehicles.
The effects of these activities on beach geomorphology and soil alteration strongly depend on the value of the submarine cable landing zone. In most of the cases, the morphological alteration of the beach will be of a temporary nature, as cable and conducts will be buried at an approximative depth of at least 2 m and they will be successively covered by the material extracted from the same trench.

The upgrading works of the substations envisages removal of existing vegetation, earthmoving, levelling of the construction area and subsequent excavation and back-filling with re-profiling of the ground around the substations. The impact on soil and subsoil will be limited to the substation extension.

It is underlined that limited land take is associated to the construction of underground cables, given that cables and related working site will be primarily located along existing roadways.

The 8 km long underground cable in Tanga will follow as much as possible the existing 33 kV distribution line route and the existing ring road alignment; land acquisition should be limited to 500 m of UGC passage through cultivated areas.
The overall impact on soil and subsoil is considered of low importance. The application of general mitigation measures (soil and erosion management plan, proper drainage throughout construction and on permanent works, etc.) will reduce soil vulnerability to erosion and compaction. The residual impact is deemed negligible.

Mitigation measures

- Availability on site of emergency response kits in case of accidental spills and leakages;

- 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 and assure periodic maintenance of the equipment and machineries in order to prevent accidental fuel spills;
- Adequate management of excavated soil, part of which constitute a waste;
- Waste management procedure;
- Latest-generation and more compact vehicles and machines will be used, in order to reduce risk of leakages and soil compaction;
- 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;
- Apply revegetation of disturbed areas, in order to prevent risk of soil erosion;
- Develop Soil Management Plan (topsoil segregation for reuse).

7.3.1.3 Waste

Potential impacts associated with construction waste likely to be generated by the project include:

- inadequate storage, handling, transportation and classification of waste, resulting in waste contamination, mixing of different waste classes, inappropriate transportation and disposal to an inappropriate waste facility or illegal disposal;
- contamination of soil, surface water and/or groundwater could occur due to spills from inappropriate storage of waste material, improper bunding for liquid waste storages, in appropriate stockpiling etc;
- dust impacts could result from the inappropriate soil storage management (both in trucks during transportation and at stockpile sites);
- transport and disposal of liquid and solid wastes could lead to environmental pollution and potential indirect impacts on public health;
- incorrect classification, handling and/or disposal of contaminated waste could lead to environmental pollution or increased public health risks.

Waste impact is classified low due to the operations' low intensity and the local special extent. If the following mitigation measures are correctly implemented, the impacts could be further reduced to negligible.

<u>Mitigation measures</u>

- These potential waste management impacts would be managed through the implementation of the management measure described in detail in the Annex 4 (SP02 Water and Soil Pollution Management Plan and SP05 Waste Management Plan).
- The debris shall be disposed by accredited waste contractors.
- Only approved landfills or dumpsites shall be used for disposal of the debris
- Construction rubble and excavated soil that is not used as backfill must be disposed of at a licensed landfill.
- All project works area shall be rehabilitated and restored to its original state after works are completed.

7.3.1.4 Water resources

Regarding water resources (surface and groundwater), the following potential negative impacts might arise during the project construction activities:

- Construction of access roads and transmission lines may interfere with the natural drainage systems and modify flow of surface water. These changes can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams, drainage channels and wetlands/swamps.
- Soil erosion from earthwork activities or vegetation removal may also increase water turbidity and sedimentation in rivers and seasonal streams.
- Potential surface water and groundwater 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 realization of paved surfaces and to consumption of water resources that may contribute to increased pressure on water abstraction and a decrease in groundwater levels.

Accidental release of fuel oil & chemical stored (transformer oil, paints and solvents) used at site could contaminate the surface water body. However, the Project does not directly affect any wetland or water body.
During the Project construction phase, excavation depths are quite limited and not likely to cause any interferences with the water table with consequent pollution of water resources. Phenomena of groundwater contamination due to accidental fuel spills and/or waste spills are considered highly unlikely, given that all suitable precautions to avoid such situations will be put in place. Alteration of ground water level might be caused by realization of paved surfaces, but this will be limited to the substations' areas.

The overall impact on water resources is considered negligible.

Mitigation measures

- Maintenance operations for vehicles used during construction activities;
- Oil and chemical storage area should be covered and have impervious floor;
- 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 effluent generated from washing of vehicle and equipment need to be stored and treated in a sedimentation tank;
- A storm water drainage system must be installed in the construction site, especially at the substations, to collect runoff from paved surfaces. This measure could avoid any pollution of water bodies near the project area;
- Adequate sanitary facilities (toilets, showers) must be available for the involved personnel during the construction phase. Workers will be strictly required to use these facilities.

7.3.1.5 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, trucks, cars).

- Transport of raw material, personnel and wastes to and from the construction areas resulting in an increase of traffic and related noise.

Construction activities and related noise emissions will take place only during day time and the noise generated is likely to be attenuated within a few tens of meter from the construction site.
Noise impacts are expected to be extremely localized and to occur throughout the project construction period (medium-long duration) with high frequency. The noise impact is evaluated of medium intensity.
The majority of noise levels and averages recorded at project site complies with the national daily limit for residential areas of 60 dBA.
The noise generated by the construction activities will mainly have an impact on the involved workers. Other potential sensible receptors are represented by residents in the city of Tanga point. The construction area on Tanzania mainland also crosses the Mangrove Forest Reserve, located along the beach of the landing point, and noise levels could also cause disturbance to potential fauna present in the area. The sensitivity is therefore considered high.
The resulting overall rating of noise impact is low importance. The application of mitigation measures allows to reduce the residual impact to negligible.

Mitigation measures

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

- All major construction plant and equipment will comply with international noise emission limits;
- Switch off equipment when not in use;
- All vehicles and mechanical plant used for the purpose of the works will be maintained in good working order;
- Transportation activities and the delivery of construction materials will be planned during normal working hours;
- Limit noisy activities to the least noise–sensitive time of the day: the contractor company must notify local community;
- Vehicle movements shall be limited to a speed limit of 20 km/h, especially when sensitive receptors are located near the construction sites;
- Noise monitoring will be undertaken during periods when activities are taking place in close proximity to noise sensitive receptors to demonstrate compliance with noise criteria and according to the Environmental Management Plan.

7.3.1.6 Electromagnetic fields

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

7.3.1.7 Landscape and visual amenities

Visual evidence of these projects cannot be completely avoided, reduced, or concealed. Visual impacts and physical changes to the landscape features may be induced by the following works:

- The construction of substations will require the removal of existing vegetation, earthmoving, levelling operations and excavation and back-filling with re-profiling of the ground.

- The construction of underground 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.

The project construction activities will constitute an aesthetic impact of medium-long duration, continuous in time, with local spatial extension. Construction activities will be more visible, where carried out within an open landscape, e.g. flat ground with no dense vegetation cover.

The main visual impact will be represented by the upgrading and extension of substations. This involves the replacement of the vegetation with anthropic elements and this marks the beginning of interferences on the landscape: these will reach the highest peak when the construction works of the substations are completed (operation phase) that will modify permanently the surrounding landscape. The visual impact, however, is substantially reduced because the involved substations already exists and the upgrading works will consist in an extension of the current structure and installation of new equipment.

The construction of underground cables and related construction yards and machinery will constitute a temporary and reversible interference with the landscape. Furthermore, no direct physical changes of the landscape features are expected to occur, given that the underground cables will be primarily built on existing roads and tracks.

Visual landscape will be affected during installation in the beach area of the landing point. After installation, the onshore facilities will be buried and therefore little visual impact is envisaged.

Potential visual receptors in the region crossed by the line may include communities located near the line corridor, travellers using road network, visitors and tourists.
The impact is rated of medium importance. The implementation of mitigation measures allows to reduce the residual impact.

Mitigation measures

The project will implement specific mitigation measures to mitigate impacts on landscape during the construction phase:

- Rehabilitate disturbed areas around construction sites in order to restrict extended periods of exposed soil;
- Maintain construction site in orderly condition and do not distribute material over many sites before usage;
- Restore temporal work sites after construction and remove all generated waste.

The nature of impacts on landscape associated to the construction of underground cable is temporary (i.e. limited to the length the construction activities) and transient (i.e. works will move along the cable route as they progress at a rate of 500÷800 m per month, and do not constitute a fixed source of disturbance); given the above no need for additional specific mitigation measures associated to the construction of underground cables is anticipated at this stage.

7.3.1.8 Summary of negative impacts on the terrestrial physical environment during the construction phase

The potential negative impacts expected to arise from the project construction activities on the terrestrial physical environment are summarized in the following matrix.

Table 7- 1 – Matrix of negative impacts on terrestrial physical environment during the project construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Air Quality	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Geology, Geomorphology and Soil	Duration (D):	Medium-long	Medium	Short-mid-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Water Resources (Surface and Groundwater)	Duration (D):	Medium-long	Low	Short-mid-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Negligible					
Noise	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Landscape and Visual Amenities	Duration (D):	Medium-long	Medium-low	Irreversible	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Waste	Duration (D):	Medium-long	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

7.3.2 Impacts on biological environment: construction phase

7.3.2.1 Habitat loss and degradation

Habitat loss occurs when a natural area is converted to a form that can no longer support the species originally residing there. This conversion can be complete, like forest land cleared for development, or partial, where fragmentation reduces the overall habitat quality, such as removing vegetation and clearing a Right of Way (RoW) for an overhead transmission line (OHTL).

Habitat degradation describes the process by which a natural habitat remains present but suffers a decline in quality, making it less hospitable to the species that depend on it. This can be caused by factors like dust and waste, including chemical pollutants, generated by vehicle and construction equipment during projects like underground cable construction. Noise generated by the operation of vehicles and machinery can also degrade habitats.

Underground cables can lead to habitat loss and degradation in two ways:

- Construction disruption: installing underground cables involves trenching the earth, which can significantly disrupt the habitat during construction. This impact burrowing mammals, reptiles, amphibians, invertebrates, and plants. The noise and activity can also disturb wildlife in the surrounding area.
- Habitat loss: while less land is cleared compared to overhead lines, the trenching itself removes vegetation and disrupts the soil profile. This can lead to some habitat loss, especially for smaller animals that rely on the topsoil layer.

Mitigation measures

- Vegetation clearing: carry out clearing outside the breeding season, minimize the width of the cleared corridor and replant with native species.
- Dust and pollution control: implement dust suppression measures (watering, covered stockpiles), proper waste management, and spill prevention plans.
- Noise management: limit night work, use quieter equipment, and maintain equipment properly.
- Habitat restoration: restore the trench promptly after cable installation, including re-grading and replanting native vegetation, to enhance habitat connectivity.
- Monitoring: conduct pre-construction surveys and monitor wildlife activity during construction to assess effectiveness of mitigation measures.

7.3.2.2 Habitat fragmentation, barrier to movement

Habitat fragmentation and creation of barriers to movement are significant concerns for underground cable in different ways:

- Habitat fragmentation: while less land is cleared compared to OHTL, trenching for underground cables can still fragment habitat, especially for smaller, burrowing animals reliant on the topsoil layer.
- Barrier effect (temporary): the trench itself acts as a temporary barrier for some less mobile animals like reptiles, amphibians, and small mammals. However, this impact is temporary and can be mitigated through proper restoration.
- Construction disturbance: construction activities create noise, vibration, and vehicle traffic, creating a zone of disturbance that animals may avoid, even if they could physically cross the barrier.

Mitigation measures

- Minimize clearing width: reduce the width of the cleared corridor and trench to the minimum required for cable installation, safe operation, and maintenance.
- Wildlife crossings: implement wildlife crossing structures like rope bridges for arboreal animals and properly designed culverts for terrestrial species to maintain connectivity between fragmented habitats.
- Seasonal work: schedule construction outside breeding seasons and periods of high wildlife activity.
- Noise control: limit night work, use quieter equipment, and properly maintain machinery to minimize noise disturbance.
- Phased construction: implement phased construction to minimize the total area disturbed at any one time.
- Restoration and monitoring: revegetate with native species and monitor wildlife activity.

7.3.2.3 Introduction and spread of invasive alien species

The construction of underground cable infrastructure, along with associated substations, can significantly disrupt terrestrial ecosystems and act as a vector for the introduction and spread of invasive alien species (IAS).

Construction activities can fragment previously contiguous habitats, creating smaller, isolated patches of native vegetation. These fragmented habitats are more vulnerable to IAS invasion due to several factors:

- Increased edge habitat: the creation of linear corridors like trenches expands the habitat edge. Edge habitats tend to be more susceptible to invasion as they offer altered environmental conditions compared to the forest interior.
- Reduced competition: fragmentation disrupts the existing plant community structure, often reducing competition from established native species. This creates open niches that invasive plants can readily exploit.

These disruptions create opportune conditions for IAS establishment, potentially leading to decline and habitat disruption.

Mitigation measures

- Pre-construction surveys: conducting surveys to identify existing IAS populations in the construction zone allows for targeted control measures before construction begins.
- Cleaning protocols for vehicles and equipment: brushing down vehicles and equipment before they leave an infested area can help remove seeds and plant parts that could be spread elsewhere.
- Use of local materials: sourcing construction materials like gravel and sand from local, weed-free sources reduces the risk of introducing new IAS propagules.
- Worker training: educating construction workers on how to identify IAS and the importance of preventing their spread can be a critical step in mitigating the risks.
- Monitor and control: regular monitoring for the emergence of new IAS populations allows for early intervention and control measures (e.g. eradication) to prevent them from becoming established.

7.3.2.4 Road kill

The construction of underground transmission lines poses a significant threat to wildlife populations by increasing road mortality rates. This elevated risk stems from several key factors associated with construction activities:

- Traffic volume surge: construction necessitates a substantial increase in vehicle traffic for transporting materials, equipment, and personnel. This heightened traffic volume directly translates to a greater risk of collisions with wildlife, particularly for species with established road crossing behaviors (e.g., amphibians, reptiles, small mammals).
- Habitat fragmentation and degradation: Construction activities fragment previously contiguous habitats, creating linear corridors like trenches and access roads. These corridors act as barriers, forcing wildlife to travel longer distances or utilize unfamiliar routes, increasing their exposure to traffic. Additionally, vegetation clearing removes cover and reduces the effectiveness of natural wildlife corridors, making animals more susceptible to predation (including vehicles) and pushing them towards roadsides for resources.
- Disruption of nocturnal behavior: Nighttime construction activities often utilize artificial lighting, which can disorient and attract some nocturnal wildlife species. This attraction behavior increases their vulnerability to road collisions.

Mitigation measures

- Speed limit enforcement: implementing and enforcing lower speed limits on construction roads allows wildlife more time to react to approaching vehicles.
- Wildlife fencing: utilizing temporary fencing can guide wildlife away from construction areas and direct them towards designated crossing points.
- Night lighting management: implementing shielded lighting or minimizing nighttime construction activities can reduce the attraction of wildlife to construction zones.

7.3.2.5 Disturbance, degradation and loss of mangroves

The construction of underground transmission lines can pose significant challenges to the ecological integrity of mangrove ecosystems. Key treats are:

- Direct habitat loss: trenching for underground cable directly results in the destruction of mangrove habitat. This can lead to the fragmentation and degradation of the entire ecosystem, as remaining mangrove areas become isolated patches.
- Habitat fragmentation and edge effects: construction activities can fragment existing contiguous mangrove stands, creating smaller, isolated patches of forest. These fragmented areas are more susceptible to "edge effects". These effects include increased wind and sun exposure, altered hydrology, and potential invasion by non-native plant species. This further degrades the remaining mangrove habitat and reduces its overall ecological value.
- Disruption of ecological services: mangrove ecosystems provide a multitude of critical services that benefit both the environment and human populations.

While utilizing the existing cleared corridor successfully minimized the need for direct mangrove clearing during the design phase, there is still a possibility of minimal impact on the root system of mangroves adjacent to the construction area.

<u>Mitigation measures</u>

- Trenchless technologies: for underground cable, utilizing trenchless technologies like microtunnelling or Horizontal Directional Drilling (HDD) can significantly reduce the need for extensive trenching. This minimizes the disruption of the intricate mangrove root system and associated ecological functions.
- Minimized clearing: limiting the clearing of mangrove vegetation to the absolute minimum required for construction is crucial.
- Mangrove restoration and rehabilitation: developing and implementing a comprehensive mangrove restoration plan is essential to compensate for any unavoidable habitat loss. This may involve planting native mangrove species in degraded areas to restore ecological functions and promote the recovery of the ecosystem.
- Monitoring and adaptive management: regularly monitoring the impacts of construction on mangroves and surrounding ecosystems is crucial. Implementing adaptive management strategies allows for addressing any unforeseen issues and ensures the effectiveness of mitigation measures. This ongoing process can be further strengthened through collaboration with ecological experts.

7.3.2.6 Summary of negative impacts on the terrestrial biological environment during the construction phase

The potential negative impacts expected to arise from the project construction on the terrestrial biological environment are summarized in the following matrix.

Table 7- 2 – Matrix of negative impacts on biological environment during the construction phase (terrestrial environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat loss and degradation	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Habitat fragmentation, barrier to movement	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Introduction and spread of invasive alien species	Duration (D):	Long	Medium-high	Long term	**Very High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Road kill	Duration (D):	Long	Medium	Short-term	**Low**	High	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Disturbance, degradation and loss of mangroves	Duration (D):	Medium-short	High	Long term	**Very High**	High	**Low**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					

7.3.3 *Impacts on socio-economic environment: construction phase*

7.3.3.1 Land acquisition, restrictions to land use and involuntary resettlement

Potential impacts include:

- Permanent loss of land: 1 a 1,5 m-wide RoW will result in the permanent loss of land above the underground cable. This area must be free from any structures, crops, and trees.
- Temporary losses/agricultural damage due to the opening of the trench (1,5 m large) that will contain the underground cable.

The underground cables solution will minimize the loss of land to 1,5 m of Right of Way. The cable will be located in the road reserve as much as possible, therefore the impacts on land acquisition is minimal.

Also, the impacts on the loss of crops are considered minimal. In Tanga the cable will run in the town following the existing ring road, crossing few fields. In Pemba the cable will pass through filed of encroachers and it will trigger loss of crops, which will be duly compensated or harvested before any construction will start. The impact is still considered minimal due to the limited RoW of the cable (1,5 m).

The table below shows the summary of data on project affected persons and related losses and impacts due to the project.

Table 7- 3 – Summary of data on project affected persons and related losses and impacts

#	Variables	Data
	A. General	
1	Region/Province/Department	Tanga
2	Municipality/District	Tanga City
3	Village/Mtaa	Majani Mapana A, Majani Mapana B, Mwakizaro, Magomeni A, Magomeni B, Majengo A, Duga Barabarani, Duga Mpya, Makokondumi and Magaoni.
4	Activity(ies) that trigger resettlement	Installation of underground cable to Pemba (132 kV) from Majani Mapana Substation to Land point at Myanjani with other components as follows: • Miyanjani landing point: ocean buffer zone and ocean floor will be used hence no displacement. • Wayleave for the underground cables laying 1.5 m wide and 8.2 km long: 0.101 ha of land will be required whereby five individual PAPs will be paid compensation. While remain of 1.129 ha is reserved land for the existing TANESCO wayleave and road reserves under TARURA. • Upgrading of existing Majani Mapana substation; 0.594 ha of land in the existing substation. The land belongs to TANESCO. Hence no resettlement for this piece of land.
5	Project overall cost	TZS 243,776,856.90
6	Overall resettlement cost	TZS 131,771,274.00
7	Applied cut-off date (s)	23rd July 2024
8	Dates of consultation with the people affected by the project (PAP)	22nd to 25th July 2024
9	Dates of the negotiations of the compensation rates / prices	22nd to 25th July 2024

#	B. Specific information	
10	Number of people affected by the project (PAP)	44
11.	Number of institutions affected by the project (PAP)	3
12	Number of Physically displaced	7
13	Number of economically displaced	44
14	Number of affected households	44
15	Number of females affected	23
16	Number of vulnerable affected	15
17	Number of major PAP	4 (affected land and house)
18	Number of minor PAP	40 (only affected kiosks, fence, tree, and crops)
19	Number of total right-owners and beneficiaries	4
20	Number of households losing their shelters	1
21	Number of households losing their crops and/or revenues	43 expect 1 PAP who loss fence only
22	Total areas of farmlands lost	1.824 ha
23	Estimation of agricultural revenue lost (TShs)	28,680,951.00
24	Number of buildings to demolish totally	1
25	Number of buildings to demolish totally at 50%	0
26	Number of buildings to demolish totally at 25%	2 (only fence affected)
27	Number of tree-crops lost	1,073

28	Number of commercial kiosks to demolish	6
29	Number of ambulant/street sailors affected	0
30	Number of community-level service infrastructures disrupted or dismantled	0
31	Number of households whose livelihood restoration is at risk	43 expect 1 PAP who loss fence only

Mitigation measures

- Compensation for lost land and livelihood restoration programs for affected farmers.
- Minimize land disturbance during construction, with compensation for temporary losses or construction planned after harvesting season
- Communication and grievance redress throughout the project.

7.3.3.2 Physical and cultural resources

Potential impacts are related to the encountering of archaeological sites, burial grounds, sacred sites and local shrines along the transmission line/underground cable corridor in the process of corridor clearing/trench excavation.

The project does not affect any mapped physical cultural resources and burial places. In addition, it is unlikely to find any buried remaining along the proposed cable route since it is located along existing roads or in agricultural fields, which were already subject to excavation works or ploughing. Hence, the impact is considered negligible and well manageable within the ESMP.

Mitigation measures

- Develop a Chance Finding Management Plan as part of the Contractor ESMP;
- Train construction workers to identify and protect cultural heritage;
- Develop compensation mechanism for burial grounds;
- Engage with local communities throughout the project.

7.3.3.3 Community health and safety

Potential impacts include:

- Risk of accidents and physical injuries involving residents from increased road traffic.
- Trespass by unauthorized 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).
- Increased of STD among local population
- 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 from the local communities.

The potential impacts are considered medium because the workers will use the main access roads to reach the terrestrial construction areas and will have frequent contacts with affected people. In addition, it is to be considered the spread of STD, asthe influx of workers from outside might increase the spread of the disease. For this reason, the impact is considered medium.

<u>Mitigation measures</u>

- Develop a Community Health and Safety Plan;
- Develop GBV/CAE/SEAH Management Plan;
- Develop Labour Management Plan and workers Code of Conduct;
- Develop Project Grievance Redress Mechanism.

7.3.3.4 Occupational health and safety

The construction of high-voltage underground cables involves several occupational health and safety risks due to the nature of the work, the environment, and the materials involved.

- Workers face the risk of electrocution, especially during cable laying, splicing, and termination. Accidental contact with live cables or improper grounding can lead to severe injuries or fatalities. High-voltage systems can produce arc flashes, resulting in severe burns or death. Workers near high-voltage equipment are at risk if proper precautions are not taken.
- Workers can be struck by or caught between heavy machinery like excavators, cranes, or cable pullers. Improper handling or mechanical failures can lead to serious injuries. The movement of construction vehicles poses a risk, particularly in confined or busy work areas.
- Some insulation materials used in cables or during the installation process may contain hazardous chemicals, leading to risks like skin irritation, respiratory issues, or long-term health effects.
- The use of heavy machinery and power tools can create high noise levels, leading to hearing damage if proper hearing protection is not used.
- Discrimination and sexual violence or harassment within worker.

<u>Mitigation measures</u>

- Provide PPE (hard hats, high-vis clothing, etc.) and conduct regular safety training.
- Maintain a safe worksite through clean-up, equipment checks, and offering occupational health screenings when needed.
- Enact a clear anti-discrimination and harassment policy with reporting procedures and training.
- Identify and manage chemical hazards with engineering controls, Material Safety Data Sheets, and air monitoring.

7.3.3.5 Employment, income and labor, working conditions

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 labour, non-observance of basic rights such as freedom of association and collective bargaining).

- Corruption, lack of ethics and integrity from contractors and primary suppliers.
- Opportunities for skilled and unskilled labor with a positive impact on local communities.
- Unrealized opportunities for local employment (e.g. failure to give priority for unskilled work to local community members).
- Unrealized 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.

Mitigation measures

- Develop Labour Management Plan and workers Code of Conduct.
- Fair hiring: prioritize local recruitment, enforce anti-discrimination policies, and pre-qualify ethical contractors.
- Local workforce development: partner for skills training and provide on-the-job opportunities.
- Transparent communication: engage the community through clear plans and open communication channels.

7.3.3.6 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.

Mitigation measures

- Plan for traffic and infrastructure: develop plans to minimize traffic disruptions and protect existing infrastructure. This includes communication with the public and utility providers.
- Maintain service access: minimize disruptions to essential services through careful planning and communication.
- Engage the community: inform residents about potential disruptions and provide feedback channels.

7.3.3.7 Summary of negative and positive impacts on the socio-economic environment during the construction phase

The potential negative and positive impacts expected to arise from the project construction on the socio-economic environment are summarized in the following matrix.

Table 7- 4 – Matrix of negative impacts on socio-economic environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Land Acquisition, Restrictions to Land Use and Involuntary Resettlement	Duration (D):	Medium-long	Medium-low	Long term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Physical and Cultural Resources	Duration (D):	Medium-long	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Communty Health and Safety	Duration (D):	Medium-long	Medium-low	Mid term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Occupational Health and Safety	Duration (D):	Medium-long	Medium	Mid term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Employment, Income, Labor and Working conditions	Duration (D):	Medium-long	Medium-low	Short-mid-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Infrastructure and Public Services	Duration (D):	Medium-long	Medium-low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					

Table 7- 5 – Matrix of positive impacts on socio-economic environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Enhancement effectiveness
Opportunities for skilled and unskilled labor	Duration (D):	Short	Low	Short-term	**Negligible**	High
	Frequency (F):	Sporadic				
	Spatial extent (E):	Project footprint				
	Intensity(I):	Negligible				

7.3.4 Impacts on physical environment: operation phase

7.3.4.1 Air quality

The project operation phase will not cause any continuous release of airborne pollutants into the atmosphere.

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 case of emergency (equipment failure, shut-down) engine driven emergency generator will be initiated, with consequent temporary release of exhaust emissions into the atmosphere.

In addition, if gas-insulated equipment is installed and used at the substations, potential fugitive emissions of SF_6 can occur during the Project lifetime. SF_6 is a powerful greenhouse gas that must be managed carefully to avoid leaks and emissions. Sulphur hexafluorides may escape as fugitive emissions during manufacturing, use, maintenance and disposal.

The scale of SF_6 emissions will be dependent on the type of and number of equipment used during operation as well as the maintenance and recycling procedures employed during operation and decommissioning.

This impact can be considered in the context of contribution to global climate change, with a medium-long term duration. However, the operational emissions are unlikely to be significant, if appropriately

managed and proper maintenance practices are implemented to ensure emissions are kept to a minimum. Therefore, the GHG emission during operation is evaluated as an impact with low significance, given that it would contribute with an extremely moderate degree to global climate change.
Detailed provisions to avoid and mitigate SF_6 emissions are included in ESMP. The residual impact value is negligible.

7.3.4.2 Soil, subsoil and freshwater resources

During the operation phase, potential soil and freshwater (surface and underground water) contamination may occur at the substations in case of accidental spills from equipment or from machinery used for maintenance activities.

An appropriate management of water discharges at the substations shall be provided, such as to exclude the accidental soil and subsoil pollution. In particular, the substations will be equipped with drainage systems of areas not occupied and occupied by equipment installations. Both systems will ensure the separation of contaminated waters which will be managed as waste and treated in accordance with national regulations in force and international standards.

Regular maintenance of substation equipment will follow detailed protocols in order to prevent accidental spill of oil and/or other potential contaminated materials. Moreover, all electrical waste and used batteries resulting from maintenance activities shall be collected and properly disposed/recycled, in compliance with national regulations and best waste management practices.

Considering the presence of rainwater and oily waters drainage and management systems at the substations and with the application of appropriate management measures during maintenance activities, soil and subsoil pollution is considered unlikely by performing the correct routine and extraordinary maintenance operations. Therefore, the importance of the impact is deemed negligible.

Mitigation measures

At the current stage of project design, the following design measures resulting in prevention of soil, subsoil and freshwater quality impacts during the Project operation phase, are anticipated:

- Protocols for periodic maintenance of substations and cables;
- A site-specific Emergency Response Plan would be prepared for soil clean-up and decontamination;
- Presence of a rain water management system at the substations;
- Presence of an oily water management system at the substations;
- Appropriate management and disposal of wastes in accordance with national legislation in force and applicable international standards;
- The line corridor will have to be maintained to limit the interaction between vegetation and underground cables that may cause damage to the installations. Vegetation cover might be maintained in order to reduce exposure to soil erosion and flooding. There will be restrictions on the planting of trees over the underground cable trenches, to prevent disturbance by deep vegetation roots. In rural areas there will be also restrictions on the use of deep cultivating equipment to avoid the risk of disturbance to the cable;
- Periodic maintenance of the equipment and ensure proper spill control and management at site;
- Monitor and detect any contamination on soil.

7.3.4.3 Noise

For the underground cables, the generated noise during the operation phase can be considered null.

During the operation phase, substations comprise several sources of noise emissions, the most significant being the continuous radiation of audible discrete tones. The noise of this type is primarily generated by power transformers, reactors, emergency generators, etc. Despite this, the expected noise
levels are low and thus the impact is negligible.

7.3.4.4 Electromagnetic fields

Electromagnetic fields (EMF)[51] are generated:

- Along the route of the underground cable. Underground cables produce EMFs in the same way as an overhead line, but the electric fields from underground cables are contained within the cable's protective insulation and sheath, so there are no external electric fields. The magnetic field can pass through the sheath and the ground so there is still an external magnetic field associated with buried cables. High voltage underground cables produce only magnetic fields. In case of underground cables single insulated phase conductors can be closer to each other, and because of that the field is lessened. If they are not buried too deep, we can get closer to them, meaning that we can be exposed to higher magnetic field magnitudes. In general, magnetic field magnitudes at the ground level near underground cable lines are fading much more intensively with the distance from the line axis than in case of overhead lines; however, they can be higher near at the cable line axis than near the overhead power line (Figure 7- 1).
- At the substations. In general, the strongest EMF around a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor bank, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

[51] ICNIRP is the acronym of International Commission on Non-Ionizing Radiation Protection and is in this field considered as the authority on the international scale. Its tasks include the formation of a scientific database about the health effects of EMF, the separation between scientifically credible proven and non-proven health effects of EMF and the drafting and publishing of recommendations for limiting the exposure of people.

The newest guidelines of ICNIRP, published in 2010 (Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic field (1 Hz to 100 kHz), 2010) are based on the current professional know-how in protecting people against the harmful effects of electromagnetic fields. The limit values provided for the general population for power frequency fields, are E = 5 kV/m and B = 200 µT

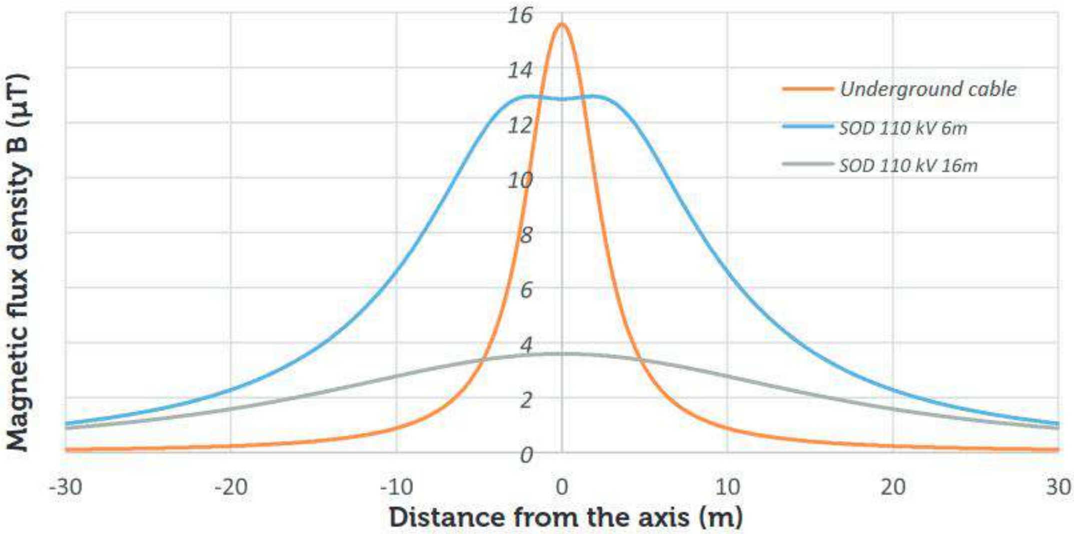

Figure 7- 1 – Magnetic field at 1 metre above ground in cross section to the cable axis; comparison for the 110 kV cables where they are set on the plane with 25 cm distance (orange), for the overhead power line SOD where the lower conductor is set at the height of 6 m (blue) and 16 m (grey)

In any case, the maximum magnetic field that can be expected from a 132 kV Transmission Line and/or cable is far below the maximum acceptable value according to IFC/WB standards based on ICNIRP guidelines (see footnote).

The recommendations and guidelines of the European Union for limiting the exposure of the general public (EU recommendation 1999/519/EC) or workers (EU Directive 2013/35/EU, which replaced the former EU Directive 2004/40/EC) are a common basis for legislation in many countries in Europe. In both guidance documents, the limits are derived in large part from the recommendations of the "*ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)*", published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 1998.

The recommended exposure limits to ELF fields are defined so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects is never reached inside the body. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions will also be met (in the body).

ICNIRP has issued new guidelines for EMF with frequencies between 1 hertz and 100 kilohertz in 2010 ("*ICNIRP Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1 Hz – 100 kHz)*), but these have not yet led to changes in the EU recommendation. The reference levels for general public and occupational exposure, according to ICNIRP guidelines published in 1998 and 2010, are provided in the following table.

Table 7- 6 – Reference (threshold) levels for public and occupational exposure to extremely low frequency (ELF) electromagnetic fields (EMFs) from ICNIRP Guidelines

	Frequency (Hz)	General public Exposure		Occupational Exposure	
		Electric Field (V/m)	Magnetic Flux Density (µT)	Electric Field (V/m)	Magnetic Flux Density (µT)
ICNIRP 1998 and EU guidelines	50	5,000	100	10,000	500
	60	4,150	83	8,300	415
ICNIRP 2010	50	5,000	200	10,000	1,000
	60	4,150	200	8,300	1,000

The impact due to EMF field during project lifetime is a permanent, long-term and continuous impact, limited to the project footprint. According to the expected levels of electric and magnetic fields, the impact is considered of low intensity. Since underground cables passes through populated areas, but the cable route will follow the existing 33 kV distribution line route, the sensitivity to this impact is judged medium.

The EMF field is rated as an impact of high importance. As previously stated, the expected levels of magnetic fields above ground are abundantly below the general public exposure limit of 200 µT. Therefore, the residual impact is rated low.

Mitigation measures

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

- Cable metal shield, shielding completely electric field;
- Use of appropriate personnel protective equipment (PPE), such as: rubber hand gloves, hard hats, safety boots, etc.;
- Information and Education of local communities regarding the effects of EMF.

7.3.4.5 Landscape and visual amenities

The main landscape and visual impact will be represented by the upgrading and extension of substations. The visual impact, however, is substantially reduced because the involved substations already exists and the upgrading works will consist in an extension of the current structure and installation of new equipment.

Potential visual receptors in the region crossed by the line may include communities located near the line corridor, travellers using road network, visitors and tourists.

No impacts on landscape are associated to the presence of underground cable, developed on existing roads and tracks.

The visual and aesthetic impact of the project is permanent, irreversible, affecting the local scale and of low intensity. Since substations and underground cables are located in populated areas, but the project envisages the upgrading and extension of existing substations, the sensitivity to this impact is judged medium. Therefore, the visual and aesthetic impact of the project is rated high and partially mitigable. The residual impact is of medium importance.

Mitigation measures

The following design measures resulting in prevention of impacts on landscape, are anticipated:

- Project layout definition and siting of facilities aimed at ensuring the least possible negative impacts (e.g. substations siting, cable route definition);
- 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 substations, materials in harmony with the dominant colors of the landscape context will be preferred;
- Shielding wooded area: 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 functional to the trophic support for the avifauna and useful entomofauna.

7.3.4.6 Summary of negative impacts on the terrestrial physical environment during the operation phase

The potential negative impacts expected to arise from the project operation on the terrestrial physical environment are summarized in the following matrix.

Table 7- 7 – Matrix of negative impacts on terrestrial physical environment during the project operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Air Quality	Duration (D):	Medium-long	Low	Long term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Beyond regional					
	Intensity (I):	Negligible					
Soil, Subsoil and Freshwater Resources	Duration (D):	Medium	Medium-low	Short-mid-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity (I):	Low					
Noise	Duration (D):	Long	Medium-low	Short-term	**Negligible**	None	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity (I):	Negligible					
Electromagnetic field	Duration (D):	Long	Medium	Irreversible	**High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity (I):	Low					
Landscape and Visual Amenities	Duration (D):	Long	Medium	Irreversible	**High**	Medium	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity (I):	Low					

7.3.5 Impacts on biological environment: operation phase

7.3.5.1 Habitat loss, degradation and fragmentation

The presence of transmission lines and associated infrastructure can create a visual barrier and potentially fragment the habitat of some species. This could restrict their movement and access to resources. Maintenance activities such as vegetation removal along the HVTL RoW could result in habitat loss and disturbance to vegetation and wildlife. In addition, this could lead to an increase in the negative effects of fragmentation.
For example, HVTL transmission projects are considered a physical barrier to the daily and seasonal movements of mobile species and could lead to changes in migratory behavior and flight patterns.

<u>Mitigation measures</u>

- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques.
- Promote the growth of low-height native plants that do not interfere with underground cable but provide habitat value.
- Implement a robust monitoring program to assess the impacts on wildlife and habitats continuously.
- Use the data collected during the monitoring activities to adaptively manage and refine mitigation measures as needed.

7.3.5.2 Introduction and spread of invasive alien species

Infestation of invasive species can also occur during periodic transmission RoW maintenance activities, especially if these activities include mowing and clearing of vegetation. Furthermore, regular vegetation clearing disrupt the habitat, often removing native plant species that compete with invasive species. Seeds can adhere to machinery, tires, and workers' clothing, facilitating their spread over large distances.

<u>Mitigation measures</u>

- Develop an Invasive Species Management Plan (ISMP) to identify risks and control methods.
- Use of Clean Equipment: Ensure all equipment and vehicles are cleaned before entering and leaving maintenance sites to prevent the spread of invasive species seeds.
- Monitoring: Implement regular monitoring programs to detect invasive species early and take prompt action to control their spread (e.g. eradication).
- Revegetation with native species: After maintenance activities, revegetate disturbed areas with native plant species to restore the habitat and reduce the opportunity for invasive species to establish.
- Train workers on invasive species identification and control.

7.3.5.3 Human disturbance

The operation and maintenance of transmission lines inherently involve human activities that can disturb the surrounding environment. These disturbances include for example noise, pollution, and physical presence. While the frequency of these activities may be low, the disturbance could affect negatively wildlife and habitat.

While the project is expected to bring benefits such as increased electricity access and improved livelihoods for local communities, it may also lead to an increase in tourism activities. This surge in tourism can have several negative impacts on the biological environment, primarily due to the increased human disturbance.

Mitigation measures

- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques.
- Train workers on minimizing noise and disturbance.
- Sustainable tourism practices and community involvement: Involve local communities to promote eco-friendly tourism practices that minimize environmental impact, such as reducing waste, conserving water, and using renewable energy sources. This includes also specific training to increase awareness about the importance of protecting the environment, biodiversity and local cultures.

7.3.5.4 Electromagnetic fields

The impacts of electromagnetic waves on organisms are still uncertain. However, some studies suspect that continuous exposure to an electromagnetic field (EMF) might generate behavioural changes and impact the reproductive success and the individual survival.

Mitigation measures

- Utilize EMF shielding technologies to reduce the intensity of electromagnetic fields in sensitive wildlife areas.

7.3.5.5 Summary of negative impacts on the terrestrial biological environment during the operation phase

The potential negative impacts expected to arise from the project operation on the terrestrial biological environment are summarized in the following matrix.

Table 7- 8 – Matrix of negative impacts on biological environment during the operation phase (terrestrial environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat Loss, Degradation and Frangmentation, Barrier to Movement	Duration (D):	Long	Medium	Short-mid-term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Introduction and Spread of Invasive Alien Species	Duration (D):	Long	Medium	Mid term	**High**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Human Disturbance	Duration (D):	Medium-long	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Electromagnetic Field	Duration (D):	Long	Low	Short-term	**Negligible**	Medium	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

7.3.6 *Impacts on socio-economic environment: operation phase*

7.3.6.1 Occupational health and safety

Workers may be exposed to occupational hazards from contact with live power lines and electrified equipment during maintenance and operation activities. They are also exposed to occupational hazards due to exposure to electric and magnetic fields and usage of fuels and lubricants. Significance of these impacts is deemed anyway low, given that limited operation and maintenance activities are expected, especially on submarine and underground cables.

Mitigation measures

- Employing qualified personnel and orientation of staff on new tasks;
- Regular training of workers in occupational health, safety and emergency response;
- Provision of in-house medical personnel and First Aider together with provision of first aid facilities;
- Provision of appropriate firefighting equipment and planning;
- Providing personal protective equipment (PPE) such safety helmets, ear muffs, ear plugs, safety masks, safety boots, uniforms and hand gloves to the workers;
- Using well-maintained equipment by qualified personnel;

7.3.6.2 Economy, employment and labor, working conditions

Potential impacts refer to maintenance works:

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

Mitigation measures

- Labor standards policy: implement a policy outlining fair treatment, legal working hours, and grievance mechanisms for workers (including contractors).
- Vet contractors: conduct audits and require a Contractor Code of Conduct to ensure ethical business practices.
- Transparency and monitoring: publicly disclose labour standards and establish a system to monitor compliance throughout the supply chain.
- Training and communication: train workers and contractors on their rights and encourage reporting concerns.

7.3.6.3 Community Health and Safety

Potential impacts include:

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

Mitigation measures

- Physical barriers: install signage and barriers to restrict access to hazardous areas.
- Emergency preparedness: develop a plan with evacuation procedures, communication protocols, and conduct drills.

- PPE: maintain a PPE stock and train workers on proper use.
- Continuous Improvement: conduct safety audits and investigate incidents to improve protocols.

7.3.6.4 Summary of negative and positive impacts on the socio-economic environment during the operation phase

The potential negative and positive impacts expected to arise from the project operation on the socio-economic environment are summarized in the following matrices.

Table 7- 9 – Matrix of negative impacts on socio-economic environment during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Occupational Health and Safety	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Economy, Employment, Labor and Working Conditions	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Community Health and Safety	Duration (D):	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

Table 7- 10 – Matrix of positive impacts on socio-economic environment during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Enhancement effectiveness
Increased power supply	Duration (D):	Long	Medium-high	Short-mid-term	**High**	High
	Frequency (F):	Continuous				
	Spatial extent (E):	Global				
	Intensity(I):	High				
Economic growth	Duration (D):	Long	Medium-high	Short-mid-term	**Medium**	High
	Frequency (F):	Continuous				
	Spatial extent (E):	Regional				
	Intensity(I):	High				

7.4 Marine domain

7.4.1 General environmental and social considerations on submarine power cables

Submarine power cables (SPC) have been in use since the mid-19th century, but environmental concerns about them are much more recent. With the development of marine renewable energy technologies, it is vital to understand their potential impacts. The commissioning of SPC may temporarily or permanently impact the marine environment through habitat damage or loss, noise, chemical pollution, heat and electromagnetic field emissions, risk of entanglement, introduction of artificial substrates, and the creation of reserve effects. While growing numbers of scientific publications focus on impacts of the marine energy harnessing devices, data on impacts of associated power connections such as SPC are scarce and knowledge gaps persist.

SPC, like any other man-made installation or human activity at sea, may cause disturbances to marine life and habitats. When talking about anthropogenic disturbances, it is important to distinguish 'effects' from 'impacts. Effects are modifications of environmental parameters, such as the substrate type, hydrodynamics, water temperature, noise, or electromagnetic fields beyond the range of natural variability. Impacts correspond to changes observed at "receptor" level, *i.e.*, the different ecosystem compartments (biotopes, biocenosis), or levels (community, populations) or some ecological processes within marine ecosystems (trophic interactions). Impacts may be positive or negative, although this distinction remains subjective. The main potential environmental impacts associated with SPC during their operational phase are those related to the production of electromagnetic fields, the creation of artificial reefs and "reserve effects" caused by the interdiction of certain human activities. Cable installation, maintenance and decommissioning also impact the environment, causing direct benthic habitat modification, which can be especially problematic in the case of sensitive bio constructed habitats. These phases of SPC may also induce significant particle and pollutant resuspension events in very confined and modified shallow coastal areas. Mitigation measures are possible before, during or after projects to limit the ecological impacts of SPC and associated maritime operations. In general, submarine cable projects typically have minor residual environmental impacts thanks to their small footprint and short time of the construction activities in each given point of the cable route, combined with the avoidance of sensitive areas when designing the system, and the application of well-known industry standard mitigation measures.

Potential environmental effects associated with SPC are summarised in Figure 7- 2. During installation, maintenance and decommissioning phases, these effects may include physical habitat disturbances, sediment resuspension, chemical pollution and underwater noise emission. More long-term effects may occur during the operational phase, with changes in electromagnetic fields, heat emission, risk of entanglement, chemical pollution, and creation of artificial reef and reserve effects.

7.4.2 Impacts on physical environment: construction phase

A schematic view of potential environmental impacts associated to submarine cables is provided in the following figure.

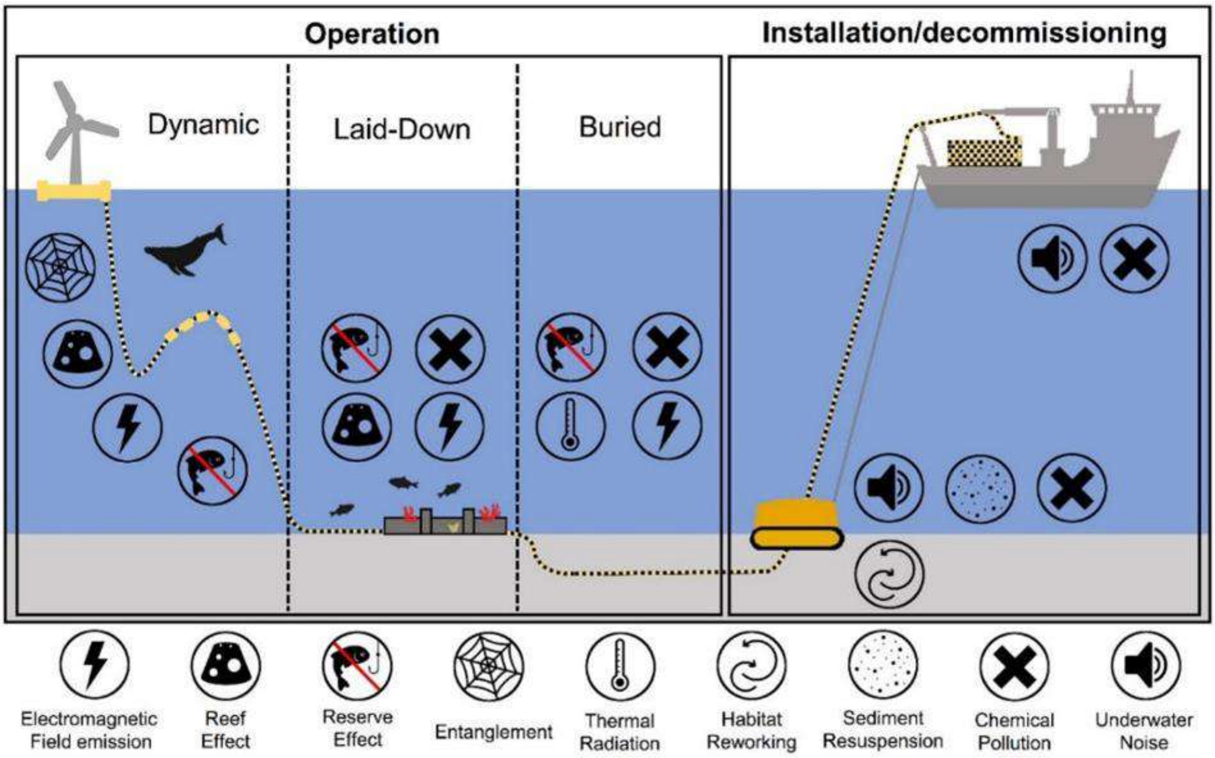

Figure 7- 2 - Potential environmental impacts of submarine cables[52]

7.4.2.1 Seabed disturbance and degradation

Construction works on the seabed can result in the disturbance, subsequent re-suspension of sediments and increased turbidity. Substratum alterations are mainly created by equipment used for cable route preparation (grapnels) and installation of the cable (ploughing, jetting and cutting wheels).

The surface area of disturbance can be enlarged when installation techniques require large ships with several anchoring stabilizers. These methods of reworking the seabed may lead to direct destruction of benthic habitats, flora and fauna. However, such effects are usually restricted to a limited area, the width and intensity of disturbance, depending on the installation method.

Cable burial activities will be undertaken in a linear manner. As such, impacts are not expected along the entire cable route for the entire period of the cable laying duration and relate to activities at each point along the cable route. The zone of elevation will be dependent on waves and currents conditions during the works, with maximum concentrations occurring within and immediately adjacent to the works. In deeper waters it is expected that suspended sediments will largely remain towards the lower part of the water column, where current velocities are lower than at the surface limiting dispersal and promoting rapid deposition.

Cable burial from jetting activities in nearshore waters (water depths <15 m) provide greater potential for dispersal of sediments due to the more dynamic nature of hydrodynamic processes in this area and

[52] Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., & Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews, 96, 380-391.

the greater level of sediment disturbance. This may extend the zone of sediment dispersal and also lead to greater dilution as sediment are dispersed.

Jetting fluidises the seabed using high power jets, and material may suspend to the water column for prolonged periods (a number of hours), and have the capacity to be transported over longer distances, increasing the number of potential receptors. Ploughing usually entails lifting a wedge of seabed and the seabed backfills over the laid cable. The level of sediment disturbance is, therefore, lower using ploughing compared to jetting techniques.

In areas with natural hard substrates and at greater water depths, it is often not possible to bury cables. Because the surface structure is changed to a considerably lesser extent than in the case of soft substrates, however, burial is not absolutely necessary.

Raised turbidity and suspended sediment levels can have a number of adverse effects on marine organisms, particularly in areas that would normally have clear waters. Where suspended sediment concentrations are present for prolonged periods, or are particularly high and widespread, visibility can be reduced affecting the ability of some fish to feed. Raised turbidity can also reduce light penetration in the water column and reduce photosynthesis/productivity in sea grasses and affecting the coral reef presents in the area.

However, 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 therefore estimated to be negligible.

Mitigation measures

Specific equipment and installation techniques can reduce the seabed disturbance and re-suspension of sediment during cable burial, e.g. use of floating machinery where seabed conditions require its application.

This is especially the case for plough burial and surface lay approaches. This will reduce the potential for suspended sediment plumes and associated deposition of sediments. In areas where the cable will be laid on the seabed, the potential for creating suspended plumes is very limited.

The cable laying vessel shall be required to meet the requirements of MARPOL 73/78, which includes requirements to avoid and minimise the discharge of harmful substances to the marine environment.

7.4.2.2 Underwater noise

Anthropogenic noise can be produced during route clearance, trenching and backfilling, cable installation offshore and near shore, 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.

Considering a behavioural threshold value for marine mammals of 120 dB re 1 µPa, the extent of the behavioural impact area for this highly sensitive marine fauna could be considered, for each activity, to be in a maximum range of 10 km, while a major impact (temporary or permanent injury) 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 animals would possibly tend to dive away from disturbing sound sources, resulting in presumably temporary avoidance to be the mayor impact of the activities.

It is underlined that the project area intersects with the following protected areas: Tanga Coelacanth Marine Park, Pemba Channel Conservation Area and Greater Pemba Channel Important Marine Mammal Area.

Noise will have a limited duration, restricted to a specific activity duration in a specific operational area within the construction phase itself. The underwater noise is classified as impact of low importance.

Mitigation measures

The following mitigation measures could be used for minimizing the impact of noise, considering that no specific threshold is 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);
- Follow the recommendations of the "*Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life*", International Maritime Organization (IMO), 2014;
- All the machinery would have noise reduction measures according to environmental protection laws.

7.4.2.3 Seabed contamination

Vessels and machinery operating on the seabed (trenching or jetting machines) pose a potential risk of accidental hydrocarbon or oil spills and accidental dispersion of waste during operations of the construction phase.
Another chemical risk is the potential release of sediment-buried pollutants (e.g. heavy metals and hydrocarbons) during sediment re-suspension caused by cable burial, repair works and decommissioning. The highest contaminant concentrations are generally located in coastal areas due to human activities.
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 negligible.

Mitigation measures

At the current stage of project design, the following mitigation measures and operational/management procedures for the prevention of seabed contamination during construction are anticipated.

- 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 waste management procedures.

7.4.2.4 Waste

Potential impacts associated with construction waste likely to be generated by the project include:

- Potential release of waste from vessels into marine water

- Inadequate storage, handling, transportation and classification of waste, resulting in waste contamination, mixing of different waste classes, inappropriate transportation and disposal to an inappropriate waste facility or illegal disposal;
- Transport and disposal of liquid and solid wastes could lead to environmental pollution and potential indirect impacts on public health;
- Incorrect classification, handling and/or disposal of contaminated waste could lead to environmental pollution or increased public health risks.

Waste impacts are classified low due to the operations' low intensity and short duration. If the following mitigation measures are correctly implemented, the impacts could be further reduced to negligible.

Mitigation measures

- These potential waste management impacts would be managed through the implementation of the management measure described in detail in the Annex 4 (SP02 Water and Soil Pollution Management Plan and SP05 Waste Management Plan).
- Vessels shall be required to comply with MARPOL 73/78, which includes best practice measures to avoid harmful waste discharges at sea.
- Hazardous waste (if any) and all debris recovered from the seabed during pre-lay clearing activities shall be safely stored on board the vessel until it can be disposed at a suitably equipped port.
- The debris shall be disposed by accredited waste contractors.
- Only approved landfills or dumpsites shall be used for disposal of the debris
- All project works area shall be rehabilitated and restored to its original state after works are completed.

7.4.2.5 Summary of negative impacts on the marine physical environment during the construction phase

The potential negative impacts expected to arise from the project construction on the marine physical environment are summarized in the following matrix.

Table 7- 11 – Matrix of negative impacts on marine physical environment during the project construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Seabed Disturbance and Degradation	Duration (D):	Short	Low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Underwater Noise	Duration (D):	Short	High	Short-term	**Low**	Low	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Very high					
Seabed Contamination	Duration (D):	Medium-short	Low	Mid term	**Negligible**	Medium	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Waste	Duration (D):	Short	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	Low					

7.4.3 Impacts on biological environment: construction phase

During the project construction, potential impacts on the seabed and marine biodiversity located in works' area are primarily related to seabed disturbance including potential contaminant release from sediments, underwater noise and entanglement risks.

Even though lay and burial and post lay burial usually displace sediments, marine cable installation has an effect that is quite limited. Most 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.

Seabed disturbances are usually limited in time, as installation works only require a few hours or days per km of cable. Ploughing and jetting methods favour a quicker recovery of bottom topography, as the trench is filled with displaced and re-suspended material immediately after digging and cable laying.

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. 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, etc.) 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 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.

Modern equipment and installation techniques though can avoid, reduce and/or mitigate the re-suspension of sediments during laying and burial activities.

Table 7- 12 – Interaction of marine cable installation and operation with biological receptors (D = Direct interaction; I = Indirect interaction; N = No interaction; ? = Unknown)

Marine cable impacts	Inter / subtidal habitats	Offshore benthic habitats	Marine fauna
Seabed disturbance	D	D	D
Potential contaminant release from sediment	D	D	D
Artificial reef effects	D	D	I
Electromagnetic fields	D	D	D
Thermal radiation	D	D	D
Underwater noise and disturbance from vessel and installation activity	N	N	D

Negative impacts on the biological environment during the construction phase are discussed below.

7.4.3.1 Habitat loss, degradation, fragmentation and barrier effect

Operations employed for cable placement disturb the seabed, impacting intertidal and benthic (bottom-dwelling) organisms and their habitats. This can range from sessile (immobile) invertebrates to fish species that rely on the seabed for shelter and food acquisition. The impact is typically localized to the direct AoI; however, it can be significant in ecologically sensitive areas like coral reefs or spawning grounds for fish populations. The installation of the cable will require excavation of sediment for the cable trench and an additional working corridor adjacent to the excavated area will be required for the movement of people and machinery. These works will therefore result in the disturbance of habitats and species, potentially including sea turtles, shorebirds, flora and marine fauna.

The project area provides potential habitat for sea turtle nesting, although this is expected to be at a low level. The presence and migratory routes of humpback whales (*Megaptera novaeangliae*) and other threatened cetaceans have also been reported in the project area. The periods of the year when cetaceans are more abundant and migrate are from August to January, while the nesting period of sea turtles is from March to May/June.

<u>Mitigation measures</u>

- Timing of construction activities: schedule outside sensitive seasons. Considering the endangered species present in the project areas and their seasonal movements, the best period for construction activities is from June to July and from the end of January to the beginning of March. With regard to construction activities in the coastal area, the period to avoid is during the sea turtle nesting season, from March to May/June.
- Bury cables deep to minimize barriers effect.
- Habitat restoration for severely impacted areas, if feasible.
- Monitoring and adaptive management: conduct post-construction monitoring of benthic communities and adjust operations if necessary.

7.4.3.2 Introduction and wide spreading of invasive alien species

Construction activities involve a significant increase in vessel traffic, with ships carrying personnel, equipment, and materials to the project site. These vessels can act as unintentional vectors for transporting and introducing IAS.

<u>Mitigation measures</u>

- Meet international obligations (IMO): all ships will strictly adhere to International Maritime Organisation (IMO) Convention for the Control and Management of Ships' Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) (2004). Sediments (BWM Convention) (2004). Part of the requirement under this Convention is to ensure that ballast water exchange operations are carried out in in deep water, in the open ocean, as far away from shore as possible. The exchange should, wherever possible, take place at least 200 nautical miles (370 km) from the coast and in water with a depth of 200 m or more.
- Implement a marine biosecurity plan with vessel inspections, ballast water management, and crew training.

7.4.3.3 Disturbance, degradation and loss of coral reefs

Physical damage, sedimentation, increased turbidity due to the construction activities could affect sensitive ecosystems such as coral reefs. The installation of submarine cables across coral reefs can lead to physical damage to corals due to trenching activities, anchoring and other mechanical activities that can break or crush coral structures. Anchoring ships and equipment during installation can create scars on the seabed, directly damaging corals and other benthic organisms. Construction activities disturb the seabed, causing an increase in sedimentation that can smother corals, blocking sunlight and hindering photosynthesis, which is crucial for the survival of zooxanthellae (symbiotic algae living within coral tissues).

Mitigation measures

- Avoidance: adjust the final route to completely bypass coral reefs.
- Conduct detailed ecological surveys to map coral reefs along the route before the construction.
- Specific cable Installation techniques: during the construction activities, diver-assisted installation should be implemented to manually guide the cable around sensitive areas.
- Temporary Coral Translocation: temporarily relocate corals from the cable path to safe areas before installation. Ensure proper handling and reattachment techniques to minimize stress and mortality rates.
- Post-Installation monitoring and restoration: Implement regular monitoring programs to assess the reef's health and recovery post-installation. Conduct active restoration efforts, such as coral gardening and reef rehabilitation projects, to support recovery.
- Community engagement and education.

The marine baseline survey indicated that there are no coral reefs along the project footprint. However, it is recommended that a detailed ecological survey be conducted to map coral reefs along the route prior to construction. If coral reefs are identified in the detailed pre-construction survey, translocation and restoration activities will need to be undertaken; otherwise, only monitoring of the status of nearby corals will be required. If the condition of nearshore corals is degraded by the project, restoration activities will be required.

7.4.3.4 Fauna collision

Fauna collision refers to the potential for physical contact between construction vessels and equipment, and marine animals during the laying of submarine cables. This can have serious consequences for various species, including:

- Marine mammals**:** these animals rely on echolocation for navigation and finding prey. Collisions with vessels can cause severe injuries or even death.
- Sea turtles: their slow-moving nature and limited ability to maneuver make them particularly vulnerable to vessel collisions. Injuries can be fatal or leave them with long-term disabilities.

Mitigation measures

- Apply reduced speed limits (<14 knots) to minimize and/or avoid any risk of collision.
- Keep on board a qualified cetacean observer as crew member responsible for the promptly detection of marine mammals on a collision course.

7.4.3.5 Noise pollution

Construction activities generate substantial underwater noise through processes like vessel operations. This noise disrupts vital behaviors in marine fauna, including communication, navigation, and foraging. Whales, dolphins, and fish are particularly vulnerable, as these activities can hinder their ability to locate food, communicate with each other, and avoid predators. In extreme cases, it can even cause physical harm such as hearing loss.

Mitigation measures

- Schedule noisy construction activities outside of critical seasons for marine animals. The best period for construction activities is from June to July and from the end of January to the beginning of March. With regard to construction activities in the coastal area, the period to avoid is during the sea turtle nesting season, from March to May/June.

- To mitigate the potential impacts especially on marine mammals, consult the ACCOBAMS "Guidance on Underwater Noise Mitigation Measures"[53].

7.4.3.6 *Chemical contamination*

Accidental leaks of hydraulic fluids or lubricants from construction equipment can introduce harmful pollutants into the marine environment. These pollutants can be toxic to marine organisms, disrupting entire food webs and potentially leading to bioaccumulation (concentration of toxins in the body) in higher trophic levels. However, stringent regulations and improved maintenance practices have significantly reduced the risk of such occurrences.

Mitigation measures

- Develop a Spill Prevention, Control, and Countermeasure Plan (SPCC) with prevention, containment, and clean-up procedures.
- Use low-impact dredging techniques and silt curtains to control sediment re-suspension. Dispose of dredged material properly.
- Educate personnel on spill prevention and response protocols.

7.4.3.7 *Summary of negative impacts on the marine biological environment during the construction phase*

The potential negative impacts expected to arise from the project construction on the marine biological environment are summarized in the following matrix.

Table 7- 13 – Matrix of negative impacts on biological environment during the construction phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Habitat loss, degradation, fragmentation and barrier effect	Duration (D):	Medium-short	Medium	Short-mid-term	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Introduction and spreading of Invasive Alien Species	Duration (D):	Medium	Medium-low	Long term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Disturbance, degradation and loss of coral reefs	Duration (D):	Medium-short	High	Long term	**Very High**	High	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	High					
Fauna collision	Duration (D):	Medium-short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Noise pollution	Duration (D):	Medium-short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Chemical Contamination	Duration (D):	Medium-short	Medium-high	Mid term	**Medium**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					

[53] https://accobams.org/wp-content/uploads/2019/04/MOP7.Doc31Rev1_Methodological-Guide-Noise.pdf

7.4.4 Impacts on socio-economic environment: construction phase

Fishing activities will be impacted during the cable laydown. The laydown activities and the trench opening on the shores will have a short duration and will be limited to the project footprint. Therefore, the impact has been considered negligible. In addition, in order to reduce the impact on the fishing activities the project will schedule the works after the fishing campaign, as far as possible, and in consultation with fishermen groups.

The main OHS risks during offshore cable laying operations usually arise from the use of specialised equipment on the ship, in addition to man overboard risks. Another impact of the Project activities is the risks associated with the use of divers for nearshore cable installation. These risks can be mitigated by the employment of trained and qualified personnel and by the use of PPE, as stated in ESMP.

7.4.5 Impacts on physical environment: operation phase

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. 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.
Therefore, considering the narrowness of the corridor and the expected weakness of thermal radiation, impacts are not considered to be significant.

7.4.6 Impacts on biological environment: operation phase

7.4.6.1 Reef effect

Unburied submarine cables and their protective casings can become suitable areas for marine organisms. This phenomenon, known as the “reef effect”, mirrors the approach of intentionally creating artificial reefs to restore habitats or bolster coastal protection. These underwater structures attract a variety of organisms that thrive on hard surfaces, from stationary filter feeders to mobile organisms.

Mitigation measures

- Monitoring for invasive species and eradication action if needed.

7.4.6.2 Electromagnetic fields

Many marine animals are known to be sensitive to electromagnetic fields (EMFs). In fact, most of them use Earth's natural magnetic field for navigation and migration. Some species, especially sharks and rays, have a special sense called electroreception that allows them to detect electric fields. They use this ability to find prey, communicate with each other, and avoid predators. There's even some evidence that these electric fields might be attracting certain animals to bite submarine cables.

Mitigation measures

- Cable shielding: prioritize shielded cables that minimize EMF leakage into the surrounding environment.

7.4.6.3 Heat emission

Submarine cables can generate some heat during operation. However, this is usually minimal and dissipates quickly in the surrounding water. It is unlikely to cause a significant rise in water temperature and should not directly harm marine organisms.

Mitigation measures

- High thermal conductivity materials: use materials with high thermal conductivity in the cable design to enhance heat dissipation.
- Insulation materials: employ advanced insulation materials that minimize heat generation and enhance efficient heat transfer away from the cable.
- Burial depth**:** bury cables at appropriate depths to ensure that any heat generated is quickly dissipated by the surrounding sediment and water.

7.4.6.4 Summary of negative and positive impacts on the marine biological environment during the operation phase

The potential negative and positive impacts expected to arise from the project operation on the marine biological environment are summarized in the following matrix.

Table 7- 14 – Matrix of negative impacts on biological environment during the operation phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Reef Effect for alien species	Duration (D):	Long	Medium-high	Mid term	**High**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Electromagnetic Field	Duration (D):	Long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Heat Emission	Duration (D):	Long	Low	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

Table 7- 15 – Matrix of positive impacts on biological environment during the operation phase (marine environment)

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Enhancement effectiveness
Reef effect	Duration (D):	Medium-long	Medium	Short-term	**Negligible**	High
	Frequency (F):	Continuous				
	Spatial extent (E):	Project footprint				
	Intensity(I):	Negligible				

7.4.7 Impacts on socio-economic environment: operation phase

7.4.7.1 Reserve effect

The activities such as trawl fishing, dredging and anchoring will be prohibited along the SPC because the activities could damage the SPC. The impacts on fishermen are considered negligible because the fishing activities are spread and intense all over the island, therefore fishermen can easily move and fish outside the restricted line corridor.

Such restriction will create the environmental reserve effect. The potential reserve effect of SPC is therefore linked to the limitation/interdiction by local authorities of damaging human activities (trawl fishing, anchoring, dredging, etc.) around the cable route during the operation phase and is considered as a positive effect for ecosystems.

In some cases, the use of passive fishing equipment (nets, lines, and traps) is permitted, reducing the protection of targeted species. The size of the protected zone and the level of restriction depend on the cable installation method (buried or unburied), the number of cables present in the area, and the size of the electrical connections.

The overall impact is considered medium because the restriction will be limited to the line corridor.

Mitigation measures

- Work with authorities and fishers to find a balance between ecological protection and economic needs.
- Limit high-impact activities (e.g., bottom trawling) and promote the use of lower-impact fishing gear within the reserve.

8 CUMULATIVE IMPACT ASSESSMENT

8.1 Introduction

For the assessment of cumulative impacts for the proposed projects the main reference sources were the IFC Performance Standards and the AfDB's Integrated Safeguards System 2023, particularly in accordance with Operational Safeguard (OS)1.

The IFC Performance Standard 1 define cumulative impacts as "*those impacts that result from the incremental impact of the project when added to other existing, planned and reasonably predictable future projects and developments*".

AfDB OS 1 defines cumulative impacts as "*The cumulative impact of the project is the incremental impact of the project when added to impacts from other relevant past, present, and reasonably foreseeable developments, as well as unplanned but predictable activities enabled by the project that may occur later or at a different location. Cumulative impacts can result from individually minor but collectively significant activities taking place over a period of time*".

The AfDB guidance is in line with IFC PS1 regarding cumulative impact assessments.

8.2 Existing, planned and reasonably predictable future projects

Several sources have been reviewed and considered to determine whether there are existing, planned, or reasonably predictable future projects and developments within the project area and the Area of Influence, where potential environmental and social interactions may combine with the proposal to result in more or less significant overall impacts. These sources are listed below:

<u>Tanzania National Five-Year Development Plan 2021/22-2025/26</u>:

This comprehensive plan outlines major infrastructure, energy, industrial and social projects throughout Tanzania, including Zanzibar. It provides insight into future developments that may interact with the proposed project, highlighting potential cumulative environmental and social impacts.

<u>Zanzibar Development Plan (ZADEP) 2021– 2026</u>:

This is a strategic plan designed to guide Zanzibar's socio-economic development over a five-year period. The theme is Blue Economy for Inclusive Growth and Sustainable Development and it intends to align society's efforts towards realization of the development aspirations as articulated in Zanzibar Development Vision 2050.

<u>Field activities and stakeholder consultations</u>:

Information gathered during field activities and consultations with various stakeholders, including authorities and local communities, revealed current issues related to previous projects in the project areas. This local knowledge was critical to understanding the historical and ongoing impacts that may affect or be affected by the proposed project.

In addition to the sources mentioned above, the cumulative impact assessment has also taken into account the two submarine cables already existing from mainland to Unguja and Pemba and the two other proposed transmission lines and submarine cables connecting mainland Tanzania with Mafia Island and Unguja Island.

The above plans and sources have been reviewed to identify potential projects and developments that could result in cumulative impacts with the proposed project. Specifically, projects within the project area and its vicinity were considered and examined to determine their potential contribution to cumulative impacts. This process involved identifying and assessing the impacts that could be caused or exacerbated by the interaction of these various developments, ensuring a comprehensive understanding of the potential cumulative effects on the environment and community.

In the following section, each of the identified existing and proposed projects and developments has been analysed and their respective impacts have been thoroughly examined. This analysis included an assessment of the potential environmental and social impacts of each project, in combination with the proposed project. By assessing impact factors, cumulative impacts were systematically identified and expressed, providing a clear understanding of how these developments could collectively affect the project area and its surroundings. Finally, appropriate mitigation measures were identified and proposed to address and reduce these cumulative impacts to ensure sustainable development and minimise adverse impacts on the region.

At present, there is little information about reasonably defined future developments in the AoI project, but by reviewing the sources, general projects and developments have been identified and described:

- **Construction and rehabilitation of Strategic Airports Construction and rehabilitation of Airports,** facilitated by June, 2026.

  Construction and rehabilitation of Tanga Airport to improved air transport, National Security and Economic activities such as Tourism, Trade investment etc.

  Construction of new terminal building, extension of runway and other facilities at Pemba.

- **East African Crude Oil Pipeline (EACOP)**: EACOP covers 1,443 km of pipeline running from Hoima (Uganda) to Tanga out of which 1,115 km are in Tanzania where 216,000 barrels of crude oil are transported per day. The project also includes storage, block valves, heating, pumping and marine export facilities.

- **Infrastructure development:** Construction of road Pangani - Tanga (50 km) and Pangani - Mkange - Makurunge (124.5 km) to bitumen standard.

- **Improvement of railway infrastructure** of TAZARA, Central, Eastern and Southern railway lines and rehabilitate existing rolling stocks: 1,223 Km of Standard Gauge Railway Line Construction of standard gauge railway line of Tanga-Arusha - Musoma with branches to Minjingu and Engaruka.

- **Expand Sea ports of Dar es Salaam, Tanga and Mtwara**.

- **Procure and rehabilitate marine vessels:**

  A total of 12 new vessels constructed in Lake Victoria, Tanganyika and in the Indian Ocean by 2025.

- **Development of tourism infrastructure in tourism areas in Pemba and Unguja.**

- **Submarine cables** from Dar es Salaam to Unguja and from Tanga to Pemba (already existing)

- **Proposed transmission lines and submarine cables** connecting Dar es Salaam and Unguja Island and from Kisiju to Mafia Island.

8.3 Potential cumulative impacts

The potential environmental and social cumulative impacts caused by the proposed project in combination with these projects and development activities were identified as:

- Local and regional economic growth and enhancement of tourism;
- Increase of human disturbance;
- Impact on air quality and increase in GHG emissions;

- Increase in underwater and terrestrial noise generation;
- Habitat fragmentation, barrier to movement;
- Deterioration of marine water quality;

The identified potential cumulative impacts, their significance and proposed mitigation measures are discussed in the following paragraphs.

8.3.1 Local and regional economic growth and enhancement of tourism

The proposed project and the other planned projects and development activities are expected to bring benefits to the local communities and therefore have a positive impact at local and regional level. Indeed, the combined development of the submarine cable, transmission lines and various planned infrastructure projects, including airport expansions, road construction and tourism facilities, will significantly stimulate local and regional economic growth. The expansion of airports and seaports, coupled with upgraded road and rail networks, will facilitate the movement of goods and services, boosting regional trade and commerce. In addition, the development of tourism infrastructure will attract more visitors and the increase in electricity supply and access will further support local businesses.

8.3.2 Increase of human disturbance

While the project is expected to bring benefits as described above, such as increased tourism activities, if not managed sustainably, this can have significant negative impacts on the biological environment due to increased human disturbance.

However, the addition of project activities to the cumulative impacts of human disturbance in the project AoI will be **minor** and specific mitigation measures have been proposed. In particular, sustainable tourism practices and community involvement have been proposed, involving local communities to promote environmentally friendly tourism practices that minimise environmental impacts, such as waste reduction, water conservation and the use of renewable energy sources. This also includes specific training to raise awareness of the importance of protecting the environment, biodiversity and local cultures.

8.3.3 Impact on air quality and increase in GHG emissions

The combined development of the proposed project and major infrastructure projects, including airport expansion and road construction, are likely to have an impact on air quality and increase greenhouse gas (GHG) emissions. Construction activities generate dust and particulate matter, while the use of heavy machinery and increased vehicle traffic contribute to higher levels of nitrogen oxides (NOx), sulphur dioxide (SO2) and carbon monoxide (CO). This increase in air pollutants and GHG emissions can affect air quality.

The addition of GHG emissions and air quality impacts from project activities to the cumulative impacts in the project AoI will be **negligible** considering the duration of construction activities and will not result in a measurable contribution that could have an impact on climate change. Furthermore, specific mitigation measures were proposed in the section 7.3.1.5 to help reducing significantly dust emission and partially also exhaust emissions.

8.3.4 Increase in underwater and terrestrial noise generation

<u>Marine domain</u>

The development of the proposed project and other infrastructure, the expansion of seaports and new vessels will lead to an increase in underwater noise generation. Underwater noise will be generated by vessel movements and cable laying activities and may cause very localised temporary adverse effects and more widespread behavioural changes in marine life. This noise will add to the underwater soundscape already created by other marine activities.

Despite this addition, the cumulative increase in noise levels in the project's AoI is expected to be **minor** and specific mitigation measures have been proposed. For the complete list of mitigation measures referred to paragraph 7.4.2.2 and 7.4.3.5.

Terrestrial domain

The construction of various development projects within the AoI of the proposed project will inevitably generate noise emissions. However, there is a lack of detailed information on the planned projects in the terrestrial part of the AoI.

The addition of noise from project activities to the cumulative noise levels in the project AoI is expected to be of short duration and is therefore considered to be of minor significance. However, specific mitigation measures have been proposed in sections 7.3.1.5 and 7.3.4.3.

8.3.5 Habitat fragmentation, barrier to movement

The development of the proposed Project, in combination with other infrastructure projects, is likely to lead to habitat fragmentation and create barriers to movement for both terrestrial and marine species. Construction activities, new infrastructure and increased vessel traffic may affect ecological connectivity, disrupt corridors and impede animal movements. For marine species, submarine cables and increased vessel traffic can obstruct migration routes and disrupt normal behavioural patterns. These barriers can lead to reduced genetic diversity, increased mortality rates and declines in species populations, ultimately threatening the ecological balance and resilience of the affected areas.

Although the consequences of fragmentation and loss of connectivity could have serious implications for habitat and species conservation, specific and effective mitigation measures have been proposed, taking into account not only the proposed project but also other developments and projects (see section 7.3.2.2). Following these proposed measures, and taking into account the short construction period of the proposed project, the addition of fragmentation and barriers to movement impacts from project activities to the cumulative impacts in the project AoI is considered of **minor** significance.

8.3.6 Deterioration of marine water quality

The construction activities of the proposed project, together with other ongoing and planned projects, have the potential to release substances that could degrade marine water quality in the project's AoI. Contamination may occur as a result of unplanned events such as accidental releases, wastewater discharges, run-off from vessel decks, and other construction activities at the cable landing site. These contaminants can include oils, chemicals and sediments that can harm marine ecosystems.

These impacts are expected to be small in magnitude and short in duration. Consequently, the potential cumulative impacts on marine water quality are expected to be of **minor** significance.

9 STAKEHOLDERS ENGAGEMENT

9.1 Introduction

Stakeholder engagement is an inclusive process conducted throughout the project life cycle and it is most effective when initiated at an early stage of the project development process and is an integral part of early project decisions and the assessment, management and monitoring of the project's environmental and social risks and impacts. Where properly designed and implemented, it supports the development of strong, constructive, and responsive relationships that are important for successful management of a project's environmental and social risks. A key issue for stakeholder management is to determine who, to what extent and why can influence a project.

9.2 Affected Parties

The affected parties are identified as follow:

1) Villages located near the landing point and the routing of underground cables;
2) People with land ownership rights along the routing of underground cables;
3) People whose livelihood depends on marine ecosystem service.

Particularly the project affected villages for the project are summarized in the table below.

Table 9- 1 – Project affected villages for the project

Region	District	Ward	Village/Town
Tanga	Tanga City	Mzingani	-
		Mabawa	-
		Duga	-
		Mwanzange	-
		Nguvumali	-

9.3 Other Interested Parties

9.3.1 Government Bodies

During the screening phase the consultant has identified the different institutions that have to be consulted since the inception phase and those who will be consulted during the design phase. Besides TANESCO, several institutions can play a role in the approval process of the project design. The chapter list the main parties that are part of this process.

- Ministry of Natural Resources and Tourism
- National Environment Management Council (NEMC)
- Ministry of Housing, Land and Human Settlement Development
- Ministry of Livestock and Fisheries
- Marine Parks and Reserve Unit (MPRU)
- District Authorities/Town Authorities
- Villages Authorities/Villages Leaders

9.3.2 Project Proponent

The project proponent is TANESCO, which is responsible for planning and project development. The proponent shall guide the implementation of the Environmental and Social Management measures during construction and operation phases.

9.3.3 Consultant

The Project Consultant is represented by an association of international engineering firms (CESI S.p.A. in Partnership with ELC Electroconsult S.p.A. and Colenco Consulting Ltd.) with the scope to assist and support the proponent in all relevant fields for the design of the Transmission Line including ESIA Studies.

9.3.4 Contractors

The Project Contractors will be selected through competitive bidding. They will be responsible to apply all the environmental mitigation measures are described in the ESIA.

9.4 Disadvantaged / Vulnerable Individuals or Groups

Vulnerable people are distinct groups of people who might suffer more or face the risk of being further marginalized due to the project and specifically include: i) households that are headed by women, ii) household heads with disabilities, iii) households falling under the regional poverty line, and iv) elderly household heads. These specific groups will be reached during the consultation phase through the selection of representatives who can take the role of spokesperson and facilitators. In order for vulnerable groups to participate in project activities, they need to be invited to consultation activities with appropriate assistance according to the actual needs.

9.5 Stakeholder Engagement Program

9.5.1 Consultation Program

Three rounds of consultations have been conducted. The first round involves meetings with key institutional stakeholders to understand the level of protection of natural areas and future planning and development in the areas crossed by the project. These collective meetings for each country are designed to share information, gather comments, and facilitate interaction among stakeholders. It is crucial to clarify with regulatory institutions the project design steps and the parties to be notified and consulted during the process.

Based on the outcomes of the inception phase and the first round of consultations, the Consultant has undertaken the second round of consultations with authorities, community leaders, and main communities during the interim phase of the project. This second round, implemented during baseline data collection, aimed to gather data and share design options to get feedback from local institutions and the community. This phase was vital to ensure the viability of the design at the local level. Community-level consultations included Key Informant Interviews and focus group discussions, with dedicated meetings organized for women.

During the RAP study, the project team conducted the third round of consultations. Meetings with local communities and stakeholders along the transmission corridor were held to gather information on resettlement, socio-economic conditions, and grievance mechanisms. Local government officials were involved to support the process.

The minutes of consultation meetings and signatures of participants are presented in Annex 7 (first round), Annex 8 (second round), and Annex 9 (third round).

Table 9- 2 – Rounds of consultations

1st ROUND	Time	Method	Topic
• National Environment Management Council • Ministry of Housing, Land and Human Settlement Development • Marine Parks and Reserve Unit (MPRU)	During the inception mission and interim phase	Meeting	Project scope of work presentation, clarification of permits, protected areas regulations and stakeholders to be involved

2nd ROUND	Time	Method	Topic
Tanga Affected Wards: Mzingani Mabawa Duga Mwanzange Nguvumali	During Interim phase	Information Sheet	The line in Tanga will be underground cable and it will be constructed within the existing ring road right of way, the main impact will be in terms of disturbance during constructions
Villages Authorities in proximity of landing points	During Interim phase	Meeting	Share of the possible project components footprints and collection of feedback
Communities living or having activities in the proximity of the landing points and along the new underground cable	During Interim phase	KII and FGD	Share of the possible project components footprints and collection of feedback and understand the fishing and other livelihood activities linked to the use of natural resources
Women living or having livelihood activities in the proximity of the landing points and along the new underground cable	During Interim phase	KII and FGD	Share of the possible project components footprints and collection of feedback and understand the role of women in the use of natural resources

3rd ROUND	Time	Method	Topic
Tanga City Council	During RAP study	Meeting	To introduce the project and establish key areas of concern, and possible areas of cooperation with local government during RAP activities.
Wards offices (Nguvumali and others)	During RAP study	Meeting	Introducing project and seeking for assistance during field works by helping in identifying individual PAPs along the project area
Affected PAPs within Mitaa	During RAP study	Meeting	To ensure their participation and cooperation during valuation activities and collection of social economic baseline
TANROADS	During RAP study	Meeting	Introducing the project and identifying the possible highway and its infrastructure to be affected during project implementation
TARURA	During RAP study	Meeting	Introducing the project and identifying their roads networks to be crossed by underground power

3rd ROUND	Time	Method	Topic
TTCL	During RAP study	Meeting	Introducing the project and identifying their underground telecommunication fibers along the project area
TANGA-UWASA	During RAP study	Meeting	Introducing the project and identifying their underground supply and transmission water networks along the project area
NGO (BRAC MAENDELEO and TAYOTA)	During RAP study	Meeting	Introducing the project and identifying how they could collaborate with TANESCO and local community during RAP implementation such as in handling GBV issues

9.5.2 Summary of the first round of consultations

On April 23rd, 2024, on the occasion of the inception phase workshop held in Zanzibar, the Consultant and Project Developers conducted the first round of consultations with institutional stakeholders. The meeting was followed by the National television which broadcasted part of the event.

Following the workshop, the Consultant held meetings with other key institutional stakeholders on the Tanzania mainland. The consultation aimed to inform the decision-makers about the project's scope of work, the project design process, and the methods for the Environmental and Social Impact Assessment study. Potential critical issues were described to gain feedback from stakeholders and an understanding of the work context, which was essential for planning the field surveys and design.

The stakeholders responded positively and made themselves available for field inspection during the survey phases.

Each stakeholder expressed views and concerns about the project giving suggestions for the planning phase, the details are reported in the minutes of meetings included in Annex 7. Main concerns referred to: presence of mangroves, future touristic infrastructure on the coastal area, turtles, presence of seasonal fishermen activities on shores and the relevant implications in terms of livelihoods and health and safety. The team discussed the survey method and approval process of ESIA, along with the inspection visit. The team clarified also the boundary of reserve areas on the shores both in Zanzibar and Tanzania.

Table 9- 3 – List of the first round of consultations

TOPICS	PARTICIPANTS	DATE	MOM
Project scope of work presentation, clarification of permits, protected areas regulations and stakeholders to be involved	Marine Parks and Reserve Unit (MPRU)	April 29, 2024	MOM_TZ_01
Project scope of work presentation, clarification of land acquisition for cables and buffer zones in the landing points	Ministry of Housing, Land and Human Settlement Development (Land Commission in Dar es Salaam)	April 29, 2024	MOM_TZ_02
Project scope of work presentation, clarification of permits, protected areas regulations	National Environment Management Council (NEMC)	June 12, 2024	MOM_TZ_03

Figure 9- 1 – Meeting at the Land Commission in Tanzania

Figure 9- 2 – Meeting at Marine Park Reserve Unit in Tanzania

Figure 9- 3 – Random Interviews

Figure 9- 4 – Random Interviews

9.5.3 Summary of the second round of consultations

The 2nd ROUND has been implemented during the baseline data collection, it was finalized to gather data and share the design options to get feedbacks from the local institutions and community. This phase was important to assure the viability of the design at local level. The consultation at community level was under the form of Key Informant Interviews and focus group discussion. Dedicated meetings were organized for women.

From June 3rd to 8th, 2024, on the occasion of the environmental survey conducted in Tanga and Pemba Island, the Consultant and Project Developers held the second round of consultations with the affected wards and village authorities near the landing points. A series of Key Informant Interviews and Focus Group Discussions were held with the communities living or conducting activities near the landing points and along the new underground cable route.

The consultation aimed to share information about the possible project components and their footprints, collect feedback, understand fishing and other livelihood activities linked to the use of natural resources, and inform the affected wards about the main impacts expected during construction, particularly in terms of disturbances.

The views and concerns have been considered for the design and in the mitigation measures. For example, the cable route in Pemba was moved to avoid the mangrove forest. Beach Management Unit was included in the SEP as one of the stakeholders to be consulted before the construction, as per suggestions of the fishermen.

The fishermen suggested to coordinate with Beach Management Unit and Ministry of Livestock and Fisheries before the marine cable laydown operations in order to avoid conflicts with seasonal fishing. This became a provision in the ESMP.

Table 9- 4 – List of the second round of consultations

	STAKEHOLDERS	TOPICS OF DISCUSSION	PARTICIPANTS	DATE	MOM
1	Communities living or having activities in the proximity of the landing points and along the new underground cable	Share of the possible project components footprints and collection of feedback and understand the fishing and other livelihood activities linked to the use of natural resources	7 M	June 8, 2024	MOM_TN_01
2	Women living or having livelihood activities in the proximity of the landing points and along the new underground cable	Share of the possible project components footprints and collection of feedback and understand the role of women in the use of natural resources	5 F	June 8, 2024	MOM_TN_01

As reported in Table 9- 4, On 8th June, the ELC team met with the fishermen who use the beach at the proposed Tanga landing point. Some of the fishermen come from Tanga, while others come from Pemba. They expressed no concerns about how the beach will be managed during project construction. The same day the team interviewed women who sell food and beverages (fish, bananas, fruit juice) near the beach at the proposed Tanga landing point. The women expressed optimism about the project, believing it will boost the economy and increase their sales. However, they voiced concerns that the influx of people from different countries could lead to cultural contamination.

Figure 9- 5 – Key Informal Interview with the fishermen (on the left) and women (on the right) at Tanga landing point

9.5.4 Summary of the third round of consultations

In July 2024, during the RAP study, the Consultant and Project Developer held the third round of consultations. These consultations were conducted mainly through community meetings with members living within and near the project area. Some information was disclosed before and during socio-economic surveys.

Upon conducting a reconnaissance survey along the entire corridor, the physical and social characteristics of the transmission corridor were established. Settlements and their corresponding local leadership were identified. TANESCO issued letters of introduction to all local leadership and district authorities.

During the RAP exercise, local government leaders, such as Ward, Village/Mtaa leaders, were consulted first to introduce the project and the RAP exercise staff, including surveyors, valuers, and the social team. Before engaging the communities, local leaders were informed and requested to join the teams during the sensitization process, and they assisted in taking the minutes of the meetings.

The table below shows the dates, villages, and the number of stakeholders who attended the meetings. A comprehensive list of project stakeholders consulted and the minutes of consultation are presented as a separate report in volume 2. Consultations were carried out in all districts where our proposed Distribution Line project passes and the proposed substation areas. The main purposes were:

- To gain insight into how resettlement and land acquisition issues are handled in such projects.
- To obtain a fair understanding of the socio-economic baseline indicators of the project areas.
- To establish how grievances have been handled in past project implementations and ascertain if there is sufficient capacity to handle social safeguards at the district level.

Emphasis was placed on a fully inclusive, open, and transparent stakeholder participation process in the transfer of information on the proposed Transmission Line. Stakeholders' meetings were held from 23rd July 2024 to 26th July 2024 at respective district, municipal, and village offices that were sampled.

During the public forums, the public was not only shown the location of the project area using maps but were also informed of the expected benefits and impacts in terms of land acquisition and the mitigation measures for compensation for the loss of their land and other benefits from the project area, including physical cultural resources. They were also informed of the arrangements to address any grievances that might arise and their opportunity to influence and identify appropriate benefits.

Table 9- 5 – List of the third round of consultations

Date	Stakeholders	Number of Participant		Purpose of involvement
		Male	Female	
23.07.2024	Tanga City Council	2	2	To introduce the project and establish key areas of concern, and possible areas of cooperation with local government during RAP activities.
23.07.2024	Wards offices; (Nguvumali and others)	2	11	Introducing project and seeking for assistance during field works by helping in identifying individual PAPs along the project area
24.07.2024	Affected PAPs within Mitaa	25	24	To ensure their participation and cooperation during valuation activities and collection of social economic baseline
24.07.2024	TANROADS	2	0	Introducing the project and identifying the possible highway and its infrastructure to be affected during project implementation
24.07.2024	TARURA	2	0	Introducing the project and identifying their roads networks to be crossed by underground power
24.07.2024	TTCL	3	0	Introducing the project and identifying their underground telecommunication fibers along the project area
25.07.2024	TANGA-UWASA	3	0	Introducing the project and identifying their underground supply and transmission water networks along the project area
26.07.2024	NGO (BRAC MAENDELEO and TAYOTA)	0	2	Introducing the project and identifying how they could collaborate with TANESCO and local community during RAP implementation such as in handling GBV issues
Total		**39**	**39**	


Figure 9- 6 – Photos taken during the stakeholder meeting

9.5.5 Main views and concerns of stakeholders

A summary of the different views and issues raised by stakeholders is presented below.

- PAPs in Tanga expressed concerns about the timeliness and equity of compensation for their land and properties. They demanded that compensation should be fair and follow government regulations.
- Local employment opportunities were a priority for PAPs in Tanga. They sought assurances from TANESCO and the contractor that local residents would be given preference for available jobs, especially those requiring minimal skills.
- Recognizing the potential challenges of managing large sums of compensation, stakeholders in Tanga requested education and sensitization programs to help PAPs effectively utilize their funds. This would not only benefit the individuals but also contribute to minimizing family conflicts.

Overall, the stakeholders' views and concerns across the different locations were consistent in their focus on fair compensation, local employment opportunities, and support for affected communities. The responses from TANESCO and other relevant agencies indicated a commitment to addressing these concerns and ensuring a positive outcome for all stakeholders involved.

9.5.6 Information Disclosure Program

The EIA regulation states that any project brief, environmental impact statement, Terms of Reference, public comments, report of a person presiding at a public hearing, environmental impact assessment statement, decision letter or any other information submitted to NEMC is public document and anyone may have access under conditions that NEMC may consider appropriate.

The EIA regulations recommend a number of ways through which the proponent can share information to the public. These include putting up posters in strategic public places near the proposed project;

publishing a notice in newspaper with nationwide circulation; making announcement in radios with nationwide coverage in both Swahili and English and holding public meetings where it is appropriate.

For disclosure purposes, the ESIA report will be published on the TANESCO website and through NEMC channels. Additionally, a non-technical summary has been prepared in English and Swahili (see Annex 9) for distribution at district, ward, and village offices. Hard copies will also be made available to local communities. Details of the ESIA information disclosure program are provided in Table 9- 6.

Approval of EIA report is necessary to obtain an EIA Certificate. NEMC prepares terms and conditions for issuance of the EIA Certificate and recommends to the Minister responsible for Environment in the Vice President's office. The Minister in turn approves the projects by signing the EIA Certificates, as stipulate in EMA 2004 section 92 (1). [54] The EIA regulations require that the decisions by the minister be made public. A copy of the decision document is supposed to be availed for inspection by the general public at NEMC offices. [55]

Table 9- 6 – ESIA Information Disclosure Program

ESIA Disclosure Process	Method	Stakeholder	Time	Implementing Agency
Disclosure of Approved ESIA and ESMP by NEMC	TANESCO Website	General Public	August 30, 2024	TANESCO
Disclosure of Approved ESIA and ESMP by NEMC	NEMC Channels	General Public	August 12, 2024	NEMC
Disclosure of ESIA non-technical summary	Districts, wards, and villages offices District, ward, and village offices	General Public	November 30, 2024	TANESCO

[54] Walmsley, B & Patel, S, 2011. Handbook on environmental assessment legislation in the SADC region. 3rd edition. Pretoria: Development Bank of Southern Africa (DBSA) in collaboration with the Southern African Institute for Environmental Assessment (SAIEA). NEMC website: http://www.nemc.or.tz/

[55] EIA and Audit Regulations 2005 (Amended 2018), article 32-(2)

10 GRIEVANCE REDRESS MECHANISM

This subsection describes the GRM that TANESCO will put in place for all the activities under the Employer's responsibility. At the same time the Contractors will have their own GRM in place for what concerns Contractor's human resources and any damage caused to the surrounding communities and properties throughout all Project phases, as defined in the Bidding Documents.

The main objectives of GRM are:

- Provide a clear, accessible, and transparent process for individuals and communities to raise their grievances related to resettlement activities.
- Address grievances at the earliest possible stage to prevent escalation into more serious conflicts or legal disputes.
- Provide amicable way to resolve disputes without resorting to legal action.
- Use feedback from grievances to identify and address issues in project implementation, ensuring that resettlement activities are conducted in a socially responsible manner.

10.1 GRM Principles

The complaints related to any aspect of the land acquisition process and environmental and social damages occurred during the project will be handled through fair negotiations in order to reach an acceptable resolution. All complaints will be documented and kept with TANESCO and ZECO. The project authority will ensure that funds are delivered on time to the implementing partners for timely payment of compensation and preparation and implementation of social activities, as applicable. The compensation issues and rehabilitation measures will be completed before beginning of major construction works. The PAPs/AHs and community will be exempted from all administrative fees incurred, pursuant to the grievance redress procedures except for cases filed in court.

The grievance redress mechanism recommended to manage project impacts related issues is described below.

10.2 GRM Procedure

Receive and Recording – Grievances will be received by the Committee. The grievances can be filed through grievances offices directly or by phone. A dedicated channel for GBV grievances will be set through the appointment of one grievances officer with experience in gender. They shall be captured in a logbook, classified, and reported to the Committee. The complainant shall receive an acknowledgment of receipt of the grievance within a prescribed and reasonable timeframe, preferably in writing. Keeping a record of those who lodged grievances helps to know who and where the vulnerable and most affected persons by project activities are. Therefore, data such as gender, age and location are also recorded, which assists in understanding the grievances better. Most importantly, the project shall recognize that those who register grievances must be protected and, therefore, handles grievances with the highest level of confidentiality; complainants are free to remain anonymous and should feel free to give as little personal information as they wish. While there is no formal minimum requirement for submitting a grievance, to enable effective review and management, the project prefers that any stakeholder who submits a complaint to include the following information:

- Name(s) of the complainant(s);
- Information on whether the identity of the complainant should be kept confidential or can be disclosed to relevant individuals/structures during the investigation process;
- Contact details (geographical location, telephone number, e-mail...);

Even without individual or personal detail, the Project will follow up and solve each grievance.

Categorize grievances – Having received and registered a complaint, the next step is to establish the eligibility of the complaint. The following criteria should be used to assess and verify eligibility:

- The issue falls within the scope of the GRM
- The complainant is anonymous or identifiable with a name and contact details provided
- The complainant is affected the project
- The grievance is clear
- The complaint has a direct relationship to the project or activity; and
- All the mandatory preliminary information is available.

The purpose of this step is to ensure that the issue being raised is relevant to the project. If the grievance is not eligible, the complainant will immediately be given the reasons. On the other hand, a decision on eligibility is only meant to trigger an initial assessment and response. It is not an admission that the organization has caused an impact, or a commitment to provide the complainant with any specific form of redress. The assessment at this step will also enhance decision-making as to whether the complaint should be directed to a different entity.

As a result of the assessment, the grievance will be assigned to one of the four categories:

CATEGORY 0: Complaints that are not related to the project;

CATEGORY 1: Queries, comments, and suggestions;

CATEGORY 2: Complaints and concerns, which are not criminal in nature or do not require the involvement of police. Concerns and complaints about land acquisition or livelihood restoration, environmental damages, nuisance impacts such as noise or dust, waste management, risks to public safety.

CATEGORY 3: Complaints and concerns that involve allegations that require investigation or intervention by the police or other law enforcement authorities. Any grievance which involves loss of life, child abuse, rape, defilement, child sacrifice, sexual harassment or any violence against children.

If the grievances fall under categories 1, 2 or 3 they can be further classified:

SURVEY GRIEVANCES: Grievances may arise at the design stage, such as where some communities feel they were not offered enough information about the objectives of the exercise. In such situations, the TANESCO shall be notified to prepare an appropriate response.

ENVIRONMENTAL AND SOCIAL GRIEVANCES – ES-related grievances may arise at any stage of the project management cycle as a result of inadequate consultation, sensitization, and or disruption of social setups by migrant workers or environmental damages. There are also situations when social grievances arise out of unrealistic expectations. When these kinds of impacts arise, the project related experts shall be notified to assess the grievance and take appropriate remedial measures.

RESETTLEMENT GRIEVANCES: Resettlement, Land Acquisition, and Compensation Related Grievances. The grievances are mainly caused by inadequate consultation and sensitization; delayed release of compensation packages or delayed return of land titles to Project Affected Persons. The process involves a lot of interaction with people during the implementation of (a) RAP implementation, the (b) land and asset inventories, (c) land valuations and verifications, (d) disbursement and during a final land take.

Review and Investigate – In this phase, the grievances will be classified into basic categories.

In general, Category 0 grievances will involve verification that the stakeholder is satisfied with the response. If the grievance involves another project or an institutional issue, the complainant should be referred there accordingly. Category 1 grievances will involve confirming receipt of the positive feedback and informing the relevant technical staff within TANESCO. Regarding category 2 grievances, verification, investigation, negotiation, mediation or arbitration, coordination with appropriate authorities, making decisions, proposing resolutions, as well as the implementation of agreed actions, will involve a thorough assessment and getting back to the complainant for more information in case it is required. A grievance which falls in category 3 shall be logged and escalated to police without any delay. If grievances include more than one issue, the Grievance Officer will make sure that all issues are reviewed and addressed at the same time to avoid any delays.

To ensure the investigation is fair, trackable and thorough each step and agreed action shall be documented with related evidence

Develop Resolution and Respond – A range of proposed resolutions will be recommended based on the investigation result. The proposed resolution shall be agreed and accepted by both parties (the Project and also the complainant). The project will follow the steps of the grievance's resolution. Hence, following the above principle the Grievance Redress Mechanism (GRM) will be established to allow project affected persons/households (PAPs/AHs) to appeal any disagreeable decisions, practices and activities arising from compensation for land and assets. The PAPs/AHs will be made fully aware of their rights and the procedures. The PAPs/AHs will have access to both locally constructed grievances redress committees specified and formal courts of appeal system. Under the latter system every PAP/AH can appeal to the court if they feel that they are not compensated appropriately.

The process of developing resolution and response is articulated in three steps and it is furtherly adapted to the mechanism in place in each Country, in particular for what concerns resettlement issues.

Close Out and Reporting - If the solution is not accepted by the complainant, the Project will conduct further consultation with the complainant to obtain more detailed clarification on the issues with the aim of agreeing upon a mutual solution. Should the complainants agree and accept the provided resolution, the Project will record the agreement in a Grievance Resolution Minutes Form and update the Grievance Log. All documentation will be stored in one central place for easy management. The fulfilment of agreements, satisfaction of complainants, and number of complaints received shall be monitored over the land acquisition process as this data will be required as part of the external monitoring for the lenders.

10.3 Notification to the complainant

Following the logging of the complaint, depending on the complexity of the complaint, the PAP(s) will be notified receipt of the complaints within 7 working days of the course of action to his/her complaints to her/him by phone, letter or acknowledgement form. For the complaints that need investigations as categorized above, the PAPs will be notified of the outcome of the investigation, within thirty (30) days of receipt of the grievance at RCMU. Feedbacks will be provided in writing from the respective Grievance Resolution Levels using special designed feedback/response notification form.

10.4 Monitoring and Evaluation

The Social safeguard expert (and the TANESCO/ZECO representative in each committee) will be responsible to oversee the implementation and effectiveness of GRM with regard to the following key performance indicators:

- Number of grievances (aggregated by type, location, aggrieved party e.g., vulnerable or not and gender) reported through the GRM system every month;

- Percentage of grievances acknowledged/responded to within the timeframe set out in the GRM;
- Number of hearing of grievances (aggregated by type and gender) within the timeframe set out in the GRM;
- Number of grievances (aggregated by type and gender) escalated to the next level GRC and within the timeframe set out in the GRM;
- Percentage of grievances resolved within the timeframe set out in the GRM;
- Evidence that all long-standing outstanding grievances (e.g., open for more than 3 months) are being addressed and closed thus within control;
- Evidence that grievance records include grievances from diverse stakeholder groups (e.g., directly and indirect PAPs, PAPs representatives, institutions/organizations, displaced and or vulnerable groups);
- Evidence that PAPs are informed about the outcome of the reported grievances according to the timeframe set out in the GRM; and
- Results of the functioning of the GRM should show that PAP groups are aware of and able to access/use the GRM system as required by international standards.

Data, correspondences and corrective actions will be archived and record keeping. Reports from the grievance database including resolution and feedback will be used for discussing the effectiveness of the GRM system as well as any common or recurrent issues that may indicate the need for structural changes in project activities as well as on the GRM system. GRM results will be reported back to the community as well as any changes made to the GRM process via village meetings.

10.5 Respect and Confidentiality Policy

Recording a complaint can be a difficult or impossible process if a person is afraid of being punished for his or her act, by members of the RCMU, PIU, VGRC, DGRC, or other interested parties. In addition, many PAPs may not wish to publicize the fact that they have filed a complaint. To address these concerns, the RCMU will have a policy of respect and confidentiality clearly publicized to all parties that will be integrated in the PIU staff and Committees training program. This policy will stipulate that; any person filing a grievance will be treated with respect by the staff of the RCMU, PIU and the Committees; the information relating to the complaint and the complainant is confidential and will not be disseminated in the community; no retaliation by anyone towards the complainant is acceptable in the eyes of the PIU and TANESCO and that it undertakes to remedy them to the extent of their means.

10.6 GRM Structures in Tanzania

This subsection describes the GRM that TANESCO will put in place for all the activities under the Employer's responsibility. This GRM is in place for RAP related activities, for what concerns environmental grievances the GRM principle will apply.

As stated in the first paragraph at the same time the Contractors will have their own GRM in place for what concerns Contractor's human resources and any damage caused to the surrounding communities and properties throughout all Project phases, as defined in the Bidding Documents.

A simple Grievance Redress Mechanism (GRM) has been proposed to enable timely settlement of grievances to the PAPs. The grievance procedures will be secured and administered at the local level to facilitate access, flexibility and openness to all PAPs.

PAP is encouraged to submit the complaint through the village GRC channel. However, other channels cannot be denied access. TANESCO would like to solve the grievance before it goes to the court system to avoid lengthy process that can affect the project.

The complaints related to any aspect of the land acquisition process will be handled through fair negotiations in order to reach an acceptable resolution. All complaints will be documented and kept with TANESCO. The Director of Finance (TANESCO) will make sure to provide funds to project implementing team for timely payment of compensation and preparation and implementation of social activities, as applicable. The compensation issues and restoration measures will be completed before beginning of major construction works. The PAPs/AHs and community will be exempted from all administrative fees incurred, pursuant to the grievance redress procedures except for cases filed in court

- ***Stage 1: Village level: Village Grievance Redress Committee (VGRC)***

There will be a Village Grievance Redress Committee, which comprises of the following members.

i. Village Chairperson
ii. Village Executive Officer
iii. Representatives of PAPs democratically elected by PAPs (Males)
iv. Representatives of PAPs democratically elected by PAPs (females)
v. TANESCO representative
vi. Representative from vulnerable group (invited depending on the case)
vii. Sub-village (Kitongoji) leader (invited depending on the case)

The Village Committee will receive the grievance/dispute (written or verbal), sort the grievances, investigate and advise the best solution by checking the fact. If the case is not resolved the case will be referred to RCMU. This committee will deal with boundary disputes, identification of rightful owners and disputes among family members, among others. However, if aggrieved PAP fails to agree with the committee, the grievance is escalated to the next level. The grievance resolution committee members shall undergo a capacity building about their roles and requirements at early stage before commencement of RAP implementation activities.

The village grievance, resettlement and compensation committee will be the first level to report a grievance, particularly as there is a degree of familiarity in people with such forums. These avenues can be utilized to formally or informally address grievance resolution for:

- wrongly recorded personal or community details;
- wrongly recorded assets including land details and/or affected acreage;
- Change of recipient due to recent death or disability
- Recent change of asset ownership
- Wrong computation of compensation
- Names missed out of register
- Disputes among relatives and neighbours over the land boundaries and ownership.

PAPs will be informed and advised to lodge their complaints, if any to this committee before forwarding them to higher level.

- ***Stage 2: TANESCO RCMU***

It is expected that most of the cases will be solved at village level. However, it is expected some cases will need TANESCO intervention directly. Hence, the VGRC may elevate to TANESCO RCMU for further action specific issues that need TANESCO including those on non-payment of compensation, need for re-evaluation of affected property etc.

- ***Stage 3: District Grievance Redress Committee (DGRC)***

The District level GRC will receive only complicated issues from TANESCO. Most of these cases will be complex cases that needs political decisions, or technical solutions that needs the intervention of District Executive Officer (DED) or District Commissioner. The District Grievance Resolution Committee will comprise of the following members.

i. District Commissioner
ii. District Executive Director
iii. District Land Officer
iv. District Valuer
v. TANESCO Representative(s)
vi. Chairperson/Village Executive Officer from the village where the dispute originates
vii. PAP Representative(s) (male and female)

The DGRC will be convened only when they receive referred cases for which TANESCO will facilitate the meeting of the DGRC. Again, if the PAP does not agree with the recommendation of the DGRC, the PAP may be allowed to escalate the matter to the court of law.

- ***Stage 4: Courts of Law***

The court of law is the only body that has been vested with the authority to provide an impartial resolution of legal disputes and to protect individual's right. Tanzanian legislation allows a right of access to the courts of law by any person who has an interest or right over property. If any person believes that TANESCO, VGRC or DGRC has decided or treated him/her unfairly, the court of law is open and the PAP is allowed to seek legal redress in courts of law as a last resort.

- *Court of law jurisdiction*

As court procedure.

- *Land Tribunals*

Tanzania has land tribunals at village (Village Land Council), ward (Ward Land Tribunal) and district levels (District Land and Housing Tribunal). The primary function of the tribunal is to secure peace and harmony in their area of jurisdiction by mediating and endeavoring to obtain just and amicable settlement of disputes, in this case land disputes. Therefore, the aggrieved PAP(s) may use this channel to get the dispute resolved. The tribunals start at the village level and again ends in the court of law. The PAP if does not believe to get justice in VGRC or TANESCO system, the PAP can proceed with the channel of Village Land Council with option of appeals up to the court of law.

The TANESCO RCMU will ensure the Project grievance mechanism:

i. Is understood by stakeholders;
ii. Is easily accessible, including special measures for vulnerable persons;
iii. Is culturally and locally appropriate;
iv. Is considered fair by stakeholders;
v. Is cost free;
vi. Is restitution free;
vii. Is timely in addressing impacts and feeding back to complainants;
viii. Is able to track and record grievances for immediate and future reference;
ix. That all complainants are treated with respect and do not incur retaliation because of their complaint;
x. Takes account of and does not delay access to judicial or administrative remedies.

This grievance procedure will not replace existing legal processes in Tanzania but rather it will seek to resolve issues quickly to accelerate receipt of entitlements and smooth resettlement without resorting to expensive and time-consuming legal processes.

10.7 AfDB Grievance and redress mechanism

The grievance and redress system at the AfDB comprises public access to the process through:

10.7.1 The Bank country office, or Project team

The country/project-level team has a responsibility for receiving and responding to requests for redress. However, they advocate of PAPs to first utilize the local project level mechanism outlined above.

10.7.2 The Compliance Review and Mediation Unit (CRMU) which administers the Independent Review/Recourse Mechanism.

While the CRMU, provides a corporate window for receiving requests for dispute resolution and mediation process.

The mandate of the Bank's Independent Review Mechanism (IRM) is to provide people who are, or are likely to be, adversely affected by a project financed by the Bank Group as a result of violation of the Bank Group's policies and procedures with an avenue to request the Bank to comply with its own policies and procedures. The requestors first seek to resolve their complaints with Bank Management; but if in their opinion, Bank Management has not adequately handled their complaints, they may submit their requests to IRM.

The IRM is an independent accountability instrument established by the Boards of Directors of the AfDB to provide people adversely affected by Bank-financed operations with an independent complaints mechanism through which they can seek redress and hold the bank to account to respect its policies and procedures related to sustainability.

The Independent Review Mechanism (IRM) administered by Compliance Review and Mediation Unit (BCRM)) provides people adversely affected by projects financed by the African Development Bank Group (AfDB) with an independent mechanism through which they can request the Bank Group to comply with its own policies and procedures.

For recourse, BCRM receives requests presented by two or more persons (such as community of persons, an organization, association, society, or other grouping of individuals) and/or by a qualified representative of the affected persons who demonstrate that their rights or interests have been or are likely to be adversely affected by the non-compliance of the relevant Bank Group policies. The requestor(s) and any other interested persons may ask that their identities be kept confidential, and if so, the reasons for such confidentiality.

Requests must be sent to the Director of the Compliance Review and Mediation Unit (BCRM), African Development Bank Group (AfDB) Compliance Review and Mediation Unit (CRMU) – AfDB BP 1387 Abidjan 01, Cote d'Ivoire Immeuble du Centre de Commerce International d'Abidjan (CCIA) - Avenue Jean Paul II |, 14th Floor BCRM_info@afdb.org Tel: +225 27 20 26 20 56 (CRMU Front Office).

The IRM comprises two separates, but related, phases:

- A grievance or problem-solving phase, led by the CRMU reporting directly to the Bank President, to assist project-affected people in finding solutions to their problems; and
- A compliance review phase, led by a three-member panel drawn from the IRM roster of experts.

- **Problem-Solving (mediation)**

In a request for problem-solving, BCRM will restore an effective dialogue between the requestors and any interested persons with an aim to resolving underlying issues without seeking to attribute blame or fault to any such party.

- **Compliance Review (investigation)**

The compliance review function is handled by the IRM Roster of Experts appointed by the Board of Directors. The Experts together with the Director of BCRM determine eligibility of request(s) for compliance review, and submit their eligibility report, recommending whether or not to undertake the compliance review, to the Board of Directors or to the President, as the case may be for project's status of approval.

The purpose of a Compliance Review is to examine whether the Bank Group has complied with its policies and procedures applicable to the concerned project/operation and, in cases of non-compliance, whether such non-compliance has caused or may cause harm to the Complainants and/or the environment.

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The purpose of the Environmental and Social Management Plan (ESMP) is to identify and describe in detail the mitigation measures that must be taken to minimize the environmental and social impacts of a project.

Most of the impacts that occur during the construction phase can be reduced or avoided through the application of sound construction management guidelines. However, some impacts will be permanent and cannot be mitigated. In these cases, compensation or enhancement activities will be implemented. Enhancement is an important part of the overall management plan, as it is used to improve existing environmental conditions, prevent potential future environmental degradation not directly related to the project, and serve as a component of compensatory measures.

For each of the potential environmental and social impacts, measures are suggested to either prevent those impacts or mitigate their effects. This chapter presents, at a preliminary level, the various preventive and/or mitigation measures that will be proposed for different types of impacts and identifies the responsible agencies.

As with the description of the impacts, the environmental measures are presented here in two parts:

- Pre-construction and construction of project facilities
- Operation of the interconnection project

This Environmental and Social Management Plan (ESMP) further acts as a framework for the Contractor to develop its mitigation and management plans. TANESCO and the Contractor will be required to develop standalone mitigation and monitoring plans, implementing the requirements contained within this document as a minimum, according to the responsibilities specified in the subplans.

TANESCO will have overall responsibility for compliance during the construction and operation phases and for implementing the mitigation measures outlined in the ESMP.

TANESCO will ensure that the agreements legally oblige the Contractor to comply with this ESMP using the Good International Industry Practices (GIIP) and enforcing the principle that the stricter of national and international standards applies.

TANESCO will monitor the performance of the Contractor and all subcontractors on a regular basis and will undertake the following throughout the construction period:

- Review the effectiveness and comprehensiveness of the Contractor's documents (e.g., associated sub-management plans, procedures, and mechanisms for reporting, record keeping, and auditing) against the requirements of this ESMP;
- Undertake regular audits;
- Set up a contractor reporting structure; and
- Conduct meetings at a sufficient frequency to ensure E&S is a priority agenda item.

Mitigation measures described for the operational phase will be implemented by TANESCO.

The Environmental and Social Management Plan (ESMP) will be updated and revised for both construction and operation phases to adapt the measures to prevailing conditions and/or additional monitored impacts during the construction period. Additionally, to strictly prevent and reduce the impacts or mitigate their effects, the Contractor's Environmental Management Plan (Contractor's EMP) shall be developed, incorporating both the Environmental and Social Management and Monitoring Plan and the Site Specific Environmental and Social Management and Monitoring Plan, to comply with AfDB's guidelines and requirements.

The details of these plans shall be presented in terms of:

- Reporting requirements;
- Emergency response procedures;
- Capacity development and training measures;
- Performance indicators to check the effectiveness of the mitigation and management actions considered;
- Residual impacts analysis and provision of relevant compensatory measures (including monetary terms).

The monitoring measures shall include parameters, methods, and sampling locations for the project's environmental aspects.

11.1 Mitigation Hierarchy Approach

The identified environmental and social impacts will be mitigated according to the mitigation hierarchy, which consists of five steps:

- Avoid
- Minimize
- Rectify
- Reduce
- Offset

The hierarchy begins with the most beneficial method of mitigation and progresses to the least beneficial method of mitigation (see Figure 11- 1).

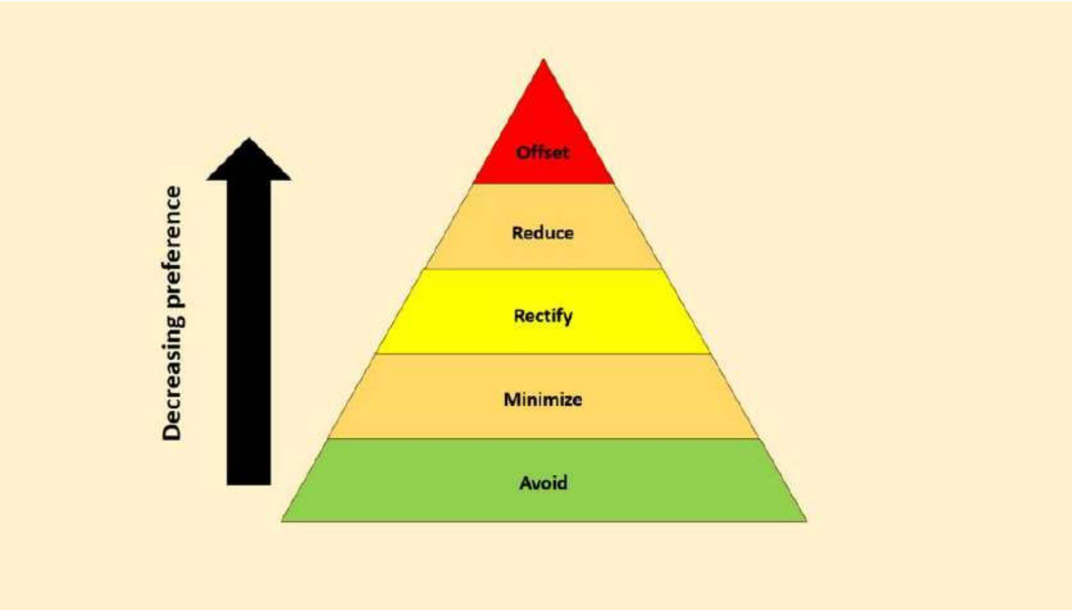

Figure 11- 1 – Mitigation Hierarchy

Avoidance is the first step in the mitigation hierarchy. It involves completely mitigating an impact by preventing it from happening, making it the most preferred form of mitigation because it ensures no environmental damage. One of the goals of the analysis of alternatives, described in the third paragraph, is to avoid as many impacts as possible by selecting the least impactful line route. Avoidance of impacts was furtherly considered in the ESIA analysis by attempting to avoid the most significant impacts through fine-tuning the location of the landing points.

The second step in this hierarchy is to **minimize**. If the impact cannot be completely avoided, it should be minimized to ensure that minimal damage is done to the environment. This is also one of the objectives of the line route selection phase. For instance, if the line cannot avoid crossing a forested area, the line route selection phase allows for choosing a route that crosses the least forested area or one with lower ecological values.

Thirdly, **rectify** involves managing an impact that has occurred and can only be addressed through enhancement, restoration, or revegetation of degraded or former habitat, etc. In essence, rectify aims to correct the mistake that led to the adverse environmental impact. This mitigation strategy is typically applicable during the construction stage and will be detailed in the ESMP.

If rectification is not feasible, the next mitigation strategy involves reducing the extent of the impact through management practices or changes. These measures will also be detailed in the ESMP.

When reduction is not possible, the final step of the mitigation hierarchy is environmental **offset**. Environmental offset typically involves actions taken outside the development site to compensate for impacts within the site. This approach is aimed at achieving “no net environmental loss” or specifically “no net biodiversity loss”. Such mitigation strategies will be considered if the previous steps do not achieve the targets for “no net biodiversity losses”. They will be described in the ESIA and implemented during the construction phase.

11.2 Implementation responsibilities

TANESCO will be responsible overall for implementing the ESMP. They will hire the necessary experts and staff to develop the proposed plans in the ESMP through consultative processes with relevant stakeholders. Each plan, program or measure will be disclosed to stakeholders, and agreements will be made with them to ensure implementation viability. The ESMP is designed to be adaptable to changes that may arise in the project area, policy and regulatory frameworks, as well as stakeholder concerns and perspectives.

A Project Implementation Unit (PIU) within the project structure will actively liaise with concerned stakeholders and Tanzanian governmental agency to assure smooth implementation of the plans.

Various parties directly and indirectly involved in environmental management of the proposed project components include, among others:

- Donor Agencies;
- Project Management Unit of TANESCO;
- Supervising Engineers for project implementation;
- Construction Contractor; and
- Regional and local-level political and governmental institutions, Community-Based Organizations (CBOs), etc.

As part of this interconnection project, TANESCO is responsible for the implementation, mitigation, and monitoring of all associated environmental impacts. TANESCO is involved in ensuring that its operations comply with environmental regulations and standards. The company engages with local communities to address concerns related to electricity supply and infrastructure development, ensuring that projects are carried out with minimal disruption.

TANESCO will be responsible in overseeing the planning and implementation of Environmental and Social Management Plan (ESMP), coordinating with relevant government agencies, and ensuring compliance with national and international standards.

Also, TANESCO will facilitate ESIA preparations, disclosure and implementation.

The effective implementation of the ESMP will require continuous monitoring of its environmental performance and, where necessary, initiating appropriate planning and corrective actions to rectify any performance shortfalls. The standard is based on the Plan-Do-Check-Act principle, which can be briefly described as follows:

- Plan: establish objectives and processes necessary to achieve results in accordance with the organization's environmental policy.
- Do: implement the planned processes.
- Check: monitor and measure processes against environmental policy, objectives, targets, legal requirements, and other criteria, and report the results.
- Act: take actions to continually improve the performance of the environmental management system.

To complete this cycle, TANESCO will adopt the following approaches in the implementation of Environmental and Social Management Plan (ESMP):

- Partnership Approach: the partnership principle involves close cooperation between TANESCO and interested agencies at district, regional and national level, NGOs and CBOs at local. While TANESCO's PIU's environmental activities, it will engage all concerned individuals and institutions responsible for planning, implementing, and monitoring environmental mitigations. Additionally, a monitoring committee will be established at the district/regional level to jointly monitor the impact mitigation measures carried out by various service providers, including NGOs.
- Involving Community-Based Organizations: the recent evolution of community organizations has underscored their effectiveness in addressing local needs compared to larger charitable organizations.
- Information Sharing: throughout the project's construction and operation phases, TANESCO's PIU will coordinate with agencies and stakeholders in the district. Effective information sharing is crucial for fostering cooperation among stakeholders and supporting the project.

The PIU will:

- implement physical and biological mitigation and enhancement programs, relevant monitoring activities, and compliance monitoring of programs implemented by the contractors as per contractual agreement.
- handle land acquisition and compensation, resettlement and rehabilitation, community development, livelihood programs, health-related programs, and the relevant monitoring of social programs implemented by the project. It will also ensure compliance monitoring of programs implemented by the contractors as per contractual agreement.
- work with Project Affected Persons (PAPs) to address their concerns and grievances with the project transparently and according to the agreed procedural steps.

During the project construction phase, PIU will operate as a full-fledged office but will be reduced in size during the operation phase.

The PIU will review the Environment Protection Plan, Health and Safety Plan, Waste Management Plan, and other environmental and social plans prepared by the contractors and assist the Project Director's Office with their timely approval. Liaising with local communities, agencies, NGOs/CBOs, and other major stakeholders will be a major task of the PIU Environment Manager.

The organization chart of the PIU and the task of each staff is reported in Table 11- 1 and Figure 11- 2.

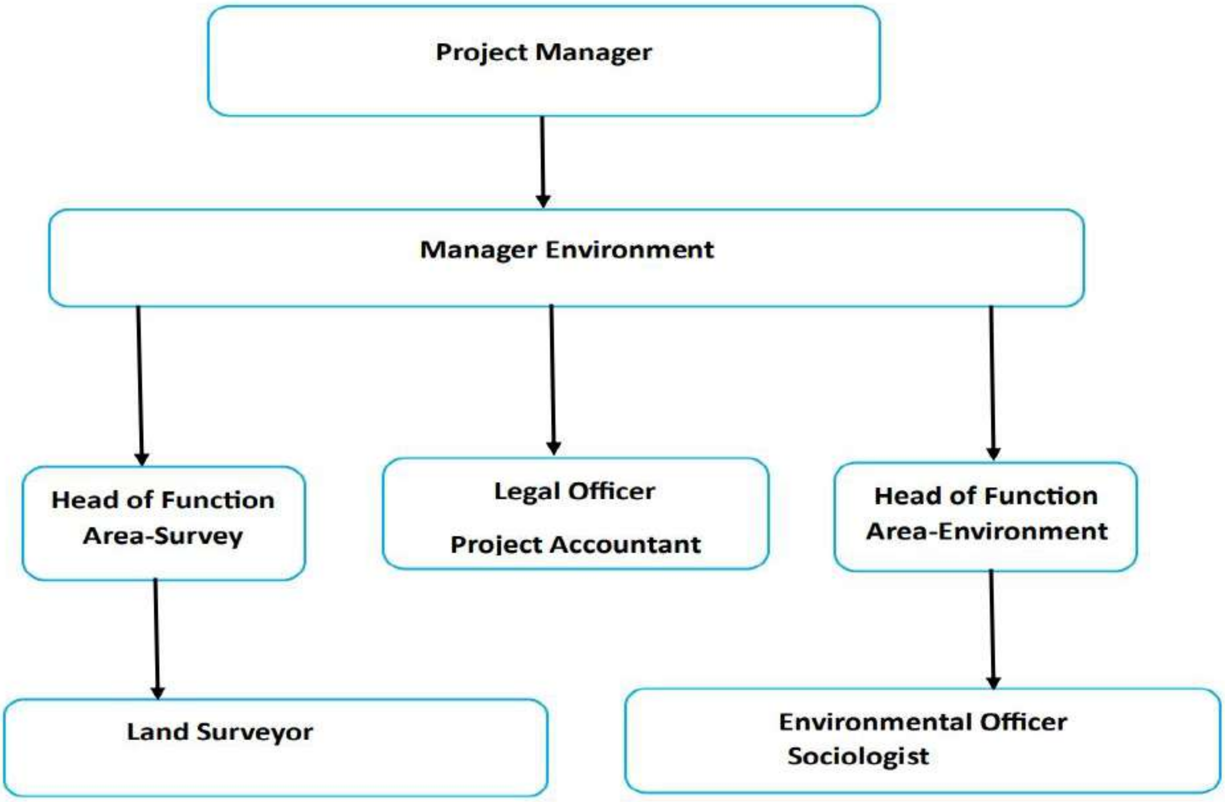

Figure 11- 2: TANESCO Project Implementation Unit

Table 11- 1: Key Roles and Responsibilities

Member	Key Role and Responsibilities
Project Manager	✓ Leading implementation of E&S obligations (community engagement, information sharing & grievance management, livelihood restoration and corporate social responsibility) ✓ Coordinate the day-to-day project activities including, ESMP and RAP implementation and other construction activities ✓ Supervising and monitoring the performance of other PIU in executing their daily implementation of ESMP and RAP ✓ Receiving and review the reports which submit to his office from Manager Environment ✓ Accountable for reporting to TANESCO and Lenders on E&S matters ✓ Establishing appropriate organizational structure and scrutiny of suitable resources to implement the ESMP, RAPs, SEP and LRP

	✓ Contribute to the project appraisal processes by reviewing, analysing, and advising on social and environmental impact/risks ✓ Play a role of report the progress of ESMP implementation to the high level of TANESCO management
Manager Environment	✓ Advise the project manager on the project environmental & Social issues, and advise on the best ways to mainstream environmental and social aspects into project design including ESMP implementation, livelihood restoration and corporate social responsibility, capacity building, awareness raising and public consultation ✓ Managing the E&S team and third parties involved in the implementation of E&S obligations ✓ Receiving the report from Head of Function Area, Project Accountant and Legal officer ✓ Reporting the progress of ESMP implementation to Project Manager.
Head of Function Area (HOFA)-Survey	✓ Sorting Land acquisition issues including valuation and reporting to Manager Environment for discussion and actions ✓ Assigned the task Land surveyor for handling ESMP and RAP issues. ✓ Reporting to Manager Environment on the day-to-day implementation of ESMP and RAP
Head of Function Area (HOFA) - Environment	✓ Reviewing the E&S report submitted by environment officer, Sociologist and third parties during ESMP and RAP implementation ✓ Reporting to Project Manager any raised E&S issues ✓ Assigned task to Environmental officer and sociologist
Project Accountant	✓ Controlling financial issues and preparing budget for implementation of ESMP activities ✓ Effecting compensation payments to PAPs and other cost relating to ESMP implementation ✓ Reporting to Manager Environment on the cost relating to daily project implementation. ✓ Works in collaboration with Environmental officer, legal officer, sociologist and land surveyor for handling all project ESMP issues
Legal Officer	✓ Providing legal advices about the project and sharing the legal ideas with other project implementor team ✓ Responding to legal matters raised by PAPs regarding the compensation payments ✓ Works in collaboration with Environmental officer, accountant, sociologist and land surveyor for handling all project ESMP issues
Environmental Officer	✓ Reporting HOFA-environment on environment safeguards issues during project implementation. ✓ A key focal point for project on environmental matters ✓ Works in collaboration with sociologist, legal officer, accountant and land surveyor for handling all project RAP issues ✓ Ensuring compliance on environmental aspects are implemented as Nation Laws and AfDB ISS requirements
Sociologist	✓ Reporting to HOFA-environment on social safeguards issues ✓ A key focal point for project on social matters

	✓ Works in collaboration with Environmental officer, legal officer, accountant and land surveyor for handling all project RAP issues ✓ Ensuring compliance on social aspects as indicated in RAP and ESMP are implemented as Nation Laws and AfDB ISS requirements
Land Surveyor	✓ Reporting to HOFA-Survey all matters relating with Land Acquisition issues ✓ A key focal point for project on Land Acquisition matters ✓ Works in collaboration with Environmental officer, legal officer, accountant and land sociologist for handling all project RAP issues ✓ Ensuring compliance on Land Acquisition issues are implemented as Nation Laws and AfDB ISS requirements

Table 11- 2 – Mitigation and management measures on physical environment (terrestrial domain)

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
Air quality	- Earthworks - Opening of access roads for excavation of cable trenches - Vehicle movement and other equipment. - Exhaust gases from engine driven vehicles and machinery - Increase of traffic for transport of raw material, personnel and wastes	- Routine watering program of all unpaved surfaces including roads and construction areas, to ensure sufficient moisture content and suppress dust generation; - 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; - Covering/humidifying of materials that can be transported by wind (e.g. topsoil, aggregate) where possible; - All stockpile materials with high risk to produce airborne dust will be covered, particularly during windy periods. - Use of best available technologies for equipment and machinery; - Regular maintenance and inspection of machinery performed in accordance with manufacturer instructions; - Vehicles and machinery will be turned off when not in use.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
Climate, Air quality	Potential fugitive emissions of SF_6 contained in the transformers insulating oil can be expected during the lifetime of the substations	- Establish a lifecycle approach for SF_6 management through company policies, protocols, and standard operating procedures; - Establish procedures for gas inventory, accounting, and tracking. Including labelling, inventory and storage of gas cylinders, using log sheets for warehouse cylinders, and inventorying all SF_6 equipment; - Train employees annually in SF_6 handling and in using the necessary equipment; - Recycle SF_6 gas at equipment servicing or disposal; - Track leak history of equipment to identify priorities for repairs and replacement; - Implement leak detection and repair strategies. Leak detection with leak pointer/sniffer, bagging or thermal	Throughout operation phase Implementation and Control: Contractor and TANESCO	5,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		imaging to detect minor, chronic leaks without taking equipment out of service. Leak detection teams regularly inspect equipment to identify SF_6 leaks and prioritize repair or replacement; - Upgrade equipment to reduce SF_6 use and leaks. New equipment designs use less SF_6 and tighter seals to reduce leaks; - Evaluate alternatives to SF_6, like vacuum-based technology with CO_2, or “Clean Air” as a base gas; - Implement proper decommissioning using SF_6 recovery systems to prevent emissions.		
Geology, Geomorphology and Soil	- Accidental spills of hydrocarbons or other contaminants on soil. - Occupation of soil by equipment and machinery, increase of waterproof surface and soil loss. - Soil disturbance and degradation.	- Prepare a general Water and Soil Pollution Management Plan including conceptual design of pollution control to be implemented on-site in accordance with project’s specific requirements; - Provide emergency response kits; - Strip and store contaminated soil on suitable impermeable surfaces; - Prepare a Waste Management Plan; - Implement waste management procedure (segregation of hazardous and non- hazardous waste); - Ensure regular surveillance of any spillage on nearby properties: land filling must be restricted within the boundary of project’s activities (trench excavation, substation expansion) - Ensure periodic maintenance of the equipment; - Prepare a general Erosion and Sediment Control Management Plan including conceptual design of erosion and sediment controls to be implemented onsite in accordance with project’s specific requirements; - Conduct land clearing activities during dry periods to help	Before construction activities starts. During construction activities. Implementation: Contractor Control: TANESCO	50,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)

		minimize erosion impacts;
		- Implement erosion and sediment protection works prior to the commencement of any construction works;
		- Minimize, wherever possible, land clearing and vegetation removal, to maintain as much as possible the original ground cover;
		- Landscape construction areas to reflect natural contours;
		- Restore suitable drainage paths in all areas disturbed by construction activities,
		- Stockpile and stabilize soil and spoil removed during the construction process separately and far away from the drainage lines;
		- Minimize and completely avoid any soil compaction outside of construction sites and access roads;
		- Construction sites shall be stabilized and rehabilitated during and after construction;
		- Spread mulch generated from cleared vegetation across exposed soils after construction;
		- Restrict land acquisition, clearing and grubbing to what is necessary;
		- Replant cleared areas and slopes vulnerable to erosion such as cut-and-fill slopes with autochthonous plant species (grasses, shrubs and/or trees) which can:
		  - armour the surface against erosion;
		  - support the slope by propping from the base (tree and shrub boles and roots).
		- All soil that is disturbed during trench digging will be restored to approximate original depths as the trenches are backfilled (sandy beach, rock armour with a new geotextile and the backshore)		

Water resources	- Soil erosion,	- Prepare a general Water and Soil Pollution Management Plan	Throughout construction	100,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
	flooding, channel modification, downstream scouring and sedimentation in streams, drainage channels and wetlands/swamps. - Increased water turbidity and sedimentation in the affected rivers and seasonal streams. - Potential ground water contamination. - Alteration of ground water level caused by the reduction of groundwater supply.	including conceptual design of pollution control to be implemented on-site in accordance with project's specific requirements; - While preparing the sub-plan, the Contractor must consult the Energy and Water Utilities Regulatory Authority (EWURA) and the Basin Water Boards; - Avoid water pollution by spillages of oil, fuel or lubricants by proper storage and handling; - Provide spill control kits to contain and clean small spills and leaks; - Prepare a Waste Management Plan; - Provide satisfactory disposal of solid and liquid waste; - Ensure periodic maintenance of the equipment; - Ensure the proper sealing of all pipelines, valves, and vessels to avoid water loss; - Avoid any dumping of excavated material in drainage pattern; - Prepare a Hazardous Material Management Plan; - Register all potentially hazardous materials to track type, quantities stored, quantities used or generated; - Allow only trained personnel to handle hazardous materials; - Seal well chemicals after use; - Record movements from storage and to waste disposal sites; - Develop and display at each construction site emergency response procedures; - Establish and include in the workers training program handling and use of hazardous materials safety procedures; - Locate workshop facilities at least 100 m away from the water sources; - Provide workshops with spilled oil and grease trapping systems;	phase Implementation: Contractor Control: TANESCO	

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		- Implement an effective water management system; - Construct sufficient cross and longitudinal drainage structures to allow for the proper passage of runoff or flood water under or along access roads; - Treat through proper wastewater treatment systems all the waters coming out from the construction site; - Adequate sanitary facilities (toilets, showers); - Construction wastes will not be allowed to accumulate on the construction site but will be collected promptly and removed regularly from the site.		
Noise	- Earth movement, aggregate material handling, excavation, mechanical works and vehicle movements. - Use of engine driven vehicles and machinery (i.e. excavators, bulldozers, trucks, cars). - Increase of traffic and related noise. - Improvement of access roads	- Prepare a general Noise and Vibration Management Plan including conceptual design of noise and vibration controls to be implemented on-site in accordance with project's specific requirements; - Provide all workers with proper Personal Protective Equipment (PPE) for noise protection; - Provide all noise generating construction equipment with effective sound-control devices (exhaust mufflers); - Limit during daytime all construction activities that may generate harmful noise, to minimize community disturbance; - Install noise barriers near villages along access roads if noise levels are found to exceed standards during monitoring; - Switch off equipment when not in use; - Perform regular maintenance of equipment and machinery to ensure noise emissions in accordance with technical specifications; - Prepare, before the beginning of any construction activity, a detailed Noise Management Plan to reduce noise impact from Project activities according to the final localization of the potential noise sources in relation to the existing noise vulnerable receptors (settlements, houses, etc.);	Throughout construction phase Implementation: Contractor Control: TANESCO	50,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		- Notify local community/public located within 500 m from the worksites before starting noise activities (residents must be informed at least 24 hours in advance); - Regularly monitor noise intensity level.		
TOTAL COST				**205,000**

Table 11- 3 – Mitigation and management measures on biological environment (terrestrial domain)

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
Flora and Fauna	- All potential impacts	- Develop a Biodiversity Action Plan (BAP) that incorporates conceptual designs for on-site biodiversity management controls. This BAP should be informed by the results and findings of the baseline data collection and pre-construction surveys.	Pre-construction phase Implementation: Contractor Control: TANESCO	30,000
	- Habitat loss and degradation. - Habitat fragmentation and barrier to movement	- Prepare a Vegetation Clearing Management Plan including conceptual design of vegetation clearing and controls to be implemented on-site in accordance with project's specific requirements. - Carefully select the trees that need to be cut to implement the project activities. - Avoid any useless cutting of trees with particular attention to protected species. - Minimize as much as possible the construction areas and clearing width: reduce the width of the cleared corridor and trench to the minimum required for cable installation, safe operation, and maintenance. - Vegetation clearing: carry out clearing outside the breeding season and periods of high wildlife activity, minimize the width of the cleared corridor and replant with native species.	Throughout construction phase Implementation: Contractor Control: TANESCO	70,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		- Dust and pollution control: implement dust suppression measures (watering, covered stockpiles), proper waste management, and spill prevention plans. - Noise management and control: limit night work, use quieter equipment, and maintain equipment properly. - Vegetation and habitat restoration: restore the trench promptly after cable installation, including re-grading and replanting native vegetation, to enhance habitat connectivity. Forbidden any use of alien and invasive species. - Avoid any fire risk caused by activities within the project area; - Wildlife crossings, if necessary: implement wildlife crossing structures like rope bridges for arboreal animals and properly designed culverts for terrestrial species to maintain connectivity between fragmented habitats.		
		- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques. - Promote the growth of low-height native plants that do not interfere with underground cable but provide habitat value. - Use the data collected during the monitoring activities to adaptively manage and refine mitigation measures as needed.	Throughout operation phase Implementation: Contractor Control: TANESCO	Included in the project costs
	- Introduction and spread of invasive alien species	- Develop an Invasive Species Management Plan to identify risks and control methods. - Cleaning protocols for vehicles and equipment: brushing down vehicles and equipment before they leave an infested area can help remove seeds and plant parts that could be spread elsewhere. - Use of local materials: sourcing construction materials like gravel and sand from local, weed-free sources reduces the risk of introducing new IAS propagules. - Worker training: educating construction workers on how to identify IAS and the importance of preventing their spread can be a critical step in mitigating the risks.	Throughout construction phase Implementation: Contractor Control: TANESCO	30,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		- Control measures (e.g. eradication) to prevent them from becoming established.		
		- Update of the Invasive Species Management Plan (ISMP) to identify risks and control methods. - Use of clean equipment: ensure all equipment and vehicles are cleaned before entering and leaving maintenance sites to prevent the spread of invasive species seeds. - Control: take prompt action to control their spread (e.g. eradication). - Revegetation with native species: after maintenance activities, revegetate disturbed areas with native plant species to restore the habitat and reduce the opportunity for invasive species to establish. - Train workers on invasive species identification and control.	Throughout operation phase Implementation: Contractor Control: TANESCO	30,000
	- Road kill	- Speed limit enforcement: implementing and enforcing lower speed limits on construction roads allows wildlife more time to react to approaching vehicles. - Wildlife fencing: utilizing temporary fencing can guide wildlife away from construction areas and direct them towards designated crossing points. - Night lighting management: implementing shielded lighting or minimizing nighttime construction activities can reduce the attraction of wildlife to construction zones - All vehicles' drivers involved in the project must attend at least one wildlife safety training before they start working - Strictly forbid to construction workers to hunt and/or poach wildlife and to fish as well as to buy and/or sell wild animals; - Strictly forbid workers to supply food from hunting or fishing; - Implement adequate practices of food waste management to avoid any attraction of wildlife scavengers;	Throughout construction phase Implementation: Contractor Control: TANESCO	10,000
	- Disturbance,	- Trenchless technologies: for underground cable, utilizing trenchless technologies like microtunnelling or Horizontal Directional Drilling	Throughout construction phase	40,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
	degradation and loss of mangroves	(HDD) can significantly reduce the need for extensive trenching. This minimizes the disruption of the intricate mangrove root system and associated ecological functions. - Minimized clearing: limiting the clearing of mangrove vegetation to the absolute minimum required for construction is crucial. - Mangrove restoration and rehabilitation: developing and implementing a comprehensive mangrove restoration plan is essential to compensate for any unavoidable habitat loss. This may involve planting native mangrove species in degraded areas to restore ecological functions and promote the recovery of the ecosystem. - Monitoring and adaptive management: regularly monitoring the impacts of construction on mangroves and surrounding ecosystems is crucial. Implementing adaptive management strategies allows for addressing any unforeseen issues and ensures the effectiveness of mitigation measures. This ongoing process can be further strengthened through collaboration with ecological experts.	Implementation: Contractor Control: TANESCO	
		- Minimized clearing for maintenance activity: limiting the clearing of mangrove vegetation to the absolute minimum required for maintenance is crucial.	Throughout operation phase Implementation: Contractor Control: TANESCO	Included in the project costs
	- Human disturbance	- Maintenance activities timing: schedule outside sensitive seasons and use minimal-impact techniques. - Train workers on minimizing noise and disturbance. - Sustainable tourism practices and community involvement: Involve local communities to promote eco-friendly tourism practices that minimize environmental impact, such as reducing waste, conserving water, and using renewable energy sources. This includes also specific training to increase awareness about the importance of protecting the environment, biodiversity and local cultures.	Throughout construction phase Implementation: Contractor Control: TANESCO	10,000

Environmental component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
TOTAL COST				**220,000**

Table 11- 4 – Mitigation and management measures on socio-economic environment

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
Labor	- Unfair working conditions, including unfair treatment, gender-based discrimination, discrimination against vulnerable workers, child and forced labour - Corruption, lack of ethics and integrity from contractors and primary suppliers - Opportunities for skilled and unskilled labour with a positive impact on local communities. - Unrealized opportunities for local employment - Unrealized opportunities to train local workers - Failure to provide local communities with timely	Develop a Project Human Resource Policy which consider at least the following aspect: - Freedom of association and collective bargaining; - Prohibit the hiring of underage workers, as defined in relevant ILO Conventions; - Prohibit recruitment, use and practices of forced labour and child labour; - Prohibit discrimination in hiring practices or pay; - Provide fair and favourable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; - Avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; - Guarantee freedom of movement in and out of the workplace and workforce accommodation; - Guarantee wages as per industry standards/minimum wage; - Guarantee access to workforce grievance mechanisms; - Guarantee provision of sufficient rest periods and rest days to avoid fatigue; - Guarantee safe and healthy workplace conditions; - Guarantee provision of food and water for drinking and sanitation; - Guarantee working conditions and accommodation standards, as per guidance note by IFC; - Guarantee provision of appropriate personal protective equipment (PPE). These requirements shall also be reflected in subcontractors' employment policy.	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	50,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
	information on work opportunities and requirements	Develop Project Grievances Mechanism for labour: - Complaint from worker about unfair treatment or unsafe living or working condition; - Grievance policies and mechanism must be developed and disclosed.		
Occupational Health and Safety	- 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	Develop a Project Occupational Health and Safety Management Plan, including at least the following provisions: - Contractor's personnel will be required to wear suitable Personal Protective Equipment (PPE), including hard hats, high-visibility vests, safety boots and gloves and life vests as appropriate, in accordance with the Health and Safety Plan (EHSP). - All construction and cable repair workers will be sufficiently trained in the safe methods of working to avoid injuries. - Worker's accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC on Workers' accommodation. - Systematically plan participatory hygiene promotion campaigns can reduce water, sanitation, and hygiene (WASH)-related diseases in camps. - Hence, hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing, and reduction of household drinking water contamination. While preparing the sub-plan, the Contractor must consult the Occupational Safety and Health Authority (OSHA).	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	50,000
Occupational and community health and safety	- Risk of accidents and physical injuries involving residents from increased road	Develop a Project Implement Traffic Management Plan, including at least: - Road safety plans/maximum speed limits for site and access routes. - Contractor's program to monitor and enforce safety plans, accident reporting and statistics, establishing penalties for	Throughout pre-construction and construction phase Implementation: Contractor	100,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
	traffic. - Trespass by unauthorized persons into construction work areas - Increased stress-related disturbances (noise, dust, light, and air pollution). - 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 increase of diseases, inappropriate conduct, and SEA-SH risks for women from the local communities.	violations. Develop a Community Health and Safety Management Plan including at least: - Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. - provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; - training of workers; - documentation and reporting of occupational accidents, diseases, and incidents; - Emergency prevention, preparedness, and response arrangements. - Appropriate fencing/signage at site entrance. - Appointment of site security personnel. - Road safety measures. - First aid and medical assistance. - HS measure at community level. - Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities. - Provision of awareness and prevention briefings. - Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling & Testing (VCT) targeting PACs. Implement and evaluate quarterly. - Prevent spread of respiratory disease, including the production of	Control: TANESCO	

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		epidemics that can pass back and forth between the project and the community. - Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. - Distribute of mask to prevent from dust in the villages most impacted by the air pollution. Implement Community Grievances Redress Mechanism to address complains related to direct and indirect project impacts. Prepare a Security Management Plan with provisions for respect of Voluntary Principles on Security and Human Rights (VPSHR) and manage the influx of workers and followers through a Labor Influx Management Plan. Harmonize the above plans with: - Local Employment Plan - Workers Code of Conduct - GBV/CAE/SEA plan, Occupational and Community Health and Safety plan - Establish continuous communication with Key stakeholders and traditional leaders. - Train foreign workers on local culture and traditions While preparing the sub-plans, the Contractor must consult the Prime Minister's Office - Department of Coordination of Disaster Operations, the Fire and Rescue Force.		
Vulnerable Groups	- Risk of sexual	GBV and CAE: - Contractors are required to have sexual harassment policies and	Throughout pre-construction and construction phase	90,000

Socio-economic component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
	abuse - Risk of child labour	Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. - Worker Code of Conduct shall be translated in local language(s) - The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV) and child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. - Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. - Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site.	Implementation: Contractor Control: TANESCO	
Cultural heritage	Potential encountering of archaeological sites, burial grounds, sacred sites and local shrines	- Establish a Chance Finding Procedure; - Inventory of any archaeological finding and unmarked graves.	Throughout pre-construction and construction phase Implementation: Contractor Control: TANESCO	10,000
TOTAL COST				**300,000**

Table 11- 5 – Mitigation and management measures on marine environment

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
Marine fauna, flora and habitats	- Habitat loss and degradation - Habitat fragmentation, barrier to movement	- Marine biologists (x2) to monitor construction activities. - Timing of construction activities: schedule outside sensitive seasons. the best period for construction activities is from June to July and from the end of January to the beginning of March. With regard to construction activities in the coastal area, the period to avoid is during the sea turtle nesting season, from March to May/June. - Bury cables deep to minimize barriers effect. - Habitat restoration for severely impacted areas, if feasible. - Habitats that are temporarily disturbed during installation activities will be rehabilitated as soon as possible after the cable has been installed. - The project will ensure that measures are adopted to avoid incursion into areas adjacent to the work site (especially the coral areas) or any secondary affects from pollution, sedimentation or accidental spills. - The project will also require that marine vessels have a similarly comprehensive plan for storage and handling of hazardous materials as well as a plan for containment and cleanup of accidental spills into the marine environment - Contractors will implement a suitable system for spotting marine mammals and turtle whilst pre-installation and installation vessels are at sea. Should any fauna be observed in the vicinity of the work area, the vessels will execute measures to avoid collision or disturbance. Vessel operators will maintain a distance of 100 m or greater and will travel 10 knots or less when safety permits, until animals are more than 500 m away. Any abrupt changes in direction will be avoided. - Vessel crews must report sightings of any injured or dead marine mammal and sea turtle immediately, regardless of whether the injury or death is caused by a project vessel. The report should include the date and location (latitude/longitude) of the animal/strike, the name of the vessel involved and the species identification or a description of the	Throughout construction phase Implementation: Contractor Control: TANESCO	35,000

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		animal. The report should be made to a designated ecology organization. - Security lighting will be beamed on the area of operation and at an adequate level of illumination only, to avoid impacts on sensitive fauna. Illumination of areas outside the direct work area will be avoided.		
	- Disturbance, degradation and loss of coral reefs	- Avoidance: adjust routing that completely avoids coral reefs. - Conduct detailed ecological surveys to map coral reefs along the final route before the construction. - Specific cable installation techniques: during the construction activities, diver-assisted installation should be implemented to manually guide the cable around sensitive areas. - Temporary coral translocation: temporarily relocate corals from the cable path to safe areas before installation. Ensure proper handling and reattachment techniques to minimize stress and mortality rates. - Post-installation monitoring and restoration: implement regular monitoring programs to assess the reef's health and recovery post-installation. Conduct active restoration efforts, such as coral gardening and reef rehabilitation projects, to support recovery. - Community engagement and education.	Throughout construction phase Implementation: Contractor Control: TANESCO	120,000
	- Fauna collision	- Apply reduced speed limits (<14 knots) to minimize and/or avoid any risk of collision. - Keep on board a qualified cetacean observer as crew member responsible for the promptly detection of marine mammals on a collision course.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in the costs of the previously mentioned mitigation measures
	- Noise pollution	- Schedule noisy construction activities outside of critical seasons for marine animals. The best period for construction activities is from June to July. With regard to construction activities in the coastal area, the	Throughout construction phase	Included in construction costs

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
		period to avoid is during the sea turtle nesting season, from March to May/June.	Implementation: Contractor Control: TANESCO	
	- Chemical contamination	- Develop a Spill Prevention, Control, and Countermeasure Plan (SPCC) with prevention, containment, and clean-up procedures. - Use low-impact dredging techniques and silt curtains to control sediment re-suspension. Dispose of dredged material properly. - Educate personnel on spill prevention and response protocols	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
	- Control invasive alien species	- Eradication action if needed.	Throughout operation phase Implementation: Contractor Control: TANESCO	Costs to evaluate based on the severity of the invasion
Water quality	- Chemical contamination - sediment dispersion and increased water turbidity	- Marine vessels will be required to always comply fully with the requirements of the MARPOL Protocol (1978). - Marine vessel anchors will not be dragged along the seabed, and they will be retrieved vertically to avoid unnecessary sediment disturbance. - The maximum speed of the cable laying will not exceed 5 knots per hour so that the amount of seabed sediment disturbed and dispersed during the cable laying process can be kept to a minimum.	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
Maritime traffic	- Risk of collision or damage to equipment	- Contact the other vessel to avoid collision or damage to equipment - Vessels will increase visive attention when navigating in areas that are kwon to be used by fishermen and other vessels	Throughout construction phase Implementation: Contractor	Included in construction costs

Environmental and social component	Potential impacts	Mitigation / Enhancement measures	Implementation timing / responsibility	Costs (USD)
			Control: TANESCO	
Socio-economic activities: fisheries, tourism (diving sites, recreational activities), shipping and anchorage, etc.		- All stakeholders will be informed on activities well in advance and signage will be put in place where appropriate. Prepare a notice for community and fishermen with full description of construction activities. - All open trenches and excavated areas will be backfilled as soon as possible after the construction has been completed. Access to open trenches and excavated areas will be secured to prevent pedestrians or vehicles from falling in. - Vessels will increase visive attention when navigating in areas that are known to be used by fishermen and other vessels. If other vessels are observed within the near vicinity, the project vessel will stop moving, contact the other vessel if possible, and wait until it has been confirmed that the course of both vessels will not result in collision or damage to equipment. - While a ship is laying cable, its manoeuvrability will be restricted; as such it will display the day signals and lights of a hampered vessel to avoid collision with other vessels at sea. - Fishing representatives to be informed of cable laying schedule and exclusion zones - Community stakeholders to be informed of cable laying schedule and exclusion zones - Local fishermen and other sea users will be informed about the presence of the cable vessel and location of the cables. To engage with local fishermen, the Contractor must consult the Beach Management Unit (BMU).	Throughout construction phase Implementation: Contractor Control: TANESCO	Included in construction costs
			TOTAL COST	**155,000**

12 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Environmental monitoring for this project will be undertaken to meet the following objectives:

- to fully comprehend the physical, social and environmental conditions in the project area prior to the implementation of the project;
- to understand the compliance status of the implementation of mitigation measures and other regulatory standards;
- to ensure effectiveness of mitigation measures implemented by contractors as per contractual clauses and obligations;
- to check the effectiveness of mitigation and enhancement measures, implemented by the project, and
- to verify the accuracy of ESIA predictions and assess the emerging and cumulative environmental problems, which could provide timely warning of potential environmental damage.

A more detailed monitoring plan in the form of a fully formulated Environmental Management Plan based on formulated plans/programs/mitigation will be prepared at a later stage.

12.1 Type of monitoring

Monitoring will be done throughout the project life. Apart from external expert monitoring, internal monitoring by the project will be done as well as participatory monitoring involving governmental authorities or other stakeholders. The main types of monitoring to be conducted are described below.

12.1.1 Pre-construction monitoring

TANESCO (ESMD) will have the principal responsibility for environmental and social baseline monitoring during the pre-construction phase.

Data and information will be collected on key physical, biological and social aspects in the direct impacted project area and other environmentally sensitive area, and the data provided by ESIA report will be updated.

The primary concern during this phase will be to collect field data needed to enhance the knowledge of baseline conditions. Focus will be on gathering key physical and biological information needed to verify and update the data provided by ESIA process such as river water quality, air quality in project sites, number of trees to be felled, etc.

12.1.2 Construction monitoring

Environmental and social monitoring during project construction will include two major groups of activities:

Review of the contractor's plans such as 'storage and construction waste management plan', 'domestic waste management plan', 'health and safety plan', 'emergency medical response unit' and other environmental plans. Monitor implementation arrangements, compliance and impacts.

Systematic observation to check that contract arrangements by contractors, and other agencies such as government, NGO/CBO, etc. are in fact complied with, and that emerging impacts are properly mitigated.

(a) Compliance Monitoring: both compliance monitoring and impact monitoring will be carried out. During construction phase, compliance monitoring will be important and will play bigger role in checking whether recommended mitigation measures and environment management plans have been properly and timely implemented or not. It will determine the overall environmental and social performance of the project.

(b) Impact Monitoring: will examine the effectiveness of the mitigation measures, identify the emerging impacts due to project activities or natural process and develop remedial actions. Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The actual impacts caused by the project implementation and the emerging impacts will be closely monitored during the construction period.

Salient features of monitoring physical, biological and socio-economic activities during construction phase are presented in Table 12- 1, Table 12- 2, and Table 12- 3. The annual environmental monitoring report will be incorporated in the Annual Environment Report which would include the status of environment in the project area, emerging and cumulative impacts and remedial tasks implemented.

12.1.3 Operation monitoring

Both compliance and impact monitoring will be carried out during project operation phase. The compliance monitoring will focus on determining if the prescribed mitigation and enhancement measures in the operation phase are being fully and properly carried out by the project.

Impacts of activities implemented during construction phase and operation phase will be monitored at regular intervals. However, the monitoring intensity during the operational phase will be much lower, compared to the construction phase.

12.2 Levels of monitoring

Environmental monitoring for the project will be carried out at different levels:

- routine monitoring,
- periodic monitoring,
- external monitoring.

12.2.1 Routine monitoring

The scope of routine monitoring of activities and conditions during construction and operation stages by the TANESCO (ESMD), the Contractor and/or Subcontractors is to ensure that potential adverse impacts, including but not limited to those that have been identified by this ESIA, are regularly controlled and that mitigation actions are implemented to fully comply with all standards and safeguards. To regularly monitor the activities, the internal organization requires an inspection team with environmental skills or trained personnel.

An Environmental Management and Monitoring Plan for Construction Phase (EMMP-CP) shall be developed to define detailed mitigation and monitoring actions to be implemented during the construction phase of the Project, which defines the roles and responsibilities and institutional arrangements of environmental management. Site Specific Environmental Management and Monitoring Plans (SSEMMP) shall also be prepared and implemented for each of the main construction sites and for other distinct activities that may have environmental impacts. These plans will be part of the contractual obligations for the Contractors and Subcontractors. In addition, an Environmental Management and Monitoring Plan shall be prepared for the Operations Phase (EMMMP-OP) prior to the commissioning of the Project.

These plans shall provide details of the various actions and measures intended to prevent adverse environmental impacts or, if they cannot be prevented, to mitigate the adverse impacts and details of the monitoring procedures (how and what will be measured or observed, who is responsible for monitoring, and the frequency of such monitoring, etc.).

All the field observation shall be recorded on standard forms and entered the database to track the status and verify and control non-compliance situations.

The technical details of the monitoring measures shall be included in the ESMMP, SSEMP and Contractor’s EMPs, including parameters, methods and sampling locations for the Project environmental aspects.

12.2.2 Periodic monitoring

Periodic monitoring activities shall be carried out by two organization, the Environmental and Social Management Unit of Tanzania (ESMUT) and the Environmental and Social Management Department (ESMD) established by TANESCO.

The ESMUs shall assure that the proponents of the project (TANESCO), the contractors and the subcontractors comply with the environmental standards and safeguards. The role of the ESMU shall be:

- to coordinate with other national agencies involved in the environmental and social aspects of the Project;
- to carry out inspections and monitoring compliance with the environmental and social measures, standards and safeguards;
- to advise the relevant authorities on environmental and social matters of the Project;
- to represent a liaison between the authorities of Tanzania, the Tanzanian people and any external organizations concerning environmental and social aspects of the Project;
- to hold public consultations on environmental matters.

The ESMDs shall be the ESMU’s counterpart and, responsible for all environmental and social obligation of proponent, assure that the Project follows the measures to prevent or mitigate adverse environmental and social impacts in compliance with all the environmental and social standards and safeguards. To effectively manage the environmental and social performance of the Project, the ESMDs shall set up an Environmental and Social Management System (ESMS) to process and record all monitoring data, including compliance issues, management decisions and corrective actions taken as:

- ESMP, ESMMP-CP, ESMMP-OP, sub-plans and site plans;
- all site plans as approved by the proponent;
- all communications which have environmental and social implications;
- all environmental and social monitoring reports from ESMD and the contractor’s staff;
- quarterly reports;
- complaints register;
- training materials;
- training attendance registers;
- non-compliance special reports;
- national environmental and social legislation;
- permits, legal documents and authorizing letters;
- monthly site meeting minutes.

12.2.3 External monitoring

An external monitor may be engaged by the GoT and/or by the Lenders, funded by the proponent, to review the effectiveness of the environmental and social measures carried out by the Project and to ensure compliance with the contractual obligations. Non-conformances or observations, identified during audits, will be reported to the Proponent for implementation and corrective action.

The Proponent shall provide available documentation, information and data requested by the auditor. The external monitor should have international experience in environmental and social auditing and monitoring. The external monitor should be engaged throughout the construction phase and for the first years of operations phase.

12.3 Specific monitoring actions

Table 12- 1 details the specific monitoring actions that should be taken on the physical environment, Table 12- 2 details the specific monitoring actions on the biological environment, while Table 12- 3 details the specific social monitoring actions.

Table 12- 1 – Environmental monitoring actions on physical environment

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Disposal of septic water	Physical and chemical parameters according to national standards (if not available, international standards shall apply) including: - pH; - Turbidity; - COD; - BOD; - Total suspended solids (TSS); - Total phosphorus; - Total nitrogen; - Total Coliform bacteria; - Oil and grease.	National (TBS) and World Health Organization (WHO) standards	Substation and offices	Continuous control, monthly analysis and reporting	ESMD / Main Contractor	10,000
	Rehabilitation of borrow areas and temporarily acquired land	Success of revegetation and erosion status/vulnerability	Revegetation and minimal erosion Reinstatement of the previous status of exploited area	All borrow/pit areas and temporarily acquired land	Continuous	ESMD / Main Contractor	20,000
	Soil erosion and siltation	Erosion status/vulnerability	Minimal erosion and siltation	All construction sites and access roads	Continuous	ESMD / Main Contractor	20,000
	Management of hazardous and non-hazardous waste, hazardous materials	Ensure waste and materials are treated in accordance with national standards (if not available international standards according to IFC shall apply).	National standards IFC standards TANESCO' s site waste management standards	Construction site	Continuous	ESMD / Main Contractor	20,000

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Impacts on air quality	Visual observation of dust generated during construction activities	Minimum dust emission.	All construction sites, access roads and nearby settlements	Continuous	ESMD / Main Contractor	-
		Measuring concentration of air quality parameters (if not available international standards shall apply) including: - Particulate matter (PM10 and PM2.5); - CO; - VOC; - SO_2; - CO_2; - NO_2.	- Environmental Management (Air Quality Standards) Regulations, 2007 - International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines - World Health Organization's Air Quality Guidelines (AQG)	All construction sites, access roads and nearby settlements	Monthly	ESMD / Main Contractor	10,000
		Visual inspections to ensure good standard machinery, equipment and trucks are in place	Proper functioning and maintenance of vehicles and machinery	All construction sites, access roads and nearby settlements	Occasionally throughout the construction period and upon complaints	ESMD / Main Contractor	-
	Exceedance of noise levels	Noise level measured using a portable noise meter	- Environmental Management (Standards for Control of Noise and Vibration Pollution)	In and around construction sites and nearby settlement areas	Monthly and upon complaints by nearby settlements	ESMD / Main Contractor	10,000

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
			Regulations, 2015 - International Finance Corporation (IFC), 2007. General Environmental, Health, and Safety (EHS) Guidelines - World Health Organization's Environmental Noise Guidelines				
	TOTAL COST						**90,000**

Table 12- 2 – Environmental monitoring actions on biological environment

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Terrestrial domain	Conduct pre-construction surveys of wildlife and vegetation with focus on invasive alien species in the construction area	Avoid habitat loss and disturbance No (or minimal) change in average density of species recorded from baseline	Construction area	Single survey before construction	ESMD / Main Contractor	10,000
		Monitoring of wildlife and vegetation with focus also on alien invasive species, to assess effectiveness of mitigation measures	Avoid habitat loss and disturbance No (or minimal) change in average density of species recorded from baseline	Entire Project area	Twice per Year	ESMD / Main Contractor	20,000 per year
	Marine domain	Conduct detailed ecological surveys to map coral reefs along the final route before the construction	Avoid coral reef degradation, habitat loss and disturbance	Entire Project area	Single survey before construction	ESMD / Main Contractor	15,000
		Number of wild animals and birds affected by traffic accidents involving	Avoid or reduce to the minimum accidents	Entire Project area	Monthly	ESMD / Main Contractor	Included in the operation al costs of ESMD

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Operation	Terrestrial domain	Monitoring of wildlife and vegetation with focus also on alien invasive species, to assess effectiveness of mitigation measures	No (or minimal) change in average density of species recorded from baseline	Entire Project area	Twice per year for five years, after project construction	ESMD / Main Contractor	100,000
	Marine domain	Conduct post-construction monitoring of marine communities	No (or minimal) change in average density of species recorded from baseline	Entire Project area	Once per year for five years, after project construction	ESMD / ESMU	50,000
	TOTAL COST						**215,000**

Table 12- 3 – Social monitoring actions

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Equity in local employment benefits / minimize social conflicts.	– Disclosure of contractor recruitment plan at Site offices and to Chiefs of Affected Villages; – Percentage of workers hired from all nearby communities; – Percentage of workers belonging to disadvantage groups; – Grievances; – Records of specialized training for local staff provided by contractor; – Certificates from contractor issued to employees (copied to TANESCO and ZECO) detailing training received/new skills acquired while employed.	Most of low skill workers are recruited locally General perception of project is positive	Project area and affected villages	Quarterly Basis	TANESCO	Included in the operation al costs of ESMD
	Labor grievance mechanism	– Established of grievance mechanism shall be documented; – Complaints log and resolution action must be recorded.	Zero or minimal complaints.		On monthly basis	TANESCO	Included in the operation al costs of ESMD

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Protecting the workforce	– Regular weekly work hours, rest periods, lunch, etc.; – Overtime limits and exceptions; – Hour averaging minimum wage; – Overtime requirements and conditions; – Labour contract provisions; – Social system payment liability; – Annual leave; – Laws to protect disadvantaged workers; – Severance pays; – Number and frequency of accidents; – Number and frequency of near misses; – Cases of illness due to working conditions; – Copy of training certificates.	Zero or minimal complaints. Zero or minimal accidents.	Project area	On monthly basis	TANESCO	Included in the operation al costs of ESMD
	Labor and Community Health and Safety – Sexual Transmittable Diseases – Vector Borne Diseases – Respiratory Disease	– Number of STIs treated; – Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures; – Number of TBs treated.	No propagation of STD and VBD caused by the project	Project area	On monthly basis	TANESCO	Included in the operation al costs of ESMD
	Community Grievance Mechanism	– Documented grievance mechanism established; – Maintenance of complaints log and resolution process.	Zero or minimal complaints.	Project area	On monthly basis	TANESCO	Included in the operation al costs of ESMD

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Occupational and community Health and Safety	– Contractor HS internal audits and statistics; – Records of accidents and near misses; – Record of illness, diseases; – Record of grievances; – Record of emergencies; – Informal feedback on effectiveness of Occupational and Community HS plan.	No accident / injuries in workers and local population	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Restrict access to sites, especially hazardous areas	Provision/review of the following documentation: – Description/photographs of fencing/signage around site perimeter; – Contractors to provide TANESCO with CV and training certification of security personnel proposed as per contract requirements; – Site registry identification system;	-	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Occupational and community Health and Safety Minimize traffic hazard within community	– Road Safety Plan documentation including identification of maximum speed limits for site and access routes; – Requirement for contractor program of monitoring; – Reporting of accidents and statistics inclusive in HS performance records; – Community training on safety; – Signs for local communities; – Document traffic safety sessions and maintain session schedule; – Maintain attendance register-	No accident / injuries in workers and local population	Project area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Local Market	– Pre-project and project local market prices for food, services and	Low impact on local	Local Markets	On monthly basis	TANESCO	Included in the

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	distortion Avoid distortion of local food prices and necessities due to influx of workers and followers	entertainment; – No. of vulnerable groups in comparison to the pre-project level; – Income level and living standard conditions in comparison to pre-project level.	market prices				operational costs of ESMD
	Vulnerable Groups GBV	– Safety Audits through key informant interviews, FGD; – No. and records of the awareness trainings; – Men & boys self-assessment form – awareness raising; – No. of qualified experts involved in the management and follow up of issues related to GBV; – GRM log; – No. of cases registered or reported by health care providers.		Project Area	On monthly basis	TANESCO	Included in the operational costs of ESMD
	Cultural Heritage	Reporting/notification of finds to the Archaeological Heritage Office	-	Project area	On monthly basis	Contractor	-
	Cultural Heritage/tombs	– Records from Chance Finding Procedures; – Photographs of findings; – Remediation measures adopted; – Payment completion; – Relocation completion; – Records of meetings.	Avoidance or relocation of physical cultural resources identified along the ROW	Construction site / excavation sites	Pre displacement and post displacement	TANESCO	Included in the operational costs of ESMD
	Stakeholder	– Records of public meetings, FGD, meeting with authorities, meeting with	-	Project area	Quarterly Basis	Contractor /	Included

Project phase	Issue	Parameters	Standards / Targets	Location	Frequency	Responsibility	Cost (USD)
	Engagement	workers and community, dissemination of information.				TANESCO	in the operational costs of ESMD
	Security Social Conflicts	– No. of accidents, violence, strikes, brutal death; – Way of dispute solution; – Interviews with key informants; – Evidence of training of security staff on Voluntary Principles on Security and Human Rights (VPSHR).	No accidents and social conflicts	Project area	On monthly basis	Contractor / TANESCO	Included in the operational costs of ESMD
	TOTAL COST						-

13 DECOMMISSIONING PHASE

Decommissioning refers to the phase in a project's lifecycle where assets are retired, dismantled, or disposed of safely and responsibly. This chapter will explain why decommissioning is not applicable to the submarine and underground cable project aimed at increasing power supply.

Reasons for Non-Applicability of Decommissioning for submarine and underground cable

- **Long-term reliability and capacity**: This project aims to enhance power supply reliability and capacity by installing new submarine and underground cables to augment existing infrastructure. Unlike projects with a finite lifespan, such as offshore oil platforms or nuclear power plants, this project is designed for long-term, sustainable power transmission with no predetermined end date or operational limit that would necessitate decommissioning.
- **Durability and resistance**: Submarine and underground cables are engineered to withstand harsh environmental conditions, providing decades of reliable service. The materials used in their construction are highly durable and resistant to degradation.
- **Maintenance and monitoring**: Regular maintenance and monitoring programs ensure the continued optimal performance of the cables, effectively extending their operational life indefinitely.
- **Efficiency and sustainability**: It is more efficient and sustainable to maintain and upgrade the cables as needed rather than decommissioning and replacing them.
- **Adaptability to growing power demands**: As power demands grow, the existing cable infrastructure can be expanded or upgraded to accommodate increased load. This flexibility eliminates the need for decommissioning and allows continuous adaptation to changing energy needs.

Given the project's objectives, the durability of the cables, economic factors, and the potential for future expansion, decommissioning is not relevant for the submarine and underground cable project. The focus is on ensuring long-term reliability, efficiency, and sustainability through proper maintenance, monitoring, and potential upgrades.

14 PROJECT BUDGET

In this chapter an indicative budget is presented for the environmental and social mitigation, management and monitoring measures of the project impacts of the interconnection project from Tanzania mainland to Pemba Island.

The Project costs for all infrastructures necessary for the full operation of the interconnection project is equal to **73.50 MUSD**.

Each table below specifies the environmental or social management or monitoring action and the schedule, detailing during which phase of project implementation (construction or operation) the relevant measure shall apply.

The budget has been evaluated considering the following components:

- Estimated program budget for the various Environmental Management activities relevant to the terrestrial physical environment to be conducted under the Environmental Management Plan as mentioned in chapter 5 that were estimated during construction phase and operation phase (see Table 14- 1).

Table 14- 1 – Budget for the management activities relevant to the impacts on terrestrial physical environment

ITEM	Project phase	US$
Air quality	Construction	-
Climate	Construction and Operation	5,000
Geology, Geomorphology and Soils	Construction	50,000
Water resources	Construction	100,000
Noise	Construction	50,000
TOTAL		**205,000**

- Estimated program budget for the various Environmental Management activities relevant to the terrestrial biological environment to be conducted under the Environmental Management Plan as mentioned in Chapter 11 that were estimated during construction phase and operation phase (see Table 14- 2).

Table 14- 2 – Budget for the management activities relevant to the impacts on biological environment

ITEM	Project phase	US$
Biodiversity Action Plan	Construction and Operation	30,000
Habitat loss and degradation, habitat fragmentation and barrier to movement	Construction	70,000
Introduction and spread of invasive alien species	Construction and Operation	60,000
Road kill	Construction	10,000
Disturbance, degradation and loss of mangroves	Construction	40,000
Human disturbance	Construction	10,000
TOTAL		**220,000**

- Estimated program budget for the various Social Management activities relevant to the socio-economic and cultural environment to be conducted under the Social Management Plan as mentioned in Chapter 11 that were estimated during construction phase and operation phase (see Table 14- 3).

Table 14- 3 – Budget for the management activities relevant to the impacts on social environment

ITEM	Project phase	US$
Labor	Construction	50,000
Occupational Health and Safety	Construction	50,000
Occupational and Community Health and Safety	Construction	100,000
Vulnerable Groups	Construction	90,000
Cultural Heritage	Construction	10,000
TOTAL		**300,000**

- Estimated program budget for the various Environmental and Social Management activities relevant to the marine environment to be conducted under the Environmental and Social Management Plan as mentioned in Chapter 11 that were estimated during construction phase and operation phase (see Table 14- 4).

Table 14- 4 – Budget for the management activities relevant to the impacts on marine environment

ITEM	Project phase	US$
Marine fauna, flora and habitats - Habitat loss and degradation, Habitat fragmentation, barrier to movement	Construction	35,000
Marine fauna, flora and habitats - Disturbance, degradation and loss of coral reefs	Construction	120,000
Marine fauna, flora and habitats - Noise pollution	Construction	-
Marine fauna, flora and habitats - Chemical pollution	Construction	-
Marine fauna, flora and habitats - Control invasive alien species	Operation	-
Water Quality	Construction	-
Maritime Traffic	Construction	-
Socio-economic activities: fisheries, tourism (diving sites. recreational activities), shipping and anchorage, etc.	Construction	-
TOTAL		**155,000**

- Estimated program budget for the various Environmental Monitoring activities relevant to the physical environment to be conducted under the Environmental Monitoring Plan as mentioned in Chapter 12 that were estimated during construction phase and operation phase (see Table 14- 5).

Table 14- 5 – Budget for the monitoring activities relevant to the impacts on physical environment

ITEM	Project phase	US$
Disposal of septic water	Construction	10,000
Rehabilitation of borrow areas and temporarily acquired land	Construction	20,000
Soil Erosion and Siltation	Construction	20,000
Management of hazardous and non-hazardous waste, hazardous materials	Construction	20,000
Air quality	Construction	10,000
Exceedance of noise levels	Construction	10,000
TOTAL		**90,000**

- Estimated program budget for the various Environmental Monitoring activities relevant to the biological environment to be conducted under the Environmental Monitoring Plan as mentioned in Chapter 12 that were estimated during construction phase and operation phase (see Table 14- 6).

Table 14- 6 – Budget for the monitoring activities relevant to the impacts on biological environment

ITEM	Project phase	US$
Pre-construction surveys of wildlife and vegetation	Construction	10,000
Monitoring of wildlife and vegetation with focus on alien invasive species	Construction	40,000
Coral reefs survey	Construction	15,000
No. of wild animals and birds affected by traffic accidents	Construction	-
Monitoring of wildlife and vegetation with focus on alien invasive species	Operation	100,000
Post-construction monitoring of marine communities	Operation	50,000
TOTAL		**215,000**

- Estimated program budget for the various Social Monitoring activities relevant to the socio-economic and cultural environment to be conducted under the Social Monitoring Plan as mentioned in Chapter 12 are included in the operational costs of the ESMD.

In the following Table 14- 7 the overall summary of the environmental and social costs to mitigate, manage and monitor all the impacts considered in this study is given. In this table also 10% contingency costs are also considered.

Table 14- 7 – Environmental and Social Budget Summary

ITEM	US$
Terrestrial Physical environment management measures	205,000
Terrestrial Biological environment management measures	220,000
Social environment management measures	300,000
Marine environment management measures	155,000
Overall management measures	**880,000**
Physical environment monitoring measures	90,000
Biological environment monitoring measures	215,000
Social monitoring measures (included in operational cost of ESMD)	-
Overall monitoring measures	**305,000**
Operational Cost of ESMD	**200,000**
Total	**1,385,000**
Contingencies (10%)	138,500
GRAND TOTAL	**1,523,500**

The overall environmental and social cost of project implementation represent the 2.1% of the development costs of Tanzania – Pemba Interconnection Project (73,500,000 US$).

ANNEXES

ANNEX 1 – APPROVAL LETTER OF SCOPING REPORT AND TOR FROM NEMC

THE UNITED REPUBLIC OF TANZANIA

VICE PRESIDENT OFFICE

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL (NEMC)

In reply please quote:

Ref: CB.145/330/222/02 **Date: 5th August, 2024**

Managing Director,
Tanzania Electric Supply Company Limited (TANESCO),
P.O. Box 453,
Dodoma.

RE: SCOPING REPORT AND TERMS OF REFERENCE (ToR) FOR UNDERTAKING ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED INSTALLATION OF 132KV POWER TRANSMISSION LINE (69.747KM) FROM THE EXISTING 32/33/11KV MAJANI MAPANA SUBSTATION IN TANGA REGION TO 132/33KV WESHA SUBSTATION IN PEMBA ISLAND

Reference is made to the above captioned subject.

2. The National Environment Management Council (NEMC) acknowledges receipt of your Scoping report submitted with draft Terms of Reference (ToR) for undertaking Environmental and Social Impact Assessment (ESIA) study for the aforementioned project. The project has been registered with an Application Reference Number (ARN) **EC/EIA/2024/0384.** Please quote this number in all future correspondences with the Council regarding this project.

3. According to the first schedule of the Environmental Management Act (EMA) Cap 191 and its subsequent Environmental Management (Environmental Impact Assessment and Audit) (Amendment), Regulations, 2018, this project falls under type A project for which Environmental Impact Assessment (EIA) Study is mandatory.

4. The Council reviewed the Submitted Scoping report and ToR and noted that most of the key issues that are required to be addressed during the detailed EIA study have been covered and thus the ToR are hereby approved.

5. The Council emphasizes to submit copies of scoping report to the identified relevant authorities and evidence of service should be submitted to the Council before the commencement of the EIA study as stated in Regulation 10(2) of the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018.

Head Office, Kambarage Tower, 6th Floor, P. O. Box 2724, Dodoma. Phone: +255 262960098, 0713608930,
Email Address: dg@nemc.or.tz Website: www.nemc.or.tz

6. In addition, the following information should be taken into consideration while preparing the EIA report: -

i. Recast project title on ToR to reflect line voltage of 132kV;
ii. The EIS should provide detailed description of the proposed project and other associated facilities. It should also clearly provide information on the source and types of the construction materials as well as the number, location and design of the campsites;
iii. The EIS should clearly discuss and provide all relevant required studies and survey of the project area;
iv. All key stakeholders not limited to such as Ministry of Energy, Ministry of Livestock and Fisheries, Marine Parks and Reserves Unit and all other relevant stakeholders are consulted and their views and concerns are addressed. Records of meetings, communication and comments should be provided. Consultation forms should bear recent date and each consulted stakeholder should sign against his/her name as the law requires.
v. Section 1.3 indicated on ToR; Baseline information should be specific to the project area of influence and should address the most current physical, biological, socio-economic and cultural environment including quantitative and qualitative baseline data for water, soil, air quality and noise level along the project area;
vi. Ensure compliance status of all applicable legal and policy frameworks and their respective requirements are addressed in the EIA report;
vii. In section 1.5 indicated in the ToR, include the following: -
    - A clear statement of the residual impacts and their significance should also be provided;
    - The significance of impacts should be assessed using the appropriate national and international quality standards where available.
viii. The EIA report should discuss alternative sites, undertakings, processes, technologies, design, and operating conditions; The main environmental advantages and disadvantages should be discussed and the reasons for the final choice given; a comparison should also be made of the alternatives in terms of potential environmental impacts;
ix. All experts involved in the study should sign the EIS with their original signatures, as per section 20 (1) of the Environmental Impact Assessment and Audit Regulation, 2005; The environmental expert undertaking the study including the firm, should indicate their registration and practicing status. Furthermore, **all foreign environmental experts undertaking environmental impact assessment study are required to obtain practicing permit** as provided in Regulation 24(2) of the Environmental Management (Registration and Practice of Environmental Experts) Regulations, 2021. Submission of documents which do not observe this requirement will be sent back to the proponent for adherence;

x. Detailed information concerning the identification and valuation process for the Peoples Affected Persons (PAPs), forest land and the village land should appear in the EIS. All permits from the relevant authority concerning the process of acquiring the land and minutes of MoUs should be appended in the EIS. Provide the surface right for the way leave and area(s) where camps will be located; Moreover, the proposed project should comply with the Urban Planning (Planning and Space Standards) Regulations;

xi. Preliminary engineering designs of the proposed project are discussed and appended in the EIS;

xii. The EIA report should provide Decommissioning Plan for the project; and

xiii. Under Reporting Requirements, the contents and the structure of the EIS should be presented according to Regulations 18(1) and (2) of the Environmental Impact Assessment and Audit Regulation, 2005 as well as the contents and structure of the Executive Summary should be as per Regulation 18 (3) of the Environmental Impact Assessment and Audit Regulation, 2005.

7. Upon Submission of the EIS, the Council will arrange for a technical review of the document by Technical Advisory Committee (TAC). Prior to this review, representatives of the Council will visit the project site to verify the adequacy of the report with respect to the proposed project site and surrounding environment. Upon submission of the EIS you will be required to as well pay to the Council a review cost though control number to be generated by the system. Kindly be informed that transportation cost for the site verification team "to and from the site will be covered by the proponent.

9. Looking forward to your cooperation concerning this project.

J. M. Baruti
For: DIRECTOR GENERAL

CC: TANSHEQ Limited,
P.O BOX 31517,
Dar es Salaam.

Head Office, Kambarage Tower, 6th Floor, P. O. Box 2724, Dodoma. Phone: +255 262960098, 0713608930,
Email Address: dg@nemc.or.tz Website: www.nemc.or.tz

ANNEX 2 – APPROVED TERMS OF REFERENCE OF THE EIA STUDY

ESIA SURVEY TERMS OF REFERENCE FOR 132 kV INTERCONNECTION FROM TANGA TO PEMBA ISLAND

In order to prepare a complete and comprehensive ESIA report, it is necessary to consult various sources of data and information. For the biological and ecological aspects, primary and secondary data will be used to assess potential impacts of the project implementation. Primary data consists of field data collection on species, habitats and ecosystems in the proposed project areas. Secondary data includes reviews of previous studies and research conducted in or near the proposed project area, previous reports from accredited sources, available national or international documentation, open access data analysis from scientifically recognised sources. Baseline information should be specific to the project area of influence and should address the most current physical, biological, socio-economic and cultural environment including quantitative and qualitative baseline data for water, soil, air quality and noise level along the project area. Potential impacts shall be analysed for each environment, and a clear statement of the residual impacts and their significance should also be provided. The significance of impacts should be assessed using the appropriate national and international quality standards where available.

The following field survey will be carried out to develop the baseline data for the different disciplines.

Terrestrial survey

Field surveys are an integral part of ESIA and play a key role in providing essential information on the biodiversity present in the project area and physical environment.

The primary objectives of these surveys are to:

1. Baseline assessment: The fundamental objective is to comprehensively assess and document the existing biodiversity in the project area before any development or human activities take place. This baseline information will serve as an important reference point for assessing the potential impacts of the proposed project on local ecosystems.
2. Species presence and distribution: Through careful observation and data collection, biodiversity surveys aim to identify and map the presence and distribution patterns of various species that occur in the project area.
3. Identification of rare and endangered species: Surveys are designed to identify the presence and distribution of rare and/or endangered species. Accurate documentation of these endangered populations will help guide conservation efforts and enable more informed decision-making regarding project development.
4. Habitat assessment: Detailed assessments of the habitats within the project area are carried out to understand their ecological importance and the role they play in supporting local biodiversity. Understanding the intricate relationships between species and their habitats helps to develop appropriate conservation strategies.
5. Biodiversity hotspots and sensitive areas: The surveys aim to identify areas of exceptional biodiversity importance, known as biodiversity hotspots, as well as regions that are particularly sensitive to environmental change. By identifying such areas, appropriate measures can be developed to protect their unique ecological value.
6. Air quality and noise: The surveys aim to measure and document the current levels of air pollutants (e.g., PM2.5, PM10) and noise in different project areas and to identify areas with particularly high levels of air pollution and noise.

Vegetation and forest data collection

The proposed biodiversity survey will involve the following main field activities for the botanist:

- **Transects**. These field survey activities involve the surveyor sampling vegetation in the field, walking a predetermined 500 m transect to collect habitat and vegetation data.

  The proposed methodology involves conducting transect surveys, where surveyors systematically assess habitats and plants along designated paths. This approach provides valuable insights into the distribution, abundance and diversity of species in different habitats and landscapes.

  Careful consideration is given to habitat diversity in determining the location of transects, with particular attention paid to sensitive habitats such as wetlands and riverine areas. Accessibility will also be considered and each transect will be located close to roads to facilitate implementation.

  During the transect surveys, surveyors will collect data on plants and habitat. The surveyors involved will meticulously record the following:

  5. Plant species: This includes trees, shrubs and herbaceous species encountered along the transect. Although the exact location of each plant species may not be possible, the surveyors will document their presence and estimate their abundance within the transect.
  6. Main habitats: The surveyors will consider each habitat type encountered within each transect. This information will provide insight into the extent and distribution of different habitats along the transect line.
  7. Abundance: For plant species, standardised abundance classes are used to document their relative abundance within each transect.
  8. Dominant species: Observations of the primary habitat type and any dominant species within each transect will be recorded.

  By meticulously implementing this comprehensive data collection approach, the vegetation survey aims to provide a thorough understanding of the plant communities across different habitats within the project area. These findings will be invaluable in informing the environmental impact assessment and contributing to sound decision-making for the proposed transmission line project.

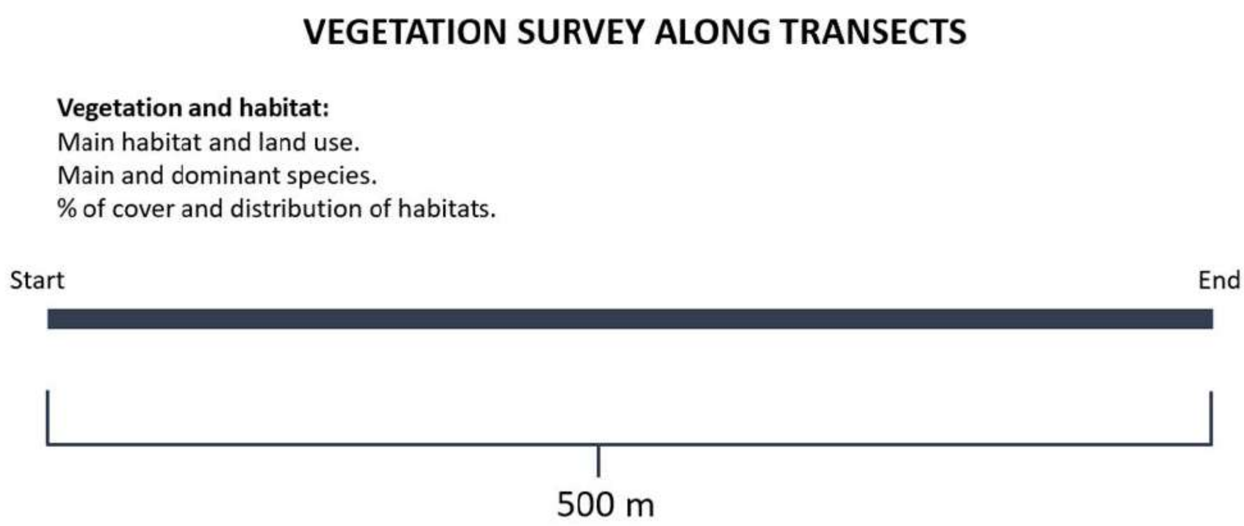

Figure 0- 1 – Scheme of the vegetation survey along transects

- **Vegetation plot** sampling is a systematic method used in ecology and environmental science to study and analyse plant communities in a given area. A 10x10m vegetation plot is established at the start of each transect. The botanist will collect vegetation data including species name, abundance (% cover of the 10x10m plot), habit, DBH and hight for trees, and local use of the plants.

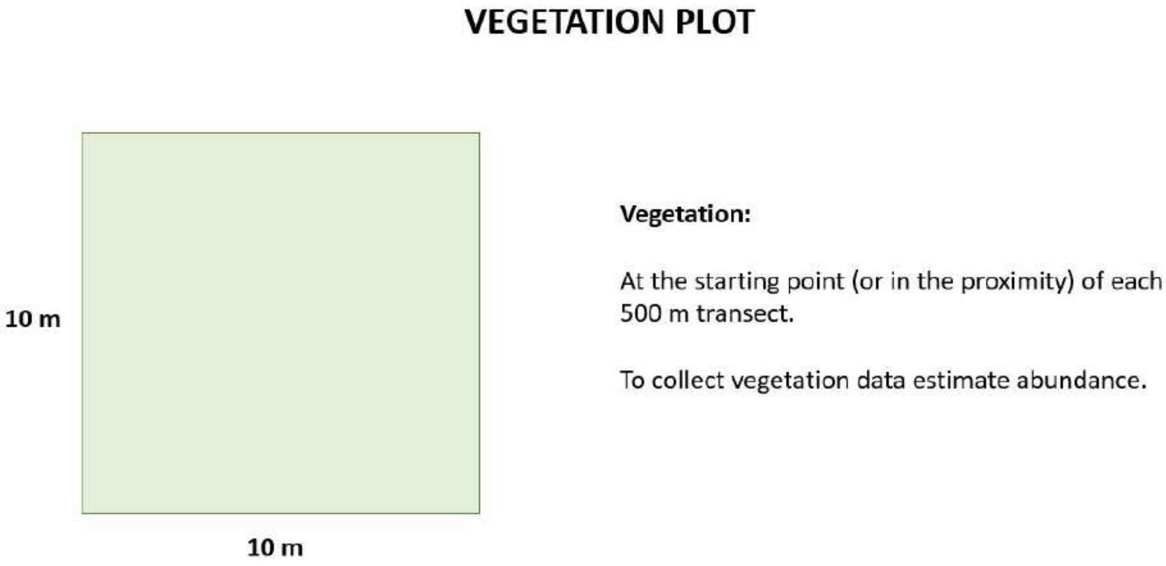

Figure 0- 2 – Scheme of vegetation plot

Wildlife data collection

The proposed biodiversity survey will involve the following main field activities for the wildlife experts:

- **Vehicle-based survey:** This data collection method involves surveyors making observations and collecting data while travelling in a vehicle. Commonly used in wildlife studies, environmental assessments, bird surveys, roadkill monitoring and general biodiversity assessments, this approach involves driving along predetermined routes or transects. Surveyors observe and record information about the target species or environmental factors. To minimise disturbance to wildlife and the surrounding environment, the vehicle speed is kept low to allow for thorough observation and data collection.

  The proposed routes of the transmission line roughly follow the roads. Baseline wildlife and habitat data will be collected along the entire route, including:

  - Documenting instances of roadkill, noting species and location using GPS coordinates.

  - Making direct observations of birds and other wildlife, recording their locations, species and abundance (estimating abundance where accurate counts are not possible).

  In those sections where the road crosses and/or is close to the proposed transmission line routes, the survey will be more detailed and focus on additional aspects beyond those already mentioned:

  - Bird (and other wildlife such as mammals) species diversity: start the survey maintain a slow and steady pace while driving along the designated route. Record information on species, approximate numbers, any notable behaviour or vocalisations, location and approximate distance from the road.

- **Transects**: These field survey activities involve the surveyor sampling wildlife in the field, walking a predetermined 500 m transect to collect habitat and wildlife data.

The proposed methodology involves conducting transect surveys, where surveyors systematically assess habitats and animals along designated paths. This approach provides valuable insights into the distribution, abundance and diversity of species in different habitats and landscapes.

The surveyors will record the presence and location of wildlife species encountered along the transect and note any direct or indirect sign of presence of animals, including: mammals, birds, herptiles and arthropods.

- Other opportunistic data: near and within project area, opportunistic data will be collected on wildlife.

Equipment

A comprehensive array of essential equipment is required to facilitate the successful execution of all field activities:

7. Camera: The camera serves as an indispensable tool for capturing photographs during sampling activities, allowing for the meticulous documentation of various habitats and the presence or abundance of different species. By visually recording these crucial aspects, the camera enables accurate and thorough analysis, aiding in comprehensive assessments and conclusive findings.
8. Binoculars: Specifically designed for enhanced visibility, binoculars play a pivotal role in the identification of bird species and other fauna. The capability to observe distant wildlife and closely inspect their distinctive features greatly contributes to accurate species identification, thereby enriching the overall data collection process.
9. GPS (Global Positioning System): Employing advanced GPS technology, this essential device is instrumental in registering and precisely tracking survey points, transects, and species locations within the designated project area. The accurate geospatial data acquired through the GPS ensures the creation of reliable maps and facilitates data integration for informed decision-making.
10. Audio Recorder: Designed to capture high-quality audio recordings, the audio recorder is of utmost importance in recording the vocalizations and calls of animals that may not be easily distinguishable through visual means. This invaluable tool significantly aids in identifying species and analysing behavioural patterns, contributing to a comprehensive understanding of the local fauna's diversity.
11. Field Guides: A collection of meticulously curated field guides serves as an invaluable resource for the team of ecologists and biologists. These guides provide comprehensive information on the local flora and fauna, enabling accurate species identification and aiding in the classification of various ecological components encountered during the survey.
12. Data Sheet: A structured data sheet is an essential element of the equipment, meticulously designed to systematically capture and organize vital information gathered during field activities. This includes details on species encountered, their habitat characteristics, abundance, and any other relevant ecological observations. The data sheet ensures the integrity and coherence of collected data, facilitating its later analysis and interpretation.
13. Air quality monitor: Air quality monitors are instruments used to measure the concentration of various pollutants in the air. A handheld device will be used to collect data on PM10 and PM2.5 levels, which are two common types of particulate matter (PM). The adopted monitor will measure PM in micrograms per cubic meter ($\mu g/m^3$).
14. Sound lever meter: Noise levels will be measured within the project areas using a handheld sound level meter. These meters typically use A-weighting, which is a frequency weighting that approximates the human ear's sensitivity to sound. This weighting ensures the measured decibel (dB) level reflects perceived loudness more accurately.

Air quality and noise data collection

Data on air quality and noise will be collected within project areas to measure current levels of air pollutants noise levels. This environmental survey will involve collecting data across different project areas, including landing points, transmission line corridors, and substation areas, to gather comprehensive information about the existing environmental conditions. At each station, data on noise levels and specific air pollutants (PM2.5, PM10, Total Volatile Organic Compounds, and HCHO) will be collected.

Marine surveys

Five data collection techniques will be employed for the marine survey:

a) Surveys of planktons using towing standard plankton net,
b) Surveys of marine benthos using Eckman grab through skin dives along line transect,
c) Surveys of marine benthos (corals community including fish) through dives along line transect,
d) Opportunistic recording of organisms,
e) Interview with key informants to determine familiar marine organisms in the study area.

Benthic survey on subtidal areas

Besides the normal surveys applying snorkelling, the area of project sites to be studied will be divided into benthic regions. In these areas, pairs of divers will descend to the pre-determined reef site with a 50-metre tape measure. Observation of marine resources will be done based on English et al. (1994) to describe the substratum.

Fish Surveys (reef areas)

Surveys will be conducted by pairs of divers swimming along the 50-metre tape on either side of the pipe as used in the benthic survey described by English et al. (1994). Species included in the census are visually and numerically dominant, without cryptic behaviour, are easily identified underwater, and are associated with reef habitats (English et al., 1994). The survey teams swim slowly along each transect recording a tally of target fish species encountered 2.5 metres either side and 5 metres above the line on a pre-drawn dive slate. Furthermore, a visit will be made to a fish landing site for surveying types of species caught.

General invertebrate and observational survey method

This survey method will be applied in conjunction with the 50 metre LIT benthic survey described in section 1.1.1 whereby a second diver in the survey team will take the readings while the first diver completes the LIT. The 10-metre survey line is laid at the chosen reef site as described in Section 3.1. The same will be done in other non-reef areas.

Plankton surveys

Continuous Plankton Recorder (CPR) will be used to sample planktons within the marine area where pipeline pass. The CPR is towed at a depth of approximately 10 metres. Water passes through the CPR and plankton are filtered onto a slow-moving band of silk (270 micrometre mesh size) and covered by a second silk. The silks and plankton are then spooled into a storage tank containing formalin. On return to the laboratory, the silk is removed from the mechanism and divided into samples representing 10 nautical miles (19 km) of tow.

Occurrence, distribution and abundance of threatened terrestrial species

Several studies have been conducted to assess the plant and animal biodiversity in the Coastal forests (e.g. CMEAMF, 2003 – 2008; Frontier Tanzania – several reports, Munishi et al., 2007; Burgess – several studies; Makonda et al., 2012) and the Coastal Forests of Tanzania and Kenya (e.g Howell et al., 2012; Birdlife International, (2013). Searching of such different sources of information will be conducted to enhance development of a comprehensive account of the available flora and fauna species, their occurrence and distribution. The encountered species will each, be subjected to examination through the List of East African (LEAP) database as well as various updated Red List summary reports by CITES and IUCN. An updated draft of the biodiversity status and trends report for the region will then be prepared based on the analysis of the above collated data.

Marine water quality

For marine water quality, data will be collected on:

- Visibility
- Temperature
- Salinity
- TDS (Total Dissolved Solids)
- Conductivity

Opportunistic Surveys

During surveying in the intertidal and subtidal areas of any human activity, including Zebu grazing, witnessed will be noted. If possible local villagers additionally will be interviewed in order to ascertain how they use the mangroves and whether they are being used at a sustainable or non-sustainable level.

Equipment

1. Van Veen grab SG
2. Plankton net
3. Multiparameter Sondes
4. Boat

Dive gears; BCD and Snorkel

Social Survey

The survey will be focused on defining the social profile of the communities and the people whose livelihood will be impacted by the project.

The survey will collect qualitative data that will be corroborated with secondary quantitative data extracted from Census Survey, which is a reliable source of data dated 2022. The survey will collect the demographic data, socio economic profile of affected ward from secondary sources. Direct data collection will be carried out in the communities living in the proximity of the landing point and the new underground cables.

The data will be collected through three methods:

1) Key Informant Interview
2) Focus Group Discussion
3) Visual inspections

The targets of these interviews will be:

1) Fishermen and users of the marine ecosystem services

2) Women with any means of livelihood linked to the marine ecosystem service
3) People living in the proximity of the project area
4) Village leaders

Guiding Questions

- *What types of fishing are practiced?*
- *With what tools?*
- *At what depth?*
- *At what times of the year?*
- *What are the most valuable fish on the market that are caught in the area? (fish and price per kg)*
- *What are the fish that sell the most? (fish and price per kg)*
- *How much does a fishing family earn on average in a month?*
- *How much does it affect the family's income? 20% - 50% -70% - 70%+*
- *What are the other economic activities of the family? employment, agriculture, business*
- *Do women fish? If so, how do they fish? Do they sell the catch or use it for food?*
- *Do you practice religious or traditional rites on the beach or in the sea?*
- *Is timber harvested in the beach area?*
- *How are labor relations structured in fisheries? I'll put a list of possibilities*
- *Independent fisherman with his boat*
- *Independent fisherman with his boat and workers (paid in cash or in catch?)*
- *Fishermen's Cooperative Etc.*
- *What is the most frequent case among the options above?*
- *Are there any cooperatives or fishermen's associations with which to dialogue for the regulation of fisheries?*
- *Are there currently any particular areas in the area where fishing is prohibited?*
- *What are the main crops that are cultivated in the areas? (list crop per season)*
- *How many fishermen use the mooring (10? – 50? – 100? – more than 100)*
- *Is the berth used all year round?*
- *Are there specific periods of higher turnout?*
- *What is the nearest dock?*
- *Why don't they use the nearest dock?*
- *Is there a fee for the nearest berth?*
- *If so, how much does it cost and how much does it affect their expenses and earnings?*
- *Is the landing point docked by anyone?*
- *If so, by whom? Is it paid?*

ANNEX 3 – EIA CERTIFICATE FROM NEMC

GN. No. 349

THE UNITED REPUBLIC OF TANZANIA

ENVIRONMENTAL IMPACT ASSESSMENT

Certificate

[Section 92(1) of the Environmental Management Act NO.20 of 2004]

Registration No. EC/EIA/2024/0384

This is to certify that

M/S *TANZANIA ELECTRIC SUPPLY COMPANY LIMITED*

of *P.O. BOX 453, DODOMA*

has this day been granted an Environmental Impact Assessment Certificate for the proposed project/activity titled INSTALLATION OF 132KV POWER TRANSMISSION LINE FROM THE EXISTING 132/33/11KV MAJANI MAPANA SUBSTATION IN TANGA REGION TO 132/33KV WESHA SUBSTATION IN PEMBA ISLAND

to be implemented/carried out at MAJANI MAPANA AREA, TANGA CITY IN TANGA REGION

This certificate shall remain in force during the whole lifecycle of this specific project unless henceforth revorked or suspended.

General condition and terms attached to this certificated are set out herein behind and specific conditions are annexed.

Dated this 12th day of August 2024

RBIXL2BCFHBW4D8X
Digitally Signed By Dr. Ashatu K. Kijaji (MP)

Minister of State, Vice President's Office - Union and Environment

CONDITIONS OF CERTIFICATE

1. This Certificate is valid during the whole lifecycle of this specific project unless henceforth revoked or suspended.

2. The Minister shall be notified of any transfer/variation/surrender of this certificate.

3. Observe all relevant national policies and legislation that guide this specific project throughout its life cycle.

4. Ensure safe disposal of all types of wastes (solid or liquid) in specified sites.

5. Ensure environmental sustainability by avoiding any form of pollution by using most viable management techniques.

6. Adhere to the Environmental Management Plan (EMP) and Monitoring plan (MP) and constantly improve and update them by taking into account any new development.

7. Constantly liaise with relevent authorities and consult stakeholders including local communities in case

of any new development or changes as regards to implementation of your project plan activities.

8. Adhere to all proposed mitigation measures as specified in the Environmental Management Plan contained in the Environmental Impact Statement.

9. Abide to all national social and environmental safeguard policies and standards and strive to maintain and constantly improve standards.

10. Prepare an Emergency and Contingency plan and put in place risk and safety measures.

11. Conduct periodic Environmental Audits and facilitate monitoring by relevant authorities.

12. Design and implement an internal Environmental and Safety Policy and Awareness Programme.

13. Prepare Annual Environmental Reports and any other reports requested by competent authorities and the Government.

14. Obtain all other relevant permits.

The above conditions shall be read together with the specific conditions spelt out in the Annex attached to this Certificate

ANNEX 4 – SUB-PLANS FOR MANAGEMENT AND MONITORING

To minimize the negative environmental and social impacts from the project, specific preliminary plans have been prepared as guidelines. The following plans shall guide and support during implementation and management during construction and operation.

SP01: Erosion and Sediment Control Management Plan
SP02: Water and Soil Pollution Management Plan
SP03: Air Pollution and Dust Management Plan
SP04: Noise and Vibration Management Plan
SP05: Waste Management Plan
SP06: Hazardous Material Management
SP07: Vegetation Clearing Management Plan
SP08: Biodiversity Action Plan
SP09: Traffic Management Plan
SP10: Cultural Heritage Management Plan
SP11: Occupational Health and Safety Management Plan
SP12: Community Health and Safety Management Plan
SP13: Stakeholders Engagement Management Plan
SP14: Local Employment Management Plan
SP15: Contractor Management Plan
SP16: Labor Influx Management Plan
SP17: Security Management Plan
SP18: GBV / SEA / CAE Plan
SP19: Labor Management Plan
SP20: Emergency Preparedness and Response Plan

The Contractor shall prepare detailed Site-Specific Management and Monitoring Plans for the implementation and monitoring of the above listed plans.

The Data Sheets on the following pages describe each of the required Sub-Plans. They serve as a basis for the Contractor who will have to prepare his own EH&S plans not necessarily limited to the 16 points above.

These Plans shall be prepared by the Contractor in the early stages of construction site development, and they shall be approved by the Project Owner, because they need to be in place and functional before main works start.

It is important to include this EMMP in the Tender Documents, to make sure that the Contractor knows EH&S requirements in detail.

SP01: Erosion and Sediment Control Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation material, earth movements, spoil disposal areas, roads
Environmental aspect	Sediment pollution of waterways, landslides
Description of Impact	Soil erosion might result from construction activities where the vegetation cover is removed. Main soil erosion will result from excavation. Soil erosion and landslides may occur along the access roads, during the construction period, particularly in the rainy season.
Affected Activities	Clearing of vegetation. Spoil disposal area. Temporary stockpiles. Use of access roads by construction vehicles.
Consequence	Destroying bottom species habitat, blocking sunlight of newly established vegetation, reducing photosynthesis, carrying attached mass of pollutants such as heavy metals. Damaging aquatic life. Damaging roads by landslides. Blocking of drainage channels and pipes.
Management and Measure	Minimize the erosion and sediment impact with good management and appropriate practices. Working in erosion sensitive areas shall be restricted only to dry season. Undertake earthworks strictly within marked areas, avoiding soil disturbance beyond these areas. Erodible construction stockpile shall be at least 30 m from drainage lines or water way. Stockpiles shall be stabilized. In windy conditions, the stockpiles shall be covered or watered to prevent to generate excessive dust. Steep slopes shall be avoided and stabilized, compacted and strengthened with appropriate drainage systems. The erosion and sediment controls shall be installed as early as possible after the commencement of vegetation clearance. Sediment controls such as sediment trap and silt fences shall be installed with adequate capacity. Sediment collection devices (including sediment basins, silt fences and sediment traps) shall be emptied when the capacity of the collection pool reach of 50%. Monitoring shall be conducted to inspect erosion and sediment control facilities to ensure protection and maintenance. Preserve the existing vegetation as much as possible to reduce the runoff flow velocities. Re-vegetation shall take place as soon as possible, after vegetation

	clearing or excavation, where applicable. Discharged water from excavation or drilling shall not be discharged directly into natural water source but shall pass through sediment traps.
Monitoring	Visual observation of steep slopes, excavation areas, and areas where the vegetation has been cleared.
Period of Implementation	Starting when construction starts, ending by completion of construction and re-vegetation works.
Frequency	Weekly visual observation and TSS monitoring during dry season and more frequent during wet season.
Training	Training for inspection of erosion and sediment control facilities.
Facilities, Equipment, Material and Supply	Analytical equipment and material
Compliance	Water Quality Guidelines for the Protection of Aquatic Ecosystem and IFC EHS guidelines on Ambient Water Quality

SP02: Water and Soil Pollution Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase and Operation Phase
Place	Construction site, Substations, Workshops, Canteen
Environmental aspect	Water Quality, Health
Description of Impact	Deterioration of the surface water and groundwater quality when discharging the polluted wastewater without appropriate treatment. Health effects from polluted supply and drinking water.
Affected Activities	Effects on water resources in the areas used by the construction activities such as workshops, painting, construction works, substations, etc. Surface water and groundwater contamination at waste disposal areas. Discharged effluent from batching plants. Erosion and sediment pollution of waterways during earthworks and site disturbance. Pollution of waterway by BOD, fecal Coliform, oil, grease, etc. at the substation. Lack of access to clean water and sanitation.
Consequence	Negative impact on aquatic life and on human health. Contamination of soil and water sources.
Management and Measure	Reasonable treatment shall be implemented to reach the targets of the Tanzanian National Environmental Standard. The water treatment systems must be adequately sized and structurally capable to treat water for consumption as well as wastewater. Surface wastewater in the workshop and construction areas Water from all construction sites and particularly the one coming from the workshop area must be collected, treated and filtered with grease trap before discharge. Sewage wastewater Waste water from substations construction sites must be collected and treated in septic tanks before discharge. Sewage from portable toilets must be collected in portable containers and treated before discharge. Canteen wastewater must be filtered with grease trap before discharge. Drinking water and supply water Drinking and supply water must comply with Tanzanian standards for Drinking Water Quality.

Monitoring	Visual observation of treatment facilities, repair area, re-fueling area and practice, storage area for hazardous substances such as waste engine oil, transformers oil, grease, and hydraulic oil. Water quality monitoring shall begin as soon as project construction start, to control the quality of discharged water to waterways. Continuous monitoring of drinking water quality at the points of consumption. Effluent water monitoring program shall be routinely conducted and sampling locations, parameters specified in national or international standards shall be identified. Water quality needs to be monitored at each location where wastewater (treated water) discharges into natural surface water. Monitoring locations shall be located within 50m upstream and downstream of the relevant discharge point, where practical. If more than two discharge points are located within less than 100m of each other, only one upstream and one downstream monitoring location shall be required. Based on the results of water quality monitoring, the project developer shall be notified immediately in case of a condition that could cause harm to humans or the environment.
Period of Implementation	Starting when construction starts, continues during operation phase for the substations
Frequency	As shown in SP02-1: Schedule of Water Quality Monitoring Requirements
Training	Training in inspection of wastewater treatment including wastewater operation and maintenance. Training of drinking and supply water treatment operations including chlorine residual monitoring. Training of water sampling and basic water quality analysis. Provision of introduction and regular training for environmental and health awareness to all workers.
Facilities, Equipment, Material and Supply	Treatment plants and equipment to achieve the management and water monitoring.
Compliance	The stricter among Tanzanian National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

Table SP02 -1: Schedule of Water Quality Monitoring Requirements

Location	Parameters	Frequency
Upstream and downstream of storm water discharged outlets at all construction sites	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Biological Oxygen Demand (BOD5)	
	Total Suspended solids (TSS)	
	Total and Total Dissolved Phosphorous	
	Oil and Grease	
	Faecal coliforms	
Working areas where vehicle or machinery maintenance are located within 200m of a drainage channel	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Suspended solids (SS)	
	Oil and Grease	
Discharge of sewage treatment plant	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Biological Oxygen Demand (BOD5)	
	Total Suspended solids (TSS)	
	Total Dissolved solids (TDS)	
	Total Phosphorous (TP)	
	Total Kjeldahl Nitrogen (TKN)	
	Nitrate Nitrogen (NO3)	
	Oil and Grease	
	Faecal Coliforms	
Drinking water	Temperature	Monthly
	pH	
	Colour	
	Taste and Odor	
	Turbidity	
	Electrical Conductivity	Every 3 months
	Total Suspended solids (TSS)	
	Total Dissolved solids (TDS)	
	Total Hardness	
	Chlorines Residual	Daily (to define Chlorine Dose)
	Total Coliform Bacteria	Monthly
	Faecal Coliforms Bacteria	Monthly
	E-coli Bacteria	Monthly
	Sulphate	Every 3 months

SP03: Air Pollution and Dust Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation, Blasting, Roads, Spoil disposal sites.
Environmental aspect	Air quality and health
Description of Impact	Drilling, blasting, loading, hauling, conveying rocks, crushing and transporting the final product are all activities which generate dust. Dust and other particle pollution by construction activities can negatively impact the health and the quality of life of people working on and living close to the sites.
Affected activities	Construction machinery and transporting of material. Activities from crushing and batching plant. Vehicle movements on unpaved roads. Uncontrolled waste burning. Excavation activities, especially in the dry season.
Consequence	Negative impact on air quality and health of workforce
Management and Measure	Spraying water on unpaved roads and stockpiles, especially at hot, dry and windy weather conditions. Limiting the spread of dust through enclosures for transport and crusher, wet drilling, automatic sprinklers at strategic points, etc. Impose an appropriate reduced speed limit at project site. Re-scheduling activities and operations with excessive dust emissions to reduce negative impacts. Meteorological monitoring for wind direction and wind speed may also be required to facilitate interpretation of the monitoring and mitigation procedure. No uncontrolled burning of waste. Adequately maintain vehicles and machinery. Use of effective PPE, in particular anti-pollution masks or N95 masks which eliminate up to almost 90% of the PM2.5 particles (surgical mask are unable to stop the PM10 and PM2.5 particles).
Monitoring	Visual observation for dust emission. Ambient air quality monitoring and particulate monitoring.
Period of Implementation	Starting when construction preparation works starts, ending by completion of construction and re-vegetation works.
Training	Training on heavy vehicle driving, loading and unloading. Awareness raising and enforcing the use of appropriate PPE (masks, etc.) at high-risk particle areas. Training on inspection of dust emission including wastewater operation and maintenance. Training on particle sampling and particle analyzing.
Facilities, Equipment, Material and Supply	Equipment for particle monitoring (handheld). Analytical equipment and material.
Compliance	The stricter among Tanzanian National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP04: Noise and Vibration Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation, Blasting, Spoil disposal sites, Roads.
Environmental aspect	Noise and health
Description of Impact	The most significant noise and vibration impacts are from construction and transportation activities. The three main sources are (i) noise related to the construction activities (vehicles, machines), (ii) heavy duty traffic, and (iii) blasting activities.
Affected Activities	Construction machinery and delivering of material. Activities from batching plant. Excavation and blasting.
Consequence	Annoyance and health impacts of construction workforce. Potential of noise nuisance and vibration to local communities and wildlife in the project area.
Management and Measure	Constructors should be aware not to carry out noisy work at nighttime hours. Provide and used of PPE (ear protectors) when exposed to excessive noise (noise level and noise duration). Using hearing protection for exposure that equals or exceeds 80 dB(A). Maintain vehicles and stationary equipment in good working order. Installation of noise mufflers on all engines. Use of explosives only during daylight hours and avoid any intensive noise works during nighttime. Blasting activities should be announced and communicated in advance. Prohibit close access to blasting sites during blasting activities.
Monitoring	Institutional responsibilities: Contractor Noise monitoring to address noise in the workplace.
Period of Implementation	Starting when construction preparatory works starts, ending by completion of construction.
Training	Training and awareness raising related to noise and vibrations. Training employees in the proper use of PPE (ear protection)
Facilities, Equipment, Material and Supply	Field observation and handheld noise monitor equipment
Compliance	The stricter among Tanzanian National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP05: Waste Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase and Operation Phase
Place	Construction site, substations, workshops.
Environmental aspect	Environment, groundwater, and health and safety impacts
Description of Impact	Waste generated from the construction activities may cause impacts to the environment and human health. Disposal costs need to be balanced against environmental impact. Inappropriate landfills may deteriorate the soil, contaminate the groundwater environment and lead to formation of GHGs. Incineration reduces the solid mass of the original waste by 80-85% but may cause undesired air pollution. The most sustainable approach for waste management is to reduce, reuse, and recycle.
Affected Activities	Inappropriate waste disposal planning and management
Consequence	Contamination of surface water and groundwater by spilling or leaking storage, transportation, and disposal of waste. Health impacts from inappropriate (hazardous) waste disposal. Air pollution during incineration or inappropriate waste landfill installation. Vectors attraction and pathogens.
Characteristics	Management depends on the type of waste generated: Non-Hazardous waste: any garbage including domestic and construction waste The latter consists of unwanted material produced directly or incidentally by the construction activities. Most of the construction solid waste are (i) wood, (ii) concrete, (iii) bricks, and (iv) metal. Hazardous waste Potentially harmful to environment and health. Can be liquids, solids, semi-solid. Soil contaminated by fuel or oil shall be managed as hazardous waste. Some have a long-term latency due to bioaccumulation, or carcinogenic or mutagenic effects. Chemical waste used oil and grease, batteries and electronic equipment, paint and solvents are categories of hazardous waste. Batteries shall be recycled by specialized external companies or authorities. Further information on Solid Waste Classification shown in Table SP05-1
Management and Measure	Waste management and collection must follow the relevant regulations. Different types of solid waste shall be separated and disposed separately according to the environmental guidelines. Provide adequate garbage bins for different types of waste (organic, non-organic, and hazardous). Waste bins and containers shall be marked clearly with “non-hazardous waste” (dry waste or wet waste) and “hazardous waste” for waste separation and sorting. Open dumping and open burning must be forbidden and waste reduction enhanced by the triple R strategy (reduce, reuse, and recycle waste). Any waste unable to be reused or recycled shall be disposed at an

	appropriate facility according to its type. Adequate and appropriate Personal Protective Equipment (PPE) shall be used at waste related activities. Non-Hazardous waste All non-hazardous waste shall be collected and taken to a Waste Segregation Center. Organic waste shall be separated and composted. Combustible waste shall be separated and shall be burned in appropriate incinerators. Ash and other residues from the incinerators shall be considered hazardous waste. Bottom ashes are taken to the hazardous waste landfill to avoid any risk related to remaining heavy metals or biohazards. Construction waste Construction waste shall be separated and reused if possible before disposal at the construction waste landfill. Non-reusable and non-recyclable construction waste shall be disposed at an authorized waste landfill. Hazardous waste Hazardous waste shall be collected and taken to the Waste Segregation Center. Non-combustible hazardous waste shall be disposed at the hazardous waste landfill according to appropriate best practices and at least 200 m away from any waterways (streams and river). Oil contaminated water shall be sent through an oil separator before being treated. Batteries are considered hazardous waste and shall be collected separately and forwarded to an appropriate recycling facility. Used oil shall be stored in closed drums and in a secure closed storage building before being transferred to appropriate treatment facilities outside of the project area. There shall be no sources of ignition permitted within 50m of the perimeter of the storage area. Hazardous waste disposal and storage areas must be appropriately labeled in relevant languages and with symbols. Containers must be adequately labeled with “hazardous waste” in local language and English and with symbols. Hazardous waste must be stored and disposed in the most suitable manner to minimize the impact to the environment. Spill kits and absorbents must be available in all areas with hazardous waste (storage area, workshops, etc.).
Monitoring	Proper waste management must be regularly monitored to address and ensure that arising issues are identified and handled properly.
Period of Implementation	From construction start until the operation phase
Training	Awareness raising and instructing workers and project stakeholders about appropriate measures related to waste: reduce, reuse, recycle, separation. Training of employees on appropriate waste segregation. All workers responsible for hazardous waste handling shall receive appropriate waste management training including Spillage Response

	Training.
Facilities, Equipment, Material and Supply	Spill kits and absorbents must be made available in all areas where hazardous waste is handled (storage area, workshop, etc.).
Compliance	The stricter among Tanzanian National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

Table SP05-1: Solid Waste Classification and Separation Guidelines

A: Non-Hazardous Waste	**B: Hazardous Waste**
Group A1: Recycle or reusable Plastic bottle (except any toxic or chemical product containers) Recyclable Metal Cardboard Glass Aluminium beverage can Clean paper and One side used A4 paper Recyclable Machinery parts Rubber Waste Tires Other recyclable construction debris	Group B1: Hazardous Waste High Acids or High Alkalis waste Sediment from the batching and cement productions Solvent Chemical Batteries Used oil Empty Fuel drums, oil drums, and other any toxic or chemical product containers e.g. chemicals, paint, oil, solvents. Bottom ash from the incinerations Paint and paint waste Spill clean-up waste Insulation material Hydraulic fluid Soil contaminated with hazardous material Waste from grease traps Other waste with unknown composition
Group A2: Organic waste or biodegradable Vegetable scraps Food waste Wet Vegetation debris (unable to burn) Other biological waste	-
Group A3: Combustible Solid (Unrecyclable) Pallets Unrecyclable wood Household waste Plastic or used plastic bag	-
Group A4: Construction Metal. Wood Concrete	-
*Any Non-Hazardous Waste mixed/contaminated with Hazardous waste, will be classified as Hazardous waste.	

SP06: Hazardous Material Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction and operation phases
Place	Construction site, workshops, storage
Environmental aspect	Soil, water, groundwater and health& safety
Description of Impact	Hazardous material may cause environmental impact, injury or death. The procedures and practices of handling, storage, transportation, removal and disposal of all hazardous materials shall be managed appropriately. When hazardous material is no longer usable for its purpose and is intended for disposal, it keeps its hazardous properties.
Affected Activities	Spillages or leakages of hazardous material (during use or storage). Inappropriate waste disposal planning and management. The major hazardous substances and material likely to be used during construction and operation activities are: Petroleum products such as oils, fuels and lubricants Concrete admixture Paint and solvents Explosives Herbicides, pesticides Acidic chemicals Contaminated waste materials Flocculants Adhesive
Consequence	Contamination of surface water and groundwater from spills or leaks during use, storage, transportation, and disposal. Environmental and health impacts from inappropriate hazardous waste handling.
Management and Measure	Pest Management Plan shall be prepared to prevent and minimize potential impact to health and environment. Any oil contaminated waste will be considered hazardous waste and disposed appropriately. Fuel and lubricants must be stored away from waterways, in tight containers placed on sealed surfaces. Vehicles maintenance must be away from waterways and in specifically allocated sites (workshops) on impermeable flooring such as concrete floor to prevent contamination of soil and water. All workshops shall be equipped with appropriate oil separators. The storage and handling of used oil must be in appropriate tanks or containers which must be labelled appropriately such as “Used Oil” in relevant languages and symbols. Waste oil shall be disposed or recycled appropriately. Hazardous materials shall be stored in suitable storage locations with appropriate labeling in relevant languages and with symbols. Containers with hazardous material or chemicals must be labelled with: “Hazardous Material”, date of storage, exact scientific and brand name and physical state (gas, solid, liquid), hazardous character (corrosive, toxic,

	reactive, ignitable), danger to user (poison, burning, etc.) Hazardous materials must be used, stored and disposed in a manner which minimizes negative impacts to the environment and according to the Material Safety Data Sheet. Store hazardous materials above flood level in sealed containers. Information of all hazardous materials movements from storage and to waste disposal sites shall be registered. There shall be no sources of ignition permitted within 50m of the perimeter of the storage area and labelled “Hazardous Material Storage Area” and “No Smoking” labels and posters shall be placed wherever fuel is handled or stored in both Local language and English. Spill kits and absorbents must be made available at handling and storage areas. Any spillage must be retained and cleaned as soon as practicable as possible. Store facilities including workshop have impermeable flooring where wash water, sludge and spills can be drained and collected for proper disposal. Used oil and other hazardous waste shall be provided with drainage leading to the oil separator or treatment facilities before discharged. Dumping of any contaminated material into the environment is prohibited. Transportation procedures must be prepared according to international accepted standards. Each storage container should be labelled with the necessary precaution information and signs. Storage facilities shall be locked and the access limited to authorize staff only. Explosive material shall be stored in the protected facilities e.g. underground or bund wall. Explosives shall be labelled with appropriate signs and the explosives storage area with “Explosive Storage Area” and “No Smoking” labels and posters. Labelling must be in relevant languages (Local Language and English). For any movement of explosives, the quantity and type of explosives and the name of the user and date shall be registered and recorded. Adequate fire-fighting equipment shall be available in the explosives and hazardous material storage facilities. Discharge of oil or chemical contaminated water into the environment is prohibited. Personal protective equipment (PPE) including emergency eyewash and shower stations shall be made available and be enforced to use.
Monitoring	Proper waste management must be regularly monitored to address and ensure that any issue is identified and handled properly. Frequent visual observation of containers, labels, collection register, etc.
Period of Implementation	From construction start until the operation phase
Training	Instruct workers and relevant people on appropriate measures such as minimization of spill and to raise the awareness. All workers responsible for hazardous waste handling shall receive appropriate waste management training including spillage response training, safe operating procedures, safe work practices, emergency

	procedures.
Facilities, Equipment, Material and Supply	Spill kits and absorbents must be in all locations where hazardous materials are handled and stored.
Compliance	The stricter among Tanzanian National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP07: Vegetation Clearing Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	All construction areas
Environmental aspect	Flora, terrestrial and aquatic fauna, erosion, air pollution by greenhouse gases
Description of Impact	Vegetation clearing may lead to habitat reduction, biomass reduction and expansion of project's carbon footprint.
Affected Activities	Inappropriate vegetation clearing. Using of herbicides, pesticides. Fire risk from uncontrolled burning (in dry season). Safety risk of the tree cutting and falling.
Consequence	Greenhouse gas emission and habitats' shrinking
Management and Measure	The use of herbicides and chemical substances are prohibited for vegetation clearing. A benchmark (clear disclosure of the biomass right of way clearing extension) shall be marked prior to the clearing activities. Only selected and marked trees shall be cut. Cutting activities and extension shall be monitored. Endangered tree species shall be clearly marked, recorded and moved, if possible. Provide appropriate PPE to the biomass clearing workers and train/ instruct them on the proper use of chainsaws and appropriate cutting techniques. Fire control zones around the clearing area shall be established, if required, to prevent uncontrolled burning.
Monitoring	Visual site inspection, verify the compliance with the specific Biomass Clearing Plan.
Period of Implementation	Starting when right of way clearing starts, ending by completion of project.
Training	Instruct workers and relevant people on appropriate cutting and burning techniques. All workers responsible for biomass clearing shall receive appropriate cutting training including safety operation procedures.

SP08: Biodiversity Action Plan

Developer	TANESCO / Contractor
Project Phase	Construction and Operation Phase
Place	Entire project area.
Environmental aspect	To minimize the impact and degradation of habitat, wildlife and aquatic species.
Description of Impact	Biodiversity Management Plan shall be prepared to prevent and minimize potential negative impact to the flora and fauna by the project activities.
Affected Activities	The entire project area.
Consequence	Disturbance to fauna and flora species.
Management and Measure	Establish and enforce rules for workers to prohibit hunting, fishing, and wood cutting. Develop and implement a comprehensive bio-monitoring program. The monitoring results must be sufficient to establish a robust baseline and to identify the change caused by project activities. The biomass clearing plan shall clearly avoid over-clearing.
Monitoring	Visual site inspection, verify the compliance according to the biodiversity management plan. Site surveys including counting of species.
Period of Implementation	Starting when construction starts, ending 5 years after operation started.
Training	Raise awareness of the importance to protect threatened species and not to trade, poach, or hunt them.
Facilities, Equipment, Material and Supply	Survey equipment and interviews.

SP09: Traffic Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction and Operation Phase
Place	Access road
Environmental aspect	Air pollution, health and safety risks
Description of Impact	Emission of air pollution resulting from the material and personnel transport. Hazards to property, injury and fatalities to worker or people. The transportations may impact the local circulation networks such as slower traffic due to heavy loads.
Affected Activities	Transportation, vehicle movement, loading and unloading
Consequence	Traffic accident, dust emission, air pollution
Management and Measure	Further Traffic Management Plan shall be developed and implemented (speed limits, load limits, training, routes to follow, avoidance of sensitive areas, regular maintenance). Security as needed to prevent unauthorized access to the project locations. Only registered vehicles shall be used in the dam construction areas. Erosion control must be implemented along the access roads. Make best efforts to always keep public roads accessible. Any closures (transport of large equipment) shall be notified in advance the relevant authorities. Dirt roads in the construction area shall be regularly sprayed with water to reduce dust generation in accordance with SP03: Air Pollution and Dust Control. Proper engineering design of access roads. In high slope areas adequate erosion control and drainage system shall be installed. Adequate signs, warnings, barriers and sufficient lighting to prevent accidents shall be installed and maintained. All traffic signs must be in a relevant language (English, Indonesian and local language) and contain symbols if possible. Community Health and Safety training shall be carried out. Safety training dedicated to children shall be carried out. Maintenance program for access roads shall be implemented before rainy season. Traffic and freight of hazardous goods (flammable hazardous petroleum products) must follow applicable rules and regulations. Traffic management through daily fleet management to avoid accidents. Enforce maximum load restrictions. Regular inspections of vehicles and project fleet. No driving allowed under the influence of drugs or alcohol. Speed limits shall be applied to minimize dust emission and risk of accidents. Vehicles exhaust and noise shall follow Tanzanian standards.

Monitoring	Internal monitoring by the contractor and supervision of contractor's performance by the project owner's environmental staff. Traffic Management plan shall be monitored daily to avoid congestion and minimize accident risks. Survey road and traffic conditions. Visual observation. Recording of road accidents. Drugs and alcohol checks.
Period of Implementation	During construction (starting at first traffic activity) and operation
Training	Training for drivers of trucks, cars, etc. and registration of training attendance. Awareness safety training among communities and children.

SP10: Cultural Heritage Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Project construction
Environmental aspect	Cultural heritage and social impact
Description of Impact	Cultural and Natural Heritage might be destroyed by the excavation, construction.
Affected Activities	Excavations works.
Consequence	Cultural and natural heritage loss.
Characteristics	The Cultural Heritage shall be defined as Remains and objects left by previous human inhabitants such as shrines, graveyards, burial sites. Natural heritage includes flora and fauna such as rare conservation species, canyons, caves, waterfalls.
Management and Measure	Construction activity shall be immediately stopped if potential cultural heritage is identified. Requirement to report to the relevant local authority. The contractor shall be allowed to continue work only after official notification. Work shall proceed only after clearance by cultural and archaeological authorities such as Department of National Heritage and local GON organization. Develop a Cultural Heritage Management Plan (CHMP) to protect local cultural heritage from the adverse impacts of project activities. Archaeological survey shall be conducted before the construction commencement. A Chance find procedure mechanism for construction activities shall be developed before construction activities start (guidelines are included in this section). Provision of grievance mechanism with multiple communication channels that allows them to express concerns without risking punishment or retribution.
Monitoring	Approve documentation and interviews with governmental agencies, site managers, the village committee and selected households. Ensure that the project activities do not impact religious sites, cultural property and common property resources.
Period of Implementation	Starting when construction starts until operation
Training	Construction workers shall be trained in identifying potential heritage sites and items and appropriate reporting.
Compliance	Cultural Heritage Management Plan (CHMP), Labour Force Management Plan (LFMP), Chance finds Procedure.

Chance Finding Procedure

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during project construction or operation.

The procedure is applicable to all activities conducted by the personnel, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

- All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.
- Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;
- Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
- Record details in Incident Report and take photos of the find;
- Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
- Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
- Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry/Agency, once completed.
- In case of significant find the Agency/Ministry (Agency for Protection of National Heritage or Archaeological Research Centre, hereinafter referred to as Heritage team) should be informed immediately and in writing within 7 days from the find (ref.law on heritage protection).
- The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.
- The Ministry must investigate the fact e response in writing.
- Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
- Construction works could resume only after permission is granted from the responsible authorities.

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Communities and Workers Health and Safety
Description of Impact	Accidents, Fatal Accidents, Near Misses, Spread of Diseases, Decrease of quality of life
Affected Activities	All related works activities
Consequence	Social Unrest, Slowdown or stop of works, Impacts on quality of life, Reputational Consequences
Management and Measure	Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; training of workers; documentation and reporting of occupational accidents, diseases, and incidents; Emergency prevention, preparedness, and response arrangements. Appropriate fencing / signage at site entrance. Appointment of site security personnel. Road safety measures. First aid and medical assistance. HS measure at community level. Workers' accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC and the EBRD from 2009 on Workers' accommodation Systematically planned and participatory hygiene promotion campaigns can reduce water, sanitation and hygiene (WASH)-related diseases in camps. Hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing and reduction of household drinking water contamination. Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities and provision of awareness and prevention briefings. Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling & Testing (VCT) targeting PACs. Implement and evaluate quarterly (this activity shall be planned in conformity to Health Regulation at District Level) Prevent spread of respiratory disease, including the production of epidemics that can pass back and forth between the project and the community.

	Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. Distribute of mask to prevent from dust in the villages most impacted by the air pollution Provision of Mosquito nets and repellent Training on good practices and behavior to minimize the risks These activities shall be planned in conformity to Health Regulation at District Level Hiring on full time basis a nurse, a medical doctor and ESHS managers Install clinic for emergencies and provide at least one ambulance available at site full time
Monitoring	Worker camps audit reports as per CHECKLIST ON WORKERS' ACCOMMODATION (Annex 1 of guidance note by IFC on Workers' accommodation) Photographs demonstrating corrective measures implemented. Number of STIs treated Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures. Number of TBs treated Contractor HS internal audits and statistics. Records of accidents and near misses. Record of illness, diseases. Record of grievances. Record of emergencies. Informal feedback on effectiveness of Occupational and Community HS plan. Description / photographs of fencing / signage around site perimeter. Contractors to provide PLN with CV and training certification of security personnel proposed as per contract requirements. Site registry identification system.
Period of Implementation	Submit the plan before the mobilization phase
Frequency	Quarterly Basis
Training	HSE trainings for community and workers First Aid - Firefighting- other as per working activities
Facilities, Equipment, Material and Supply	PPE as per project activities, First aid kits, firefighting systems, warning systems, Ambulance, Lodging, Canteen, HS facilities, Sanitary facilities (men and women separated),
Compliance	National Standards, ILO Standards, ILO conventions ratified by Government of Tanzania, Guidance note by IFC.

SP13: Stakeholders Engagement Management Plan

INFORMATION REQUIRED	DETAILS
Developer	TANESCO
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Management of Project Stakeholders Relation
Description of Impact	Social Unrest, Friction with Local Authorities, Delay in Authorization Processes
Affected Activities	All construction works activities
Consequence	Stop or slowdown of construction works
Management and Measure	Describe regulatory, lender, company, and/or other requirements for consultation and disclosure Develop a Stakeholders Map and a Stakeholder Engagement Matrix including at least Villages Heads Traditional Leaders District Road Authorities Health authorities Forest authorities Contractors TANESCO Women Representatives Youth representatives Directly affected Households Vulnerable Groups Identification of key stakeholders potentially involved in the management of project GBV, their capacity and potential roles and responsibilities Define a communication plan with periodic meeting with stakeholders to integrate the Stakeholder Engagement with the Project Cycle detailing which information will be disclosed and the periodicity of the external reports. Define communication tools and languages, including local dialects, where necessary Describe resources and responsibilities for implementing stakeholder engagement activities detailing the number and qualification of staff necessary Describe how stakeholder engagement activities will be incorporated into a company’s management system Create Project Information Centre for affected communities Include Project Grievances Redress Mechanism, specifying the methods to disseminate it and the responsibilities for managing it. Define a Budget
Monitoring	Compliance Monitoring through Records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information.

	Participatory monitoring through the involvement of affected stakeholders in scientific sampling methods and analysis observations by affected parties, triangulated to strengthen validation group discussions on the success of mitigation or benefit measures and/or on how to manage new issues that have arisen
Period of Implementation	All the project Phases
Frequency	Not less than one in a Month
Training	Capacity-building and training programs to enable project-affected people or local organizations to acquire the technical skills necessary to participate in effective implementation programs and monitoring
Facilities, Equipment, Material and Supply	Dissemination tools
Compliance	Project Disclosure Policy, National Standards and IFC Stakeholder Engagement Good Practice Note

SP14: Local Employment Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Employment
Description of Impact	Short and Medium Terms Employment
Affected Activities	All activities
Consequence	Social Unrest Abuse of local work force Decrease of workers wellbeing
Management and Measure	Work with the procurement team to ensure that contracts with (sub) contractors and agencies follow national law in the country of operation, with company codes of conduct and policies, and with ILO, AfDB guidelines. Develop an action plan in cooperation with TANESCO and local authorities to prioritize recruitment among affected communities indicating manpower needs, time schedule and provision of training. Define a procedure to keep track of directly affected people hired by the consultant in cooperation with TANESCO using a shared affect households records/database distributed by TANESCO and local authorities. Develop a Human Resources Policy in compliance with TANESCO related policy guaranteeing at least freedom of association and collective bargaining; prohibit the hiring of underage workers, as defined in relevant ILO Conventions; prohibit recruitment, use and practices of forced labor and child labor; prohibit discrimination in hiring practices or pay; provide fair and favorable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; guarantee freedom of movement in and out of the workplace and workforce accommodation; guarantee wages as per industry standards/minimum wage; guarantee access to workforce grievance mechanisms; guarantee provision of sufficient rest periods and rest days to avoid fatigue; guarantee safe and healthy work place conditions; guarantee provision of food and water for drinking and sanitation; guarantee working conditions and accommodation standards; guarantee provision of appropriate personal protective equipment Adopt a Worker Accommodation Management Plan AS PER guidance note by IFC on Workers' accommodation. Develop a workers' grievances mechanism, a workers' code of

	conducts and GBV action plan. Contractually require all (sub)contractors to adhere to Contractor and TANESCO Human Resources Policy, workers grievances mechanism, a workers' code of conducts and GBV action plan, Community and Occupational HS Plan
Monitoring	Consult the Contractors and Subcontractors employment logs, verify against national and international standards working hours, leave, salary, health and safety condition, lodge arrangements. Interviews with key informants Record of meetings and communication to workers Gender breakdown of local workforce employed by contractor and subcontractors
Period of Implementation	Pre - Construction – Construction – Operation
Frequency	Quarterly Basis
Training	HS training general and specifics as per plans' needs,
Facilities, Equipment, Material and Supply	PPE, Lodging, HS facilities, Sanitary facilities, Canteen Provide separate facilities for women
Compliance	Project ESMP and related policies, standards, laws.

SP15: Contractor Management Plan

INFORMATION REQUIRED	DETAILS
Developer	TANESCO
Project Phase	Pre-Construction – Construction
Place	Entire Project Area
Social aspect	The CMP highlights all responsibilities, requirements and work statements that are expected of the contractors and how they will be delivered to the beneficiary. The contract management plan will consist of procuring, tracking and managing contracts to ensure all contractual obligations are fulfilled, including those related to environmental, social health and safety safeguards. The Contractors themselves will be required to develop their own detailed environmental, social health and safety management plans/action plans as per Project ESMP, which will reflect the commitments in this CMP and which demonstrate how they will meet these commitments.
Description of Impact	Environmental damages, decrease of wellbeing and social impacts due to non-compliance to Project ESMP, national regulations and international standards,
Affected Activities	All the activities
Consequence	Increase pf costs, slow down of construction activities, social unrest, etc.
Management and Measure	Define the Contractors' and Subcontractors' engagement and management processes, procedures and systems used; define roles and responsibilities for Contractors and its Subcontractors, as well as the relationship and cooperation between all parties, with regards to all Project activities; outline the applicable Project Standards relevant to the Contractors and its Subcontractors; set out the processes to ensure the implementation, by the Contractors and its Subcontractors, of all requirements, project commitments, conditions, methods (work statement for the construction phases), and procedures applicable to them, intended to assure the execution of the Project; define training requirements; establish a Grievance Mechanism about other Construction Environmental and Social Management Plans; define monitoring and reporting procedures, including Key Performance Indicators (KPIs), to monitor the performance of the Contractors and its Subcontractors; Define intervention procedures, i. e. the way will liaise to sort out any issues, namely related with non-compliance and/or environmental and social performance. contractors' environmental, social, cultural heritage management of contractors
Monitoring	On time delivery of contractually obligated deliverables as per mutually agreed plans Deliverables uploaded to knowledge system according to agreed timeframe. Supporting/ working documents uploaded (Templates, weekly status reports, minutes of meetings, training manual, project progress etc.) Number of ESHS people proposed, rejected or replaced due to performance

	issues or not meeting the expectations. Number of non-compliances registered
Period of Implementation	Pre-Construction – Construction
Frequency	Quarterly Basis
Training	As per plan indications
Facilities, Equipment, Material and Supply	NA
Compliance	TANESCO Policies and AfDB standards, Project ESMP related provision, BD

SP16: Labor Influx Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction
Place	Entire Project Area
Social aspect	Community Relations
Description of Impact	Social Conflicts
Affected Activities	All activities
Consequence	Social Unrest Violence Decrease of community well being
Management and Measure	Employ local workers to reduce labour influx, avoid child labour as per ILO regulations Define numbers of expected incoming workers and where they would come from (non-local, national, foreign, rural, urban). Propose accommodation options for workers. Propose mode of transport from point of origin, and between worker camp(s) and work site(s). Assess Likelihood that family members accompany workers (visiting, resident). Identify formal and informal service providers, including businesses and individuals aiming to provide goods and services to the project, contractors, sub-contractors, and workers. Consider National and International legislation on employment of workers relevant to project (migrant workers, minimum age, disability, etc.). Country- and sector-specific considerations, including coverage and enforcement of legislation. Screening worker influx for communicable disease and providing treatment, as appropriate, to reduce exposure to local population Vaccinating workers against common and endemic (locally prevalent) diseases
Monitoring	Supporting/ working documents uploaded (Templates, weekly status reports, minutes of meetings, training manual, project progress etc.) Grievances raise by community or workers N of penalties Conflicts reported
Period of Implementation	Pre - Construction – Construction
Frequency	Quarterly Basis
Compliance	Project ESMP and related policies, standards, laws.

SP17: Security Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Internal and external risk to the security
Description of Impact	Damages to the project
Affected Activities	All activities
Consequence	Social Unrest Violence Decrease of community well being
Management and Measure	Address: Internal Risks as illegal, unethical, or inappropriate behaviour of project personnel or those directly affiliated with it, such as employee theft, workplace violence, and labor unrest, potentially with associated sabotage). External Risks as those caused by the actions of people outside the project who seek to take advantage of opportunities presented by the development and operation of the project, such as common criminal activity; disruption of the project for economic, political, or social objectives; and other deliberate actions that have a negative impact on the effective, efficient, and safe operation of the project. In extreme cases, these could include terrorism, banditry, inter/intra community conflicts, armed insurgency, coups, or war. The plan shall indicate: Risk description Likelihood of the risk occurring Impact if the risk occurs Severity Rating based on impact & likelihood. Responsibility (Person who will manage the risk). Mitigating action Contingent action (Action to be taken if the risk happens)
Monitoring	
Period of Implementation	Pre - Construction – Construction
Frequency	Quarterly Basis
Compliance	Project ESMP and related policies, standards, laws.

SP18: GBV / SEA / CAE Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Place	Entire Project Area
Social aspect	Community Wellbeing
Description of Impact	Sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work.
Affected Activities	All activities
Consequence	Permanent health and psychological damages of victims of abuse
Management and Measure	Contractors are required to have sexual harassment policies and Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. Worker Code of Conduct shall be translated in local language(s) The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV), sexual abuse exploitation (SEA), child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site Develop a "child labour monitoring" system, a three-person team of community members (such as a school teacher, mothers' club member or retired policeman) are given training in how to monitor child labour. They then periodically visit places where children are likely to be working. If they find a child, they report the case to a specially constituted community committee, as well as to the labour inspector or local government authority for follow-up. Depending on the child's situation, the committee will recommend a course of action, Protecting older children in or at risk of hazardous work offering comprehensive packages of training and services to facilitate the transition from school to decent work (skills, apprenticeships, vocational training, job counselling, enterprise development, financing) Raising awareness among employers of productivity gains to be achieved through improvement of working conditions to a level that is safe for young people to work. Establishing joint worker-employer safety committees, safety representatives and connections to workers' organizations to provide

	support for young people in the work environment. Ensuring regular inspection of enterprises regarding workplace conditions and adherence to minimum age restrictions Training frontline health-care providers to detect and document occupational injuries, illnesses of children, GBV and CAE Define Roles and Responsibilities Define a management and consultations schedule
Monitoring	Safety Audits through key informant interviews, FGD N and Records of the awareness Trainings Men & Boys Self-Assessment Form – Awareness Raising N of qualified experts involved in the management and follow up of issues related to GBV/CAE/SAE GRM log Records of community monitoring N of cases registered or reported by Health care providers
Period of Implementation	All project phases
Frequency	On quarterly Basis
Training	Awareness training for workers GBV/CAE/Child labor Monitoring training for inspectors selected from community, health providers etc.
Facilities, Equipment, Material and Supply	As per plan needs
Compliance	National Legislation, AfDB and IFC Standards

SP19: Labor Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Employment
Description of Impact	Short and Medium Terms Employment
Affected Activities	All activities
Consequence	- Social Unrest - Abuse of local work force - Decrease of workers wellbeing
Management and Measure	- Work with the procurement team to ensure that contracts with (sub) contractors and agencies are in compliance with national law in the country of operation, with company codes of conduct and policies, and with ILO, AfDB guidelines. - Develop an action plan in cooperation with TANESCO/ZECO and local authorities in order to prioritize recruitment among affected communities indicating manpower needs, time schedule and provision of training - Define a procedure to keep track of directly affected people hired by the consultant in cooperation with TANESCO/ZECO using a shared affect households records/database distributed by TANESCO/ZECO and local authorities - Develop a Human Resources Policy in compliance with TANESCO/ZECO related policy guaranteeing at least - freedom of association and collective bargaining; - prohibit the hiring of underage workers, as defined in relevant ILO Conventions; - prohibit recruitment, use and practices of forced labour and child labour; - prohibit discrimination in hiring practices or pay; - provide fair and favourable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; - avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; - guarantee freedom of movement in and out of the workplace and workforce accommodation; - guarantee wages as per industry standards/minimum wage; - guarantee access to workforce grievance mechanisms; - guarantee provision of sufficient rest periods and rest days to avoid fatigue; - guarantee safe and healthy work place conditions; - guarantee provision of food and water for drinking and sanitation; - guarantee working conditions and accommodation standards; - guarantee provision of appropriate personal protective

	equipment - Adopt a Worker Accommodation Management Plan as per guidance note by IFC and the EBRD from 2009 on Workers' accommodation. - Develop a workers' grievances mechanism, a workers' code of conducts and GBV action plan - Contractually require all (sub)contractors to adhere to Contractor and TANESCO/ZECO Human Resources Policy, workers grievances mechanism, a workers' code of conducts and GBV action plan, Community and Occupational HS Plan
Monitoring	• Consult the Contractors and Subcontractors employment logs, verify against national and international standards working hours, leave, salary, health and safety condition, lodge arrangements. • Interviews with key informants • Record of meetings and communication to workers • Gender breakdown of local workforce employed by contractor and subcontractors
Period of Implementation	Pre - Construction – Construction – Operation
Frequency	Quarterly Basis
Training	HS training general and specifics as per plans' needs,
Facilities, Equipment, Material and Supply	PPE, Lodging, HS facilities, Sanitary facilities, Canteen Provide separate facilities for women
Compliance	Project ESMP and related policies, standards, laws.

SP20: Emergency Preparedness

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction and Operation Phase
Place	Entire project area
Environmental aspect	Environmental, Health, and Safety
Description of Impact	Emergency response plan must be developed and established before construction for any potential emergency event to occur at the project site.
Affected Activities	Unexpected occurrence demands immediate actions.
Consequence	To provide guidance and procedures and implementation of emergency preparedness plans.
Management and Measure	Develop and implement an Emergency Response and Evacuation Plan for any event such as flood, earthquake, explosion, structure collapse or failure, sabotage, loss of person, landslides, darkness and power outages, chemical and hazardous material spills, severe injuries and illness, forest or other fires and any accident related to the project. Two documents are required, an emergency preparedness plan (EPP) and an emergency response plan (ERP). Ensure safety and emergency training for all employees and workers. Provision of emergency medical equipment and services such as oxygen, electrical stimulator and stimulant, ambulance, etc. Access to emergency response and procedures. Emergency response and emergency contact numbers at employees' ID cards and visitor cards. Emergency phone number such as of police, fire-fighters, hospital, safety manager, security manager should be provided at the hazardous work place and advertising boards. Emergency drills shall be organized and maintained at least twice a year. Establish an emergency organization team and response. Emergency response procedures, emergency contact numbers and communication and reporting procedures shall be clearly displayed at each component of the construction site. First aid team shall be provided with appropriate equipment. Medical staff and first aid kits must be accessible and available at all times. Chemical and hazardous material accidents shall be treated according to the Material Safety Data Sheet (see SP06: Hazardous Material Management).
Monitoring	Ensure availability of an Emergency Response Plan including equipment and staff.
Period of Implementation	During construction and operation
Training	Provision of first aid courses and emergency response training for all employees and workers.
Facilities, Equipment, Material and Supply	First aid or health center with well-equipped and supplies for all basic requirements from first aid to emergency treatment. Fire fighter and ambulance with appropriate equipment and staff.
Compliance	Emergency Preparedness Plan (EPP) and Emergency Response Plan (ERP).

ANNEX 5 – FLORA AND FAUNA DATA

Table 0- 1 – Wildlife transects and coordinates (from the field study – June 2024)

ID	Coordinates (WGS84, UTM 37S)		Date
	X	Y	
T_T01	508821	9437720	08/06/2024
	508787	9437626	
	508776	9437529	
	508808	9437435	
	508857	9437348	
	508907	9437262	
	508919	9437243	
T_T02	513717	9436330	08/06/2024
	513808	9436371	
	513865	9436414	
	513961	9436403	
	514022	9436345	
	514079	9436345	
	514110	9436339	
T_T03	514853	9435983	08/06/2024
	514782	9436053	
	514709	9436120	
	514653	9436202	
	514631	9436273	
	514604	9436282	
	580635	9421679	
	580559	9421631	

ID	Coordinates (WGS84, UTM 37S)		Date
	580504	9421627	

Table 0- 2 – Flora and habitats transects and coordinates (from the field study – June 2024)

ID	Coordinates (WGS84, UTM 37S)		Date
	X	Y	
TSS500m	508226	9438419	08/06/2024
	508288	9438340	
	508340	9438255	
	508390	9438169	
	508444	9438084	
	508491	9437996	
	508522	9437947	
TSE500m	508985	9437066	08/06/2024
	509022	9436974	
	509069	9436885	
	509117	9436797	
	509165	9436709	
	509186	9436671	
TL500m	514597	9436140	08/06/2024
	514501	9436170	
	514410	9436204	
	514315	9436236	
	514220	9436265	
	514137	9436303	

ID	Coordinates (WGS84, UTM 37S)		Date
	514131	9436310	
	580485	9421502	
	580444	9421593	
	580402	9421684	
	580361	9421775	
	580320	9421867	
	580288	9421938	

Table 0- 3 – Flora and habitats plots and coordinates (from the field study – June 2024)

ID	Coordinates (WGS84, UTM 37S)		Date
	X	Y	
TL1-TL500m	514596	9436142	08/06/2024
TSE1-TSE500m	508983	9437066	08/06/2024
TSS1-TSS500m	508221	9438415	08/06/2024

Table 0- 4 – Threatened terrestrial fauna in Tanga project area according to IUCN database

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Amphibian	HYPEROLIIDAE	*Afrixalus sylvaticus*	-	VU	Endemic/RR
Bird	TURDIDAE	*Geokichla guttata*	Spotted Ground-thrush	VU	Endemic/RR
Bird	ACROCEPHALIDAE	*Acrocephalus griseldis*	Basra Reed-warbler	EN	-
Bird	ARDEIDAE	*Ardeola idae*	Madagascar Pond-heron	EN	-
Bird	FALCONIDAE	*Falco concolor*	Sooty Falcon	VU	-
Bird	BUCEROTIDAE	*Bucorvus leadbeateri*	Southern Ground-hornbill	VU	-
Bird	ACCIPITRIDAE	*Trigonoceps occipitalis*	White-headed Vulture	CR	-
Bird	ACCIPITRIDAE	*Gyps rueppelli*	Rüppell's Vulture	CR	-
Bird	ACCIPITRIDAE	*Torgos tracheliotos*	Lappet-faced Vulture	EN	-
Bird	ACCIPITRIDAE	*Gyps africanus*	White-backed Vulture	CR	-
Bird	ACCIPITRIDAE	*Necrosyrtes monachus*	Hooded Vulture	CR	-
Bird	ACCIPITRIDAE	*Terathopius ecaudatus*	Bateleur	EN	-
Bird	SAGITTARIIDAE	*Sagittarius serpentarius*	Secretarybird	EN	-
Bird	ACCIPITRIDAE	*Polemaetus bellicosus*	Martial Eagle	EN	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Bird	ACCIPITRIDAE	*Aquila rapax*	Tawny Eagle	VU	-
Insect	MEGAPODAGRIONIDAE	*Amanipodagrion gilliesi*	-	CR	Endemic/RR
Insect	ACRIDIDAE	*Parodontomelus arachniformis*	Northern Forest Grasshopper	VU	Endemic/RR
Insect	LENTULIDAE	*Mecostibus minor*	Little Shortheaded Grasshopper	VU	Endemic/RR
Crustacean	POTAMONAUTIDAE	*Potamonautes infravallatus*	-	VU	Endemic/RR
Mammal	HERPESTIDAE	*Bdeogale omnivora*	Sokoke Dog Mongoose	VU	Endemic/RR
Mammal	EMBALLONURIDAE	*Taphozous hildegardeae*	Hildegarde's Tomb Bat	EN	Endemic/RR
Mammal	CERCOPITHECIDAE	*Colobus angolensis* ssp. *palliatus*	Peter's Angolan Colobus	VU	-
Mammal	RHINOCEROTIDAE	*Diceros bicornis* ssp. *minor*	South-eastern Black Rhino	CR	-
Mammal	MANIDAE	*Smutsia temminckii*	Temminck's Pangolin	VU	-
Mammal	FELIDAE	*Panthera pardus*	Leopard	VU	-
Reptile	VIPERIDAE	*Bitis gabonica*	Gaboon Viper	VU	-

Table 0- 5 – Threatened marine fauna in the project area according to IUCN database

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Coral	ACROPORIDAE	*Acropora aculeus*	-	VU	-
Coral	ACROPORIDAE	*Acropora hemprichii*	-	VU	-
Coral	ACROPORIDAE	*Acropora horrida*	-	VU	-
Coral	ACROPORIDAE	*Acropora pharaonis*	-	VU	-
Coral	ACROPORIDAE	*Acropora solitaryensis*	-	VU	-
Coral	ACROPORIDAE	*Acropora verweyi*	-	VU	-
Coral	ACROPORIDAE	*Acropora willisae*	-	VU	-
Coral	ACROPORIDAE	*Alveopora allingi*	-	VU	-
Coral	ACROPORIDAE	*Alveopora daedalea*	-	VU	-
Coral	ACROPORIDAE	*Alveopora fenestrata*	-	VU	-
Coral	ACROPORIDAE	*Isopora brueggemanni*	-	VU	-
Coral	ACROPORIDAE	*Isopora cuneata*	-	VU	-
Coral	ACROPORIDAE	*Montipora calcarea*	-	VU	-
Coral	ACROPORIDAE	*Montipora caliculata*	-	VU	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Coral	ACROPORIDAE	*Montipora stilosa*	-	VU	-
Coral	AGARICIIDAE	*Leptoseris incrustans*	-	VU	-
Coral	AGARICIIDAE	*Pavona cactus*	-	VU	-
Coral	AGARICIIDAE	*Pavona decussata*	Cactus Coral	VU	-
Coral	AGARICIIDAE	*Pavona venosa*	-	VU	-
Coral	COSCINARAEIDAE	*Anomastraea irregularis*	-	VU	-
Coral	COSCINARAEIDAE	*Horastrea indica*	-	VU	-
Coral	DENDROPHYLLIIDAE	*Duncanopsammia peltata*	-	VU	-
Coral	DENDROPHYLLIIDAE	*Turbinaria mesenterina*	-	VU	-
Coral	DENDROPHYLLIIDAE	*Turbinaria reniformis*	-	VU	-
Coral	DENDROPHYLLIIDAE	*Turbinaria stellulata*	-	VU	-
Coral	EUPHYLLIIDAE	*Euphyllia cristata*	-	VU	-
Coral	EUPHYLLIIDAE	*Galaxea astreata*	-	VU	-
Coral	FUNGIIDAE	*Cycloseris curvata*	-	VU	-
Coral	HELIOPORIDAE	*Heliopora coerulea*	Blue Coral	VU	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Coral	LOBOPHYLLIIDAE	*Acanthastrea hemprichii*	-	VU	-
Coral	LOBOPHYLLIIDAE	*Lobophyllia ishigakiensis*	-	VU	-
Coral	MERULINIDAE	*Astraeosmilia connata*	-	VU	-
Coral	MERULINIDAE	*Catalaphyllia jardinei*	-	VU	-
Coral	MERULINIDAE	*Echinopora robusta*	-	VU	-
Coral	MERULINIDAE	*Favites spinosa*	-	VU	-
Coral	MERULINIDAE	*Leptoria irregularis*	-	VU	-
Coral	MERULINIDAE	*Paragoniastrea deformis*	-	VU	-
Coral	MERULINIDAE	*Paramontastraea serageldini*	-	VU	-
Coral	MERULINIDAE	*Pectinia africana*	-	VU	-
Coral	MERULINIDAE	*Pectinia lactuca*	Lettuce Coral	VU	-
Coral	NOT ASSIGNED	*Pachyseris rugosa*	-	VU	-
Coral	PLEROGYRIDAE	*Physogyra lichtensteini*	-	VU	-
Coral	PORITIDAE	*Porites nigrescens*	-	VU	-
Echinoderm	HOLOTHURIIDAE	*Actinopyga echinites*	Deep Water Redfish	VU	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Echinoderm	HOLOTHURIIDAE	*Actinopyga miliaris*	Harry Blackfish	VU	-
Echinoderm	HOLOTHURIIDAE	*Holothuria fuscogilva*	-	VU	-
Echinoderm	HOLOTHURIIDAE	*Holothuria lessoni*	Golden Sandfish	EN	-
Echinoderm	HOLOTHURIIDAE	*Holothuria nobilis*	Black Teatfish	EN	-
Echinoderm	HOLOTHURIIDAE	*Holothuria scabra*	Golden Sandfish	EN	-
Echinoderm	STICHOPODIDAE	*Stichopus herrmanni*	Curryfish	VU	-
Echinoderm	STICHOPODIDAE	*Thelenota ananas*	Pineapple Sea Cucumber	EN	-
Fish	AETOBATIDAE	*Aetobatus ocellatus*	Spotted Eagle Ray	VU	-
Fish	ALOPIIDAE	*Alopias pelagicus*	Pelagic Thresher	EN	-
Fish	ALOPIIDAE	*Alopias superciliosus*	Bigeye Thresher	VU	-
Fish	CARCHARHINIDAE	*Carcharhinus albimarginatus*	Silvertip Shark	VU	-
Fish	CARCHARHINIDAE	*Carcharhinus amblyrhynchos*	Grey Reef Shark	EN	-
Fish	CARCHARHINIDAE	*Carcharhinus amboinensis*	Pigeye Shark	VU	-
Fish	CARCHARHINIDAE	*Carcharhinus falciformis*	Silky Shark	VU	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Fish	CARCHARHINIDAE	*Carcharhinus leucas*	Bull Shark	VU	-
Fish	CARCHARHINIDAE	*Carcharhinus limbatus*	Blacktip Shark	VU	-
Fish	CARCHARHINIDAE	*Carcharhinus longimanus*	Oceanic Whitetip Shark	CR	-
Fish	CARCHARHINIDAE	*Carcharhinus melanopterus*	Blacktip Reef Shark	VU	-
Fish	CARCHARHINIDAE	*Rhizoprionodon acutus*	Milk Shark	VU	-
Fish	CARCHARHINIDAE	*Triaenodon obesus*	Whitetip Reef Shark	VU	-
Fish	DASYATIDAE	*Himantura uarnak*	Coach Whipray	EN	-
Fish	DASYATIDAE	*Pastinachus ater*	Broad Cowtail Ray	VU	-
Fish	DASYATIDAE	*Taeniurops meyeni*	Blotched Fantail Ray	VU	-
Fish	DASYATIDAE	*Urogymnus asperrimus*	Porcupine Ray	VU	-
Fish	DISTICHODONTIDAE	*Distichodus petersii*	-	VU	Endemic/RR
Fish	EPINEPHELIDAE	*Epinephelus fuscoguttatus*	Brown-marbled Grouper	VU	-
Fish	EPINEPHELIDAE	*Epinephelus polyphekadion*	Camouflage	VU	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
			Grouper		
Fish	GINGLYMOSTOMATIDAE	*Nebrius ferrugineus*	Tawny Nurse Shark	VU	-
Fish	GINGLYMOSTOMATIDAE	*Pseudoginglymostoma brevicaudatum*	Shorttail Nurse Shark	CR	-
Fish	HEMIGALEIDAE	*Hemipristis elongata*	Snaggletooth Shark	VU	-
Fish	ISTIOPHORIDAE	*Istiophorus platypterus*	Sailfish	VU	-
Fish	KNERIIDAE	*Kneria uluguru*	-	VU	Endemic/RR
Fish	LABRIDAE	*Bolbometopon muricatum*	Green Humphead Parrotfish	VU	-
Fish	LAMNIDAE	*Carcharodon carcharias*	White Shark	VU	-
Fish	LAMNIDAE	*Isurus oxyrinchus*	Shortfin Mako	EN	-
Fish	LAMNIDAE	*Isurus paucus*	Longfin Mako	EN	-
Fish	LETHRINIDAE	*Lethrinus mahsena*	Sky Emperor	EN	-
Fish	MOBULIDAE	*Mobula alfredi*	Reef Manta Ray	VU	-
Fish	MOBULIDAE	*Mobula birostris*	Oceanic Manta Ray	EN	-
Fish	MOBULIDAE	*Mobula kuhlii*	Shorthorned Pygmy	EN	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
			Devil Ray		
Fish	MOBULIDAE	*Mobula mobular*	Spinetail Devil Ray	EN	-
Fish	MOBULIDAE	*Mobula mobular*	Spinetail Devil Ray	EN	-
Fish	MOBULIDAE	*Mobula tarapacana*	Sicklefin Devil Ray	EN	-
Fish	MOBULIDAE	*Mobula thurstoni*	Bentfin Devil Ray	EN	-
Fish	MOLIDAE	*Mola mola*	Ocean Sunfish	VU	-
Fish	MONACANTHIDAE	*Oxymonacanthus longirostris*	Harlequin Filefish	VU	-
Fish	MYLIOBATIDAE	*Myliobatis aquila*	Common Eagle Ray	CR	-
Fish	NOTHOBRANCHIIDAE	*Nothobranchius albimarginatus*	-	EN	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius insularis*	-	EN	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius korthausae*	-	EN	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius luekei*	-	EN	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius palmqvisti*	-	VU	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius rubripinnis*	-	EN	Endemic/RR
Fish	NOTHOBRANCHIIDAE	*Nothobranchius ruudwildekampi*	-	VU	Endemic/RR

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Fish	ODONTASPIDIDAE	*Carcharias taurus*	Sand Tiger Shark	CR	-
Fish	ODONTASPIDIDAE	*Odontaspis ferox*	Smalltooth Sand Tiger	VU	-
Fish	POECILIIDAE	*Aplocheilichthys lacustris*	Kibiti Lampeye	VU	Endemic/RR
Fish	PRISTIDAE	*Pristis pristis*	Largetooth Sawfish	CR	-
Fish	PRISTIDAE	*Pristis zijsron*	Green Sawfish	CR	-
Fish	PRISTIDAE	*Pristis zijsron*	Green Sawfish	CR	-
Fish	RHINCODONTIDAE	*Rhincodon typus*	Whale Shark	EN	-
Fish	RHINIDAE	*Rhina ancylostoma*	Bowmouth Guitarfish	CR	-
Fish	RHINIDAE	*Rhynchobatus australiae*	Bottlenose Wedgefish	CR	-
Fish	RHINIDAE	*Rhynchobatus djiddensis*	Whitespotted Wedgefish	CR	-
Fish	RHINOBATIDAE	*Acroteriobatus leucospilus*	Greyspot Guitarfish	EN	-
Fish	RHINOPTERIDAE	*Rhinoptera jayakari*	Oman Cownose Ray	EN	-

Taxon	Family	Scientific Name	Common Name	IUCN Status	Endemic/RR
Fish	SPHYRNIDAE	*Sphyrna lewini*	Scalloped Hammerhead	CR	-
Fish	SPHYRNIDAE	*Sphyrna mokarran*	Great Hammerhead	CR	-
Fish	STEGOSTOMIDAE	*Stegostoma tigrinum*	Zebra Shark	EN	-
Fish	SYNGNATHIDAE	*Hippocampus histrix*	Thorny Seahorse	VU	-
Mammal	BALAENOPTERIDAE	*Balaenoptera borealis*	Sei Whale	EN	-
Mammal	BALAENOPTERIDAE	*Balaenoptera musculus*	Blue Whale	EN	-
Mammal	BOVIDAE	*Cephalophus adersi*	Aders' Duiker	VU	-
Mammal	DELPHINIDAE	*Sousa plumbea*	Indian Ocean Humpback Dolphin	EN	-
Mammal	DUGONGIDAE	*Dugong dugon*	Dugong	VU	-
Mammal	MANIDAE	*Smutsia temminckii*	Temminck's Pangolin	VU	-
Mammal	PHYSETERIDAE	*Physeter macrocephalus*	Sperm Whale	VU	-

ANNEX 6 – MANGROVE MANAGEMENT PLAN

Mangrove Management Plan

1 INTRODUCTION

1.1 Project Overview

The Consultant CESI S.p.A. (Italy), in a joint venture with ELC Electroconsult S.p.A. (Italy) and Colenco Consulting Ltd. (Nigeria), has been appointed to carry out an Environmental and Social Impact Assesment (ESIA) for a project involving the installation of a 132 kV transmission line from Tanga (Tanzania mainland) to Pemba Island. As part of the Project the requirement for a Biodiversity Management Plan (BMP) has been identified.

The African Development Bank (AfDB), called the 'Lender', is considering financing the Project. The Project has therefore been developed in accordance with the Lender policy and requirements.

This MMP should be read in conjunction with the following studies:

- 132 kV Transmission Line and Submarine Cables from Tanga to Pemba – **ESIA Chapter 2.1.2 and 2.2.2: Biological Environment**
- 132 kV Transmission Line and Submarine Cables from Tanga to Pemba – **ESIA Chapter 2.3: Critical Habitat**

The proposed cable route should be used as route corridor center lines for future marine geophysical surveys. The main features of the proposed submarine cable routes are provided in Table 1- 1 and an overview map is presented in Figure 3- 1.

Table 1- 1 – Main features of the 220 kV submarine cable route from Tanzania mainland (Tanga) to Pemba Island

RPL	**DTS_TANGA-PEMBA_RPL-0-040624.xls**	
TANGA LP COORDINATES	039° 7.94700' E	05° 6.06300' S
PEMBA LP COORDINATES	039° 39.58800' E	05° 12.50700' S
Total Route Length	69.747km	
Number of Alter Courses	9	
Maximum Water Depth (approx.)	830m (GEBCO and Ad.CH.)	
Maximum Slope along the route (approx.)	13° at KP56.2	
Number of crossing points with IS systems	0 (*)	
Crossed Protected Areas	Tanga Coelacanth Marine Park Pemba Channel Conservation Area	

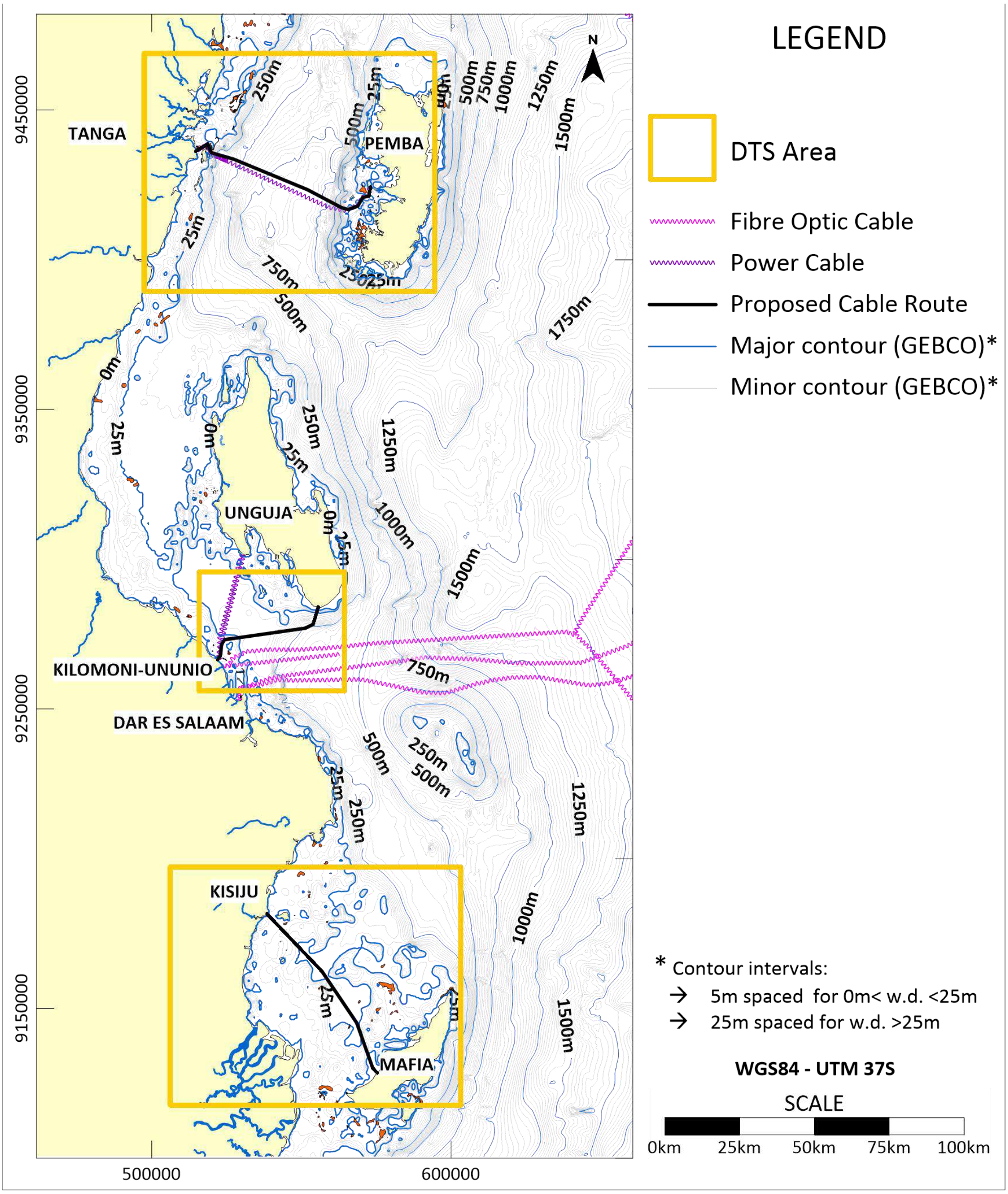

Figure 1- 1 – Overview of the submarine cable route (extracted from Submarine Cable Study). This map includes the proposed submarine cable for the current scoping as well as those planned for other interconnections.

1.2 Purpose and Objectives of the Mangrove Management Plan

This report outlines a framework for mitigation and monitoring commitments necessary to ensure the Project remains compliant with Environmental and Social Operational Safeguard 6[56] and adheres to international best practices for biodiversity. These commitments stem from the outcomes of the Project's Environmental and Social Impact Assessment (ESIA) and Critical Habitat Assessment (CHA).

The Mangrove Management Plan (MMP) has been developed to systematically mitigate potential impacts on mangrove ecosystems arising from the proposed construction activities. The MMP comprehensively assesses potential direct and indirect impacts, outlines specific management measures to minimize these impacts, and establishes a robust monitoring program to track project-related effects on mangrove habitats.

This document will remain active throughout the construction and operation phases (unless otherwise agreed by the Project Lender) and should be updated to incorporate an enhanced understanding of the Project's program and design. It should also be informed by new information as it becomes available, such as from ongoing or pre-construction surveys or feedback from relevant Project stakeholders.

The Mangrove Management Plan (MMP) includes data from the flora and habitats survey conducted in 2024. Further updates will be made as needed following the completion of pre-construction surveys. An ongoing review mechanism will be established to ensure the BMP reflects current biodiversity management practices.

2 RELEVANT LEGISLATION

Separate sets of laws and government agencies manage forest resources in mainland Tanzania and the islands of Zanzibar. The following paragraphs describe the institutional, policy and legal instruments for Tanzania and Zanzibar, respectively. The main policy and legal frameworks applicable in management of mangrove forests in Tanzania are resumed in Table 2- 1.

2.1 Tanzania

Formal mangrove forest management began in Tanganyika (now Tanzania) in 1893 when they were officially designated as forest reserves. The Rufiji Delta was the first area protected in this way between 1928 and 1932. While Tanzania gained independence in 1963 and introduced a new forest policy two years later, the management of mangroves continued to be governed by colonial forestry laws until 1998. The subsequent National Forest Policy and the 2002 Forest Act reaffirmed the status of mangroves as protected forest reserves in mainland Tanzania.

In Tanzania mainland, forest management is divided between two government bodies: the Tanzania Forest Service (TFS) oversees day-to-day operations, while the Forestry and Beekeeping Division (FBD) develops forest policies and laws. The primary legal framework for forests, including mangroves, is outlined in the 1998 National Forestry Policy and the 2002 Forest Act, which classify mangroves as state-protected areas. However, weak enforcement of these regulations has led to unsustainable exploitation of mangrove resources (Semesi 1992[57], Mangora 2011[58]).

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[56] African Development Bank. 2023. Environmental and Social Operational Safeguard 6: Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources

[57] Semesi, A. K. (1992). Developing management plans for the mangrove forest reserves of mainland Tanzania. In The Ecology of Mangrove and Related Ecosystems: Proceedings of the International Symposium held at Mombasa, Kenya, 24–30 September 1990 (pp. 1-10). Springer Netherlands.

Due to the complex nature of mangrove ecosystems, various laws and regulations beyond forestry directly impact their protection in mainland Tanzania. These include legislation governing environment, land, wildlife, fisheries, marine parks, local authorities, land use, and water resources.

2.2 Zanzibar

Mangrove management in Zanzibar was initially regulated by the Wood Cutting Decree of 1945. Subsequent legislation in 1946 specifically addressed mangrove protection and designated them as reserves. A 1950 working scheme prioritized mangrove resources for colonial markets, with little regard for the ecosystem. Although the 1996 Forest Resources Management and Conservation Act replaced the earlier decree, it maintained mangroves as reserved forests. The 1999 National Forest Policy acknowledged the diverse benefits of forests, including mangroves. However, inconsistencies remain in mangrove protection.

Zanzibar's forest sector is managed by the Department of Forest Development (DFD). The key policies governing forests, including mangroves, are the 1999 National Forest Policy for Zanzibar and the 1996 Forest Resources Management and Conservation Act. While Tanzania's overall forest governance framework is sound, the implementation of mangrove management specifically is lacking. This is attributed to the unique challenges posed by mangrove ecosystems, coupled with limited resources and capacity within responsible agencies.

In Zanzibar, laws and regulations related to the environment, fisheries, and marine conservation areas also have implications for mangrove protection.

[58] Mangora, M. M. (2011). Poverty and institutional management stand-off: a restoration and conservation dilemma for mangrove forests of Tanzania. Wetlands Ecology and Management, 19, 533-543.

Table 2- 1 – Main policy and legal frameworks applicable in management of mangrove forests in Tanzania[59]

Part	Sector	Policy/Legal Framework
Mainland Tanzania	Forestry	National Forestry Policy of 1998 Forest Act No 14 of 2002
	Beekeeping	National Beekeeping Policy of 1998 Beekeeping Act No 15 of 2002
	Environment	National Environmental Policy of 1997 Environmental Management Act No. 20 of 2004 National Integrated Coastal Environmental Management Strategy of 2003
	Land	National Land Policy of 1997 Land Act No. 4 of 1999 Village Land Act No. 5 of 1999 Land Use Planning Act No. 6 of 2007
	Marine Protected Areas	Marine Parks and Reserves Act No. 29 of 1994
	Fisheries	National Fisheries Sector Policy and Strategy Statement of 1997 Fisheries Act No. 22 of 2003
	Mining	Mining Act of 2010
Zanzibar	Forestry	National Forest Policy for Zanzibar of 1999 Forest Resources Management and Conservation Act No 10 of 1996
	Environment	Zanzibar Environmental Policy of 2013 Zanzibar Environmental Management Act of 2015
	Land	Land Tenure Act No. 12 of 1992
	Fisheries and Marine Conservation Areas	Fisheries Policy of 2014 Fisheries Act No. 7 of 2010

3 PROJECT DESCRIPTION

Of the project elements outlined in paragraph 1.1, the development with the potential to impact on mangroves is represented by the construction of the underground cables from the landing points in Tanga and Pemba Island.

The project area in Tanga intersects with the Mangrove Forest Reserve, located along the beach of the landing point where the presence of mangroves is documented (Figure 3- 1). This mangrove area in the beach of landing point in Tanga is dominated by the *Lumnitzera racemosa*.

The project area in Pemba Island intersects mangrove area and it is dominated by mangrove stand mostly two species namely *Rhizophora mucronata and Avicennia marina* (Figure 3- 2).

[59] Mangora, M.M., Kamnde, K.J., Medard, M., Ndagala, J. and Japhet, E. (2021). Socio-economic Role of Mangroves and their Conservation Framework in Tanzania. WWF Tanzania, Dar es Salaam. xii + 77 pp.

Figure 3- 1 - Mangroves in the proximity of the landing point in Tanga

Figure 3- 2 - Mangrove near the landing point in Pemba Island

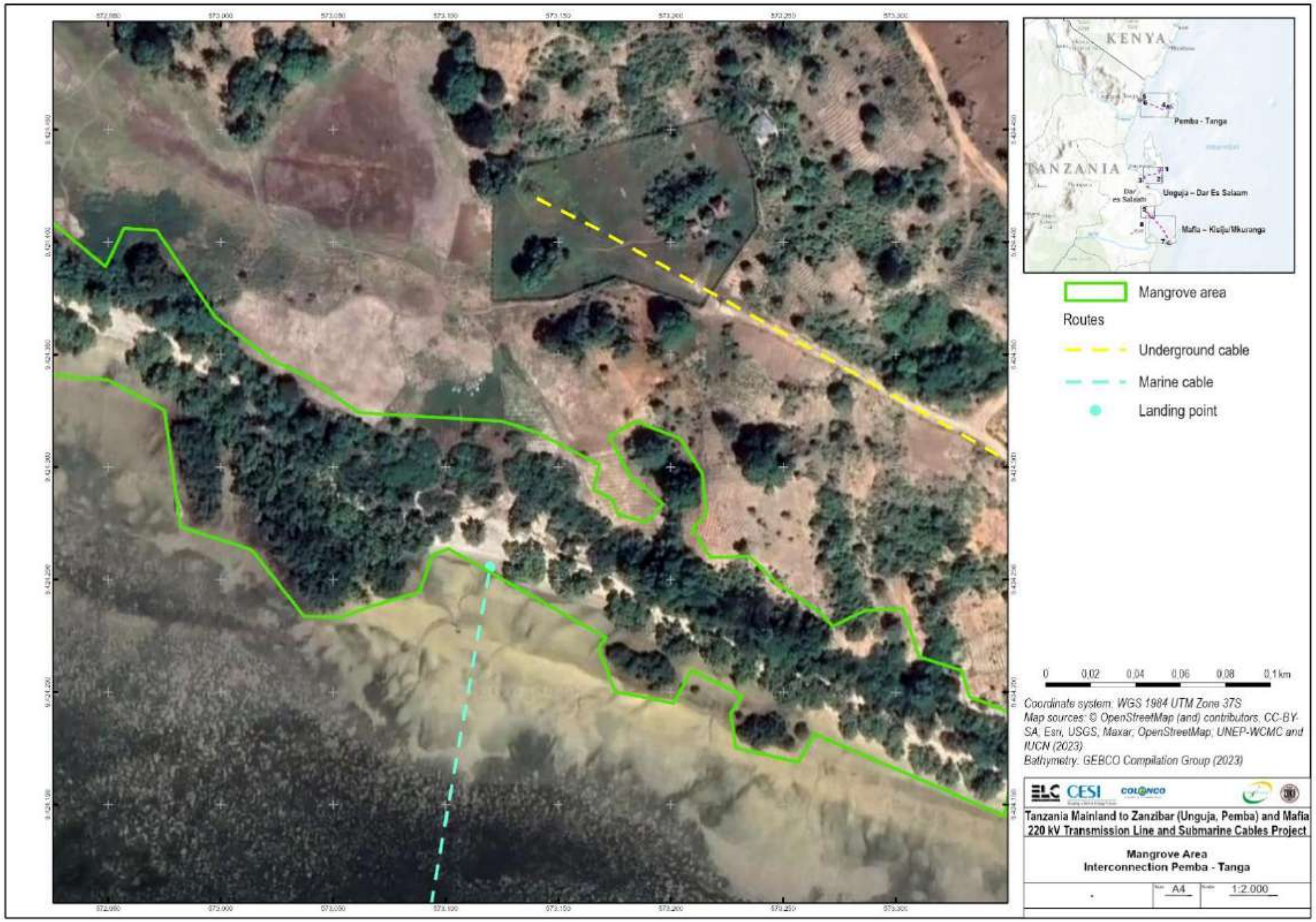

Figure 3- 3 – Mangroves near the project area (Pemba Island)

Figure 3- 4 – Mangroves near the project area (Tanga)

3.1 Vegetation Clearing

Mangrove areas are expected to be located inside and in the vicinity of the construction area in Tanga and Pemba Island. In the landing points and along the underground cables the mangroves are sparse and with open canopy (scattered). The underground HV cables permanent right of way is estimated to be 1.5 m, although temporarily larger areas are required for construction and access to splice vaults for maintenance, this is estimated to be 5-6 m. Given the scattered pattern of the mangroves, the underground HV cables routes were designed to avoid any mangroves tree cutting in both Tanga and Pemba Island landing points.

Given the sensitivity of these areas, this document outlines potential mitigation measures and a monitoring plan to address potential mangrove impacts.

4 EXISTING ENVIRONMENT

4.1 Overview

Mangroves in Tanga and Pemba Island are an example of both environmental resilience and vulnerability. In recent years, Tanga's mangroves in particular have been subject to significant anthropogenic pressures, including deforestation for fuelwood, agricultural expansion and urban development, due to their proximity to Tanga city. However, conservation efforts are underway at both local and national levels, including reforestation initiatives and the adoption of sustainable management practices. The overall condition of Tanga's mangroves remains precarious and requires sustained and intensified conservation efforts to ensure their long-term sustainability and ecological functionality.

5 IMPACTS AND MANAGEMENT

5.1 Objectives and Key Performance Indicators

The objectives of this MMP are:

- to avoid and limit the direct loss of mangroves associated with construction of underground cable in Tanga and Pemba Island
- to avoid indirect impacts to the mangrove ecosystem
- to maintain the abundance, diversity, geographic distribution and productivity of mangrove communities at species and ecosystem levels.

The Key Performance Indicators (KPIs) of this MMP are:

- no direct loss of mangroves as a result of the underground cable construction
- no indirect impacts to mangroves as identified through the mangrove monitoring program

5.2 Direct Impacts

5.2.1 Potential mangroves clearing

The Right of Way (RoW) for the cable installation on Pemba Island is planned to avoid the cutting of mangrove trees, thereby preserving these vital ecosystems. However, there remains a potential need for minimal cutting if absolutely necessary. In such cases, a specific protocol will be strictly followed.

5.2.2 Management

Any clearing of mangroves should be avoided, as is the case for the current project layout. If the project layout is changed, it should ensure that mangroves are avoided, and if this isn't possible, it is essential to prioritise strategies to minimise and, where possible, avoid impacts on mangroves.

- Quantification of the total area and the total number of trees to be removed (only if cutting is necessary)
- Construction machinery will remain within the project footprint to minimise any unplanned loss or damage to adjacent areas of mangroves
- Minimized clearing: limiting the clearing of mangrove vegetation to the absolute minimum required for construction
- Trenchless technologies: for underground cable, utilizing trenchless technologies like microtunnelling or Horizontal Directional Drilling (HDD) can significantly reduce the need for extensive trenching. This minimizes the disruption of the intricate mangrove root system and associated ecological functions. Microtunnelling is a trenchless construction method used for installing underground cables with minimal surface disruption. This technique is highly accurate and is particularly advantageous in sensitive or congested areas where traditional open-cut excavation would be impractical or environmentally damaging.
  The Horizontal Directional Drilling (HDD) process involves drilling a pilot hole along a predetermined path, enlarging it with reamers and then pulling the cable through the borehole. HDD is particularly useful in environmentally sensitive areas or where surface excavation is impractical, as it reduces the environmental impact.
  Alternatively, the trench for the cable could be excavated manually, using hand digging or small machinery to create the required trench. This method allows precise control of the excavation process, which can be advantageous in sensitive environments such as mangrove areas. Manual trenching can be more adaptable to specific site conditions and can help reduce the risk of damage to sensitive root systems and habitats compared to larger-scale mechanical excavation.
- Mangrove restoration and rehabilitation (if necessary): developing and implementing a comprehensive mangrove restoration plan is essential to compensate for any unavoidable habitat loss. This may involve planting native mangrove species in degraded areas to restore ecological functions and promote the recovery of the ecosystem

5.2.3 Pollution

Construction activities can lead to the runoff of pollutants, such as oils, chemicals, and sediments, into nearby water bodies. These pollutants can degrade water quality and harm mangrove ecosystems.

5.2.4 Management

- Incorporate pollution control measures into the construction site design, such as drainage systems, sediment traps, and containment structures
- Material Storage: Store construction materials such as oils, chemicals, and fuels in designated, covered, and impervious areas to prevent spills and leaks.
- Spill response: Have a spill response plan in place, including spill kits and training for personnel on how to immediately handle and contain spills.
- Waste management: Properly manage and dispose of construction waste and hazardous materials. Use designated bins and ensure waste is regularly removed from the site.
- Staff training: Train construction personnel on pollution prevention practices, proper handling of hazardous materials, and emergency response procedures.

5.2.5 Noise and vibration

Construction noise and vibrations can disturb wildlife in mangrove areas. Many species are sensitive to these disturbances, which can lead to changes in behaviour, reduced breeding success, or displacement.

5.2.6 Management

- Plan construction activities: Plan construction activities to avoid sensitive periods for wildlife, such as breeding or nesting seasons.
- Time restrictions: Restrict construction activities to certain hours, such as avoiding early mornings or late evenings, to reduce disruption during sensitive periods.
- Choice of equipment: Use quieter construction equipment and machinery whenever possible. Ensure that all equipment is well maintained to operate efficiently and with minimal noise.
- Speed limits: Limit the speed of construction vehicles and machinery to reduce noise and vibration.
- Worker training: Train construction workers and site managers on the importance of noise and vibration control and practices to minimise disturbance.

5.3 Indirect Impacts

5.3.1 Slippage of Fill

There is a risk that the earth fill used in the construction of the infrastructure corridor could and spread in a fan across the tidal flat. In this case, the most likely impact would be the burial of mangrove pneumatophores, which could ultimately lead to tree mortality.

5.3.2 Management

Engineering measures to manage and/or prevent fill slippage, where practicable and useful, include the use of rock armour to contain fill.

5.3.3 Mangrove fauna

Indirect impacts on fauna from construction activities, particularly near sensitive ecosystems like mangroves, can be significant. These impacts often stem from changes to the environment that affect the behaviour, health, and survival of wildlife.

5.3.4 Management

Management of indirect impacts on mangrove fauna will be by restricting direct habitat loss to the defined project footprint.

6 MONITORING

6.1 Overview

Monitoring to assist in the management of potential impacts on mangrove vegetation associations will consist of:

- mangrove mapping;
- mangrove health surveys;
- monitoring of any sediment accumulation within mangrove vegetation associations;
- assessment of the potential for changes in soil salinity in the vicinity of the project construction area.

6.2 Mangrove Mapping

Aerial photography and field surveys will be used to map the distribution and extent of mangrove vegetation associations in the vicinity of the project footprint.

Mangrove mapping will be carried out:

- prior to the start of the project to provide up-to-date information on mangrove distribution;

- at project milestones, including the completion of clearing activities within the infrastructure corridor; and corridor; and

- upon completion of the project.

Mangrove distribution and cover will be compared with baseline data to confirm that the area of direct disturbance of mangrove habitat does not exceed approved limits.

6.3 Mangrove Health Survey

Mangrove health surveys will be undertaken in an effort to ensure that any negative impacts are

detected as soon as possible. Mangrove health monitoring will consist of:

- regular visual assessments to determine mangrove condition;
- detailed mangrove health surveys prior to dredging, after six months (following commencement of construction) and on completion of the project.

Mangrove monitoring sites will be established prior to the commencement of construction activities. The number and location of these sites will be determined during a preliminary site investigation and via the interpretation of aerial photography.

6.4 Sedimentation

Sedimentation is monitored within the mangrove communities to provide early warning of potential impacts. Sedimentation monitoring will be carried out at the same monitoring and reference used in the mangrove health surveys.

7 CONTINGENCY MEASURES

Impacts to mangroves will be monitored through mangrove mapping, mangrove health survey and sedimentation monitoring. If mangrove monitoring reveals impacts in excess of the approved amount, the following contingency measures will be applied:

- Construction activities will be temporarily halted until the results of an investigation have been completed;
- Rehabilitation options will be investigated.

ANNEX 7 – SUMMARY OF CONSULTATIONS – 1ST ROUND

In April 2024, on the occasion of the inception mission, the Consultant and Project Developer conducted the first round of consultations with key institutional stakeholders on the Tanzania mainland. The consultation aimed to inform the decision-makers about the project's scope of work, the project design process, and the methods for the Environmental and Social Impact Assessment study. Potential critical issues were described to gain feedback from stakeholders and an understanding of the work context, which was essential for planning the field surveys and design.

The stakeholders responded positively and made themselves available for field inspection during the survey phases.

Table 0- 1 – List of the first round of consultations

TOPICS	PARTICIPANTS	DATE	MOM
Project scope of work presentation, clarification of permits, protected areas regulations and stakeholders to be involved	Marine Parks and Reserve Unit (MPRU)	April 29, 2024	MOM_TZ_01
Project scope of work presentation, clarification of land acquisition for cables and buffer zones in the landing points	Ministry of Housing, Land and Human Settlement Development (Land Commission in Dar es Salaam)	April 29, 2024	MOM_TZ_02
Project scope of work presentation, clarification of permits, protected areas regulations	National Environment Management Council (NEMC)	June 12, 2024	MOM_TZ_03

Minute of Meeting – First round of consultations

MOM_TZ_01

Date: April 29, 2024

Location: Dar es Salaam

Marine Park Conservation Office

Participants:

- Officers of Marine Park Authority in Tanzania
- The Consultant (ELC)
- Environmental Expert from TANESCO

The Consultant and TANESCO explained to the authorities the project objectives, the timeline and the process of selection of best project alternatives along with the survey that will be carried out in the subsequent month.

The Marine Park authority recommended to follow the study as per: *the* Marine *Protected Areas Investment Plan, the EIA GUIDELINES IN Marine Protected Areas, the Marine Act and the Fisheries Act*.

The Marine Park Authority clarify that the process of ESIA submission and revision pass first through the Ministry of Environment (NEMC) who deploys the Marine Park Authorities for joint site inspection and revision of the reports.

The Consultant enquired about the buffer zone boundaries on the shores of Tanzania Mainland. The Marine Authority confirmed that the buffer zone extends from the high tide 60 m inland, and confirmed that that area is government land. The Provision is under EMA & Fisheries Act and is into force from years 2000. Any development on the buffer is dated before 2000.

The Consultant clarified that due to a very short schedule the field activities will start the following month and by that time the surveyors will contact the Marine Authority for join inspections and secondary data collection.

Minute of Meeting – First round of consultations

MOM_TZ_02

Date: April 29, 2024

Location: Dar es Salaam

Land Commission

Participants:

- Officer of Land Commission in Tanzania
- The Consultant (ELC)
- Environmental Expert from TANESCO

The Consultant and TANESCO explained to the authorities the project objectives, the timeline and the process of selection of best project alternatives along with the survey that will be carried out in the subsequent month.

The Land Commission confirmed that 60 m buffer zone are government land and clarified that land acquisition is necessary for underground cables, if they cross private properties.

Minute of Meeting – First round of consultations

MOM_TZ03

Date: June 13th, 2024

Location: NEMC Office, Dar es Salaam

On 13th June, the ELC team (Ms. Arianna Longarini, Ms. Federica Fonda, Prof. Dr. Nsajigwa Emmanuel Mbije and Prof. Dr. Emmanuel Nzunda), accompanied by Ms. Anastacia Rwegasila (TANESCO), met with Mr. Jamal Baruti (Manager – Review of Environmental and Social Impact Assessment) and Ms. Edika S. Masisi (Manager – Registration of Environmental Experts) at the NEMC office.

The consultant detailed the project location, presented relevant maps, and discussed the alternative analysis conducted for the scoping report. The main environmental and social criticalities identified during the study were also highlighted.

NEMC representatives emphasized the mandatory registration of the project and the requirement to submit the scoping report through a local environmental consultant or firm. The consultant acknowledged this process, noting ongoing internal discussions. As the scoping report was presented to the client only two days prior, the consultant anticipated client feedback before formal submission and planned to address this during the upcoming workshop.

The meeting also covered stakeholder consultations. The consultant explained initial consultations conducted during the April inception mission and planned further engagements during the environmental survey. NEMC stressed the importance of involving local communities, districts, and villages in this process.

Clarifications were sought regarding the number of documents required for submission. The consultant inquired whether a separate document was needed for each interconnection and requested TANESCO to seek specific guidance on this matter.

Finally, the consultant invited the NEMC representatives to the scoping report presentation during the interim workshop scheduled for June 19th.

On the 23rd of April 2024, in occasion of the inception phase workshop which was held in Zanzibar, the Consultant and the Project Developers conducted the first round of consultations with institutional stakeholders. The meeting was followed by the National television which broadcasted part of the event.

Following the workshop, the Consultant had meetings with other key institutional stakeholders in Tanzania Mainland.

The consultation had the objective to inform the decision makers on the project scope of work, the process of the project design and the methods for the Environmental and Social impact Assessment. Study. Potential critical issues were described in order to gain feedback from stakeholder and knowledge of the context of work that was essential to plan the filed surveys and the design.

The stakeholders responded positively and made themselves available for filed inspection during the survey phases.

List of the first round of consultations

TOPICS	PARTICIPANTS	DATE	MOM
Project scope of work presentation, clarification of permits, protected areas regulations and stakeholders to be involved	ZANZIBAR • Zanzibar Environmental Management Authority • Marine Conservation Unit (Ministry of Blue Economy and Fisheries) • Ministry of Blue Economy and Fisheries • Ministry of Water, Energy, and Minerals, ZECO • Ministry of Lands and Housing Development • Department of Forestry (Ministry of Agriculture, Natural Resources, Livestock and Fisheries)	April 23, 2024	MOM_ZNZ_01
	TANZANIA • Marine Parks and Reserve Unit (MPRU)	April 29, 2024	MOM_TZ_02

TOPICS	PARTICIPANTS	DATE	MOM
Project scope of work presentation, clarification of land acquisition for cables and buffer zones in the landing points	TANZANIA • Ministry of Housing, Land and Human Settlement Development (Land Commission in Dar es Salaam)	April 29, 2024	MOM_TZ_02
Project scope of work presentation, clarification of permits, protected areas regulations	TANZANIA • National Environment Management Council (NEMC)	June 12, 2024	MOM_TZ_03

ANNEX 8 – SUMMARY OF CONSULTATIONS – 2ND ROUND

Minute of Meeting – Second round of consultations

MOM_TN_01

Tanga

Date: June 8th, 2024

Location: Tanga Landing Point

On 8th June, the ELC team (Ms. Arianna Longarini and Ms. Federica Fonda), accompanied by the TANESCO team, met with the fishermen who use the beach at the proposed Tanga landing point.

Some of the fishermen come from Tanga, while others come from Pemba. The main activities, in addition to classic fishing near the reefs, are collecting wood in the area close to the beach and the collection of crabs and squid. However, these last two activities are done by women. Fishing activities take place throughout the year.

Boat ownership varies among the fishermen. Some own their vessels, while others rent them. Up to 18 people can share a single boat. Their primary catches consist of anchovies and red snappers. They also venture beyond the reefs to fish.

They have only seen turtles in the sea and have never seen them nesting on the beach. They do not use mangroves.

They expressed no concerns about how the beach will be managed during project construction.

<u>Tanga</u>

Date: June 8th, 2024

Location: Tanga Landing Point

On 8thJune, the ELC team (Ms. Arianna Longarini and Ms. Federica Fonda), along with the TANESCO team, met with the women who sell food and beverages (fish, bananas, fruit juice) near the beach at the proposed Tanga landing point. Their shops also offer money transfer services through a system called Tigopesa. Additionally, some women collect firewood for home use. These women operate at the beach year-round.

The women reported a positive impact on their business during the previous submarine cable project, as the workers purchased food and other goods from them. They noted that beach activity decreases during Ramadan and peaks in July.

The women expressed optimism about the project, believing it will boost the economy and increase their sales. However, they voiced concerns that the influx of people from different countries could lead to cultural contamination.


tigo
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ANNEX 9 – SUMMARY OF CONSULTATIONS – 3RD ROUND

Tanga

Summary of main concerns and opinion raised by stakeholders and PAPs

S/No	Stakeholders Category	General View	Remarks and Response
1.	TANGA City Council Office	• The exercise will be more effective when people are fully involved. It will not make it hard for Tanga since the people are so understanding and Local leaders should be the ones to direct you to their people who are directly involved in this project.	• TANESCO will ensure serious involvement of all stakeholders during implementation
2.	Individual PAPs identified during RAP and participated in meeting awareness.	• Most of the PAPs requested TANESCO and contractor to provide employment opportunities to the surrounding community: hence TANESCO will make sure contractor employs local people of the respective area for works that requires manual labour; • All Project Affected Persons (PAPs) should be compensated accordingly and timely: Compensation will be fair and will follow the government regulations, market value. Normally the government Valuers of the respective Tanga City Council will perform the task • Stakeholders requested education and sensitization of PAPs on how to spend and save compensation before they receive the payments. This will help them to utilize compensation money effectively which is for the benefit of whole family; not only that but also it will help to minimize unnecessary conflicts within families. • Most of the PAPs were concerned as to when someone dies before being compensated and if a representative will be allowed to take cash after completing the inheritance process. • If the project will be adhered to the National and International Laws, then everything will go as planned.	• Contract will ensure available opportunities benefits the surrounding community • TANESCO will provide various forms of sensitization based on the type of activities being implemented
3.	TANROADS	• TANROADS has incorporated the existing power line from Tanga to Pemba into their designs for the section from Utofu to Duga Road, although it is still under planning approval	• Noted and TANESCO will cooperate according

S/No	Stakeholders Category	General View	Remarks and Response
		• They have no objections to the proposed underground cable but request to be engaged during implementation	
4.	TARURA	• They requested TANESCO to share design alignments for future development.	• Design will be shared
5.	TANGA-UWASA	• Following a joint field visit, TANGA-UWASA advised TANESCO to cooperate to avoid extensive reallocation of water pipes during implementation	• Design will be shared
6	TTCL	• TTCL noted that existing underground fibers from Tanga to Hale will be impacted and advised TANESCO to collaborate during implementation	• Noted and TANESCO will cooperate according
7	NGOs, (BRAC Maendeleo & TAYOTA)	✓ Both NGOs has informed TANESCO that they work in various program which support GBV issues, empower both youth and women and provide advocacy assistance ✓ Also, they informed us they can cooperate with TANESCO during implementation of said project which focused to the livelihood restorations, Sensitization and GBV issues	✓ TANESCO will ensure relevant NGOs were involved during RAP implementation

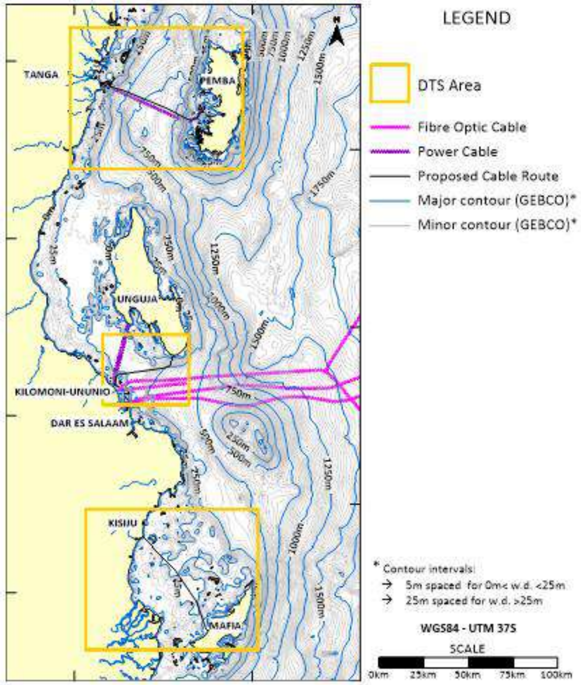
ANNEX 10 – NON-TECHNICAL SUMMARY

ENGLISH VERSION

132 kV Interconnection from Tanga to Pemba Island

The Project

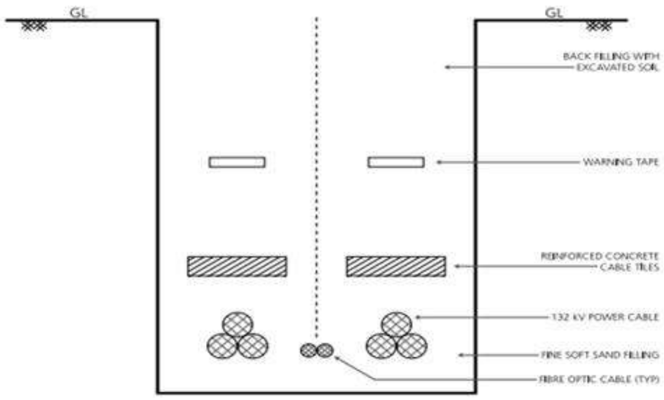
- **Project Goal**: Increase power supply to Zanzibar to meet growing demand
- **Project Benefits:**
  - Improved livelihood and socio-economic development in Tanzania and Zanzibar through increased electricity availability and affordability.
- **Project Partners:**
  - Tanzania Electric Supply Company Limited (TANESCO)
  - Zanzibar Electricity Corporation (ZECO)
  - African Development Bank (AfDB)
  - Consultant: CESI S.p.A. (Italy) with ELC Electroconsult S.p.A. (Italy) and Colenco Consulting Ltd. (Nigeria)
- **Project Features:**
  - New 132 kV submarine and underground transmission line from Tanga (Tanzania mainland) to Pemba Island (Zanzibar).
  - Underground cables chosen for both mainland and island sections due to densely populated and cultivated areas.



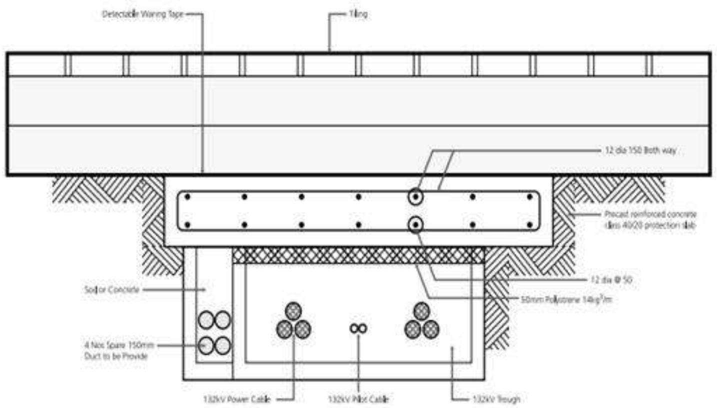
The Project

- **Submarine Cable Route:**
  - Total length: 69.747 km
  - Maximum water depth: 830 meters
  - Crosses 2 protected areas: Tanga Coelacanth Marine Park and Pemba Channel Conservation Area
- **Terrestrial Cable Routes:**
  - Mainland Tanzania: 8 km underground cable from Mnyanjani landing point to Majani Mapana substation.
  - Pemba Island: 9 km underground cable from new landing point near Ras Mkumbuu to Wesha substation.
- **Cable Installation:**
  - Submarine cable: buried using trenching, ploughing, or water jetting techniques.
  - Underground cable: installed directly in excavated trenches.

The Project



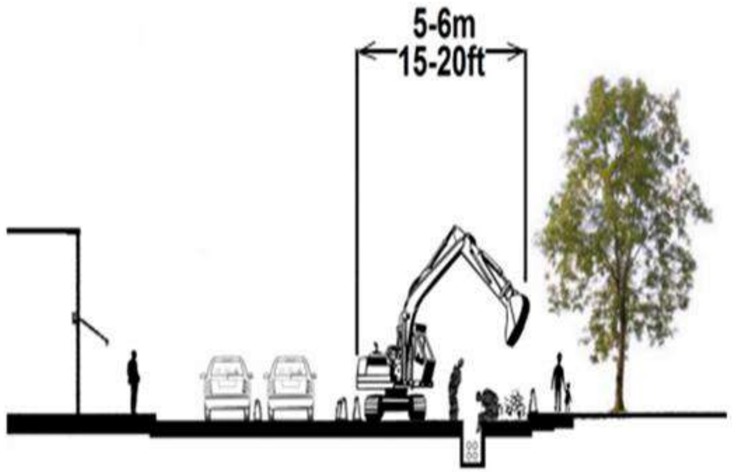
Cable laying method directly buried 132 kV Power / Pilot / F.O. Cable



Protection slab details for road construction on top of the 132 kV Trough/Cable

The Project

- Land requirements: 1.5 m Right of Way (or trench width)
- The permanent right of way may be approx. 1 m across, though temporary easements are needed for construction and to access splice vaults for maintenance. Routing has considered stakeholder impact, future construction plans along the line and accessibility.



Cable route Right of Way in a city street

Alternative analysis

- The Consultant has evaluated the "no-go" option, landing points, transmission routes, and substation locations. The optimal solution was selected based on technical, environmental, and socio-economic factors.
- Site visits were conducted in March and April 2024 to assess field conditions and identify alternatives.
- Submarine cable and transition areas will be within buffer zones (60 m mainland, 30 m Zanzibar).
- Potential resettlement impacts from the underground cable have been addressed in the Resettlement Action Plan.

Alternative analysis – Tanzania Mainland

- The 132 kV underground connection, comprising both submarine and underground cable sections, linking the Mnyanjani landing point to the existing Majani Mapana substation (approximately 8 km in length) was determined the optimal solution for Tanga. This option demonstrated the lowest environmental and socioeconomic impacts compared to alternative routes considered.

Landing point at Tanga

Alternative analysis – Zanzibar

- To minimize environmental and social impacts, particularly land acquisition, the underground cable alignment was strategically planned to follow existing roadways.
- An alternative landing point was considered but rejected due to technical limitations.
- A rigorous design approach has been implemented to mitigate potential impacts on the mangroves at the landing point.

Landing point of near Ras Mkumbuu, Pemba Island

Existing overhead line in Pemba Island

Construction Activities

CLEARING

- It is a common practice to clear the entire RoW before line construction can commence. Trees, scrub, and undergrowth vegetation will be cleared prior to the commencement of construction works. This practice is necessary to ensure sufficient clearance for construction and it also facilitates maintenance of the line should repairs be required.

LAND ACQUISITION

- The responsibility for acquiring land rests with the Local Authorities. Local authorities will handle any specific compensation measures required by local laws for lands crossed by the transmission line corridor. Additionally, compensation will be provided for the loss of annual and perennial crops during construction.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment. The main potential impacts expected during the construction and operation phases of the project are listed below.

Terrestrial Domain

PHYSICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Landscape and visual amenities:** The project will have visual impacts, primarily from substation construction and underground cable installation. While temporary, these changes can be more noticeable in open areas. Overall, the project's visual impact will be moderate and long-term.

Negative impacts during the operation phase:

- **Landscape and visual amenities**: The project's primary visual impact will be from upgrading and expanding existing substations. However, this impact is considered moderate due to the substations being in populated areas and the limited scope of the changes.

BIOLOGICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Habitat loss and degradation:** Underground cable also contribute to habitat loss and degradation. The process of installing these cables requires trenching, which disrupts ecosystems by damaging burrows, disturbing wildlife, and removing vegetation. While the land disturbance is less extensive compared to overhead lines, it still results in habitat loss, particularly for small animals reliant on the topsoil.
- **Habitat fragmentation, barrier to movement:** Underground cable installation can fragment habitats and impede wildlife movement. While less land is disturbed compared to overhead lines, trenching disrupts ecosystems and creates temporary barriers for animals. Construction noise and activity further deter wildlife, even after the physical barrier is removed.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment. The main potential impacts expected during the construction and operation phases of the project are listed below.

Terrestrial Domain

BIOLOGICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Introduction and spread of invasive alien species:** Underground cable infrastructure construction poses significant risks to terrestrial ecosystems. By fragmenting habitats and creating edge effects, it increases vulnerability to invasive species. These new, smaller habitat patches provide ideal conditions for invasive plants to establish and thrive, potentially leading to native species decline and further habitat degradation.
- **Disturbance, degradation and loss of mangroves:** The construction of underground transmission lines can potentially harm mangrove ecosystems through habitat loss and fragmentation. However, no significant impact on mangroves is anticipated for this project as the construction area avoids direct mangrove presence. Where potential risks exist, especially regarding root systems near the construction zone, preventive measures will be implemented.

Negative impacts during the operation phase:

- **Habitat loss, degradation and fragmentation:** Transmission lines and associated infrastructure can disrupt wildlife habitats by creating visual barriers, restricting movement, and limiting access to resources. Maintenance activities, such as vegetation clearing, can further exacerbate these issues by causing habitat loss and disturbing wildlife.
- **Introduction and spreading of invasive alien species:** Transmission line maintenance, involving vegetation clearing and mowing, can inadvertently spread invasive species. By removing native vegetation, these activities create favorable conditions for invasive plants to establish. Additionally, maintenance equipment and personnel can transport invasive seeds over long distances.
- **Human disturbance**: The operation and maintenance of transmission lines can disturb wildlife and their habitats through noise, pollution, and human presence. While these disturbances are infrequent, they can negatively impact the environment. Additionally, the project's potential to boost tourism may lead to increased human activity, further disrupting the delicate ecological balance.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment. The main potential impacts expected during the construction and operation phases of the project are listed below.

Terrestrial Domain

SOCIAL ENVIRONMENT

Negative impacts during the construction phase:

- **Land Acquisition, Restrictions to Land Use and Involuntary Resettlement:** Underground cable installation necessitates a permanent 1.5-meter-wide RoW, resulting in permanent land loss. Temporary land disruption and agricultural damage will also occur during trenching. However, the underground cable solution minimizes land acquisition by utilizing road reserves whenever possible.
- **Community Health and Safety:** Project implementation poses significant risks to local communities. Increased traffic, trespassing, and environmental disturbances can lead to accidents, injuries, and property loss. Additionally, the influx of workers may result in health hazards, social unrest, and heightened vulnerability for women and girls to sexual exploitation and abuse.
- **Infrastructure and Public Services**: Project implementation may lead to increased traffic congestion, infrastructure damage, and temporary disruptions in access to essential services. Local residents may experience limitations in accessing healthcare facilities and utilities due to construction activities.

Positive impacts during the operation phase:

- **Increased power supply:** Increased power supply facilitates economic development, improves quality of life, strengthens energy security, and enables the integration of renewable energy sources into the grid.
- **Economic growth:** Primarily driven by increased energy supply reliability, attracting industries reliant on stable power, supporting local businesses, and potentially increasing property values in areas with improved power access.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment. The main potential impacts expected during the construction and operation phases of the project are listed below.

Marine Domain

BIOLOGICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Habitat loss, degradation, fragmentation and barrier effect:** Cable installation will disrupt marine ecosystems. Bottom-dwelling organisms and fish will be affected by seabed disturbance, with potential impacts on coral reefs and fish spawning grounds. Sea turtles and migratory whales may also be impacted, especially during nesting and migration periods.
- **Introduction and spreading of invasive alien species:** Increased vessel traffic during construction can introduce invasive species. Ships transporting personnel and equipment may unintentionally spread invasive organisms.
- **Disturbance, degradation and loss of coral reefs**: Submarine cable installation poses significant risks to coral reefs. Trenching, anchoring, and increased sedimentation can cause physical damage, smother corals, and disrupt their delicate ecosystem.

Recommendations

- Ensure compliance with national and international environmental and social standards (e.g., AfDB Operational Safeguards).
- Develop mitigation measures as suggested in the ESIA to minimize impacts.
- Establish effective monitoring processes based on assessments in the ESIA to ensure adaptive management and sustainable performance outcomes.
- Ensure effective implementation of ESMP through robust auditing systems.
- Ensure regular reporting and public disclosure and information dissemination of the ESIA findings.

Conclusions

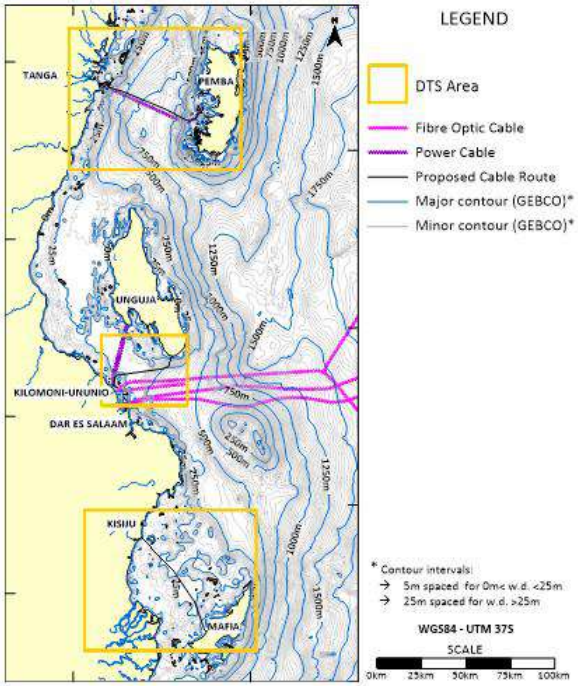
- A comprehensive ESIA process was carried out for the project. The EIA process and reports were structured to meet the requirements in the respective jurisdictions. Two separate reports were prepared and submitted to support the project's application for environmental authorization in Tanzania and Zanzibar. For Tanzania, authorization is being sought from the National Environment Management Council (NEMC). For Zanzibar, authorization is being sought from the Zanzibar Environmental Management Authority (ZEMA).
- The Contractor needs to comply with the various AfDB requirements, and the need to issue Environmental Compliance Reports will have to be stated and fully described in contracts.
- The project will have both positive and negative impacts. The increased power supply will benefit the economy and improve the quality of life for residents of Zanzibar. However, there are also potential negative impacts on the environment and local communities. These impacts need to be carefully considered and mitigated through appropriate planning and safeguards.
- Overall, the benefits of the project are likely to outweigh the costs, but it is important to carefully consider and mitigate the potential negative impacts.

SWAHILI VERSION

Uunganisho wa kV 220 kutoka Tanga hadi Kisiwa cha Pemba

Mradi

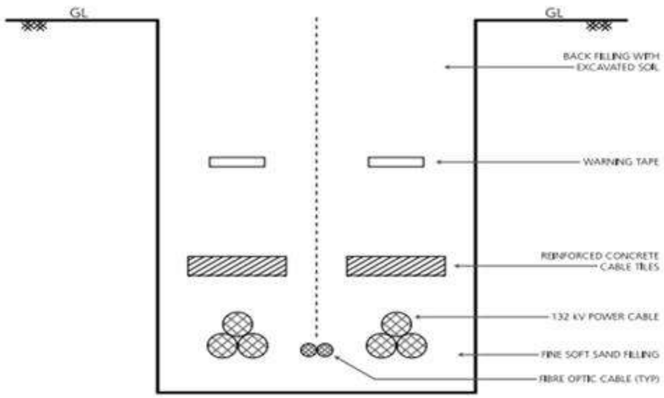
- **Lengo la Mradi:** Kuongeza usambazaji wa umeme Zanzibar ili kukidhi mahitaji yanayokua.
- **Faida za Mradi:**
  - Kuboresha maisha na maendeleo ya kiuchumi na kijamii Tanzania na Zanzibar kupitia ongezeko la upatikanaji na gharama nafuu wa umeme.
- **Washirika wa Mradi:**
  - Kampuni ya Ugavi wa Umeme Tanzania (TANESCO)
  - Shirika la Umeme Zanzibar (ZECO)
  - Benki ya Maendeleo ya Afrika (AfDB)
  - Mshauri: CESI S.p.A. (Italia) kwa kushirikiana na ELC Electroconsult S.p.A. (Italia) na Colenco Consulting Ltd. (Nigeria)
- **Vipengele vya Mradi:**
  - Ujenzi wa laini mpya ya umeme ya chini ya maji na ardhini yenye uwezo wa kV 132 kutoka Tanga (Tanzania Bara) hadi Pemba (Zanzibar).
  - Kutiwa kwa kebo za chini ya ardhi katika sehemu zote za bara na kisiwa kutokana na maeneo yenye watu wengi na kilimo.



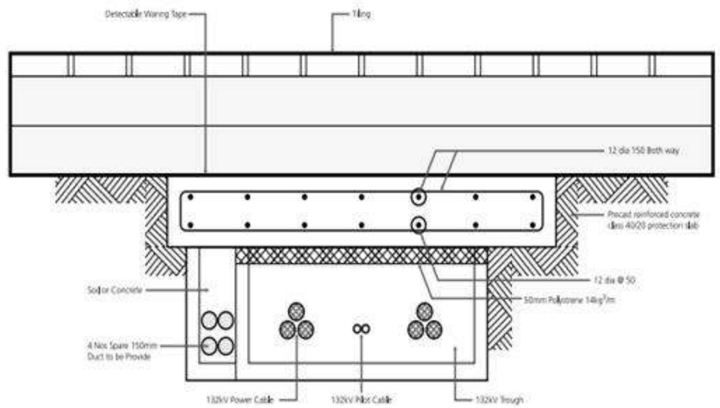
Mradi

- **Njia ya Kebo ya Chini ya Maji:**
  - Urefu wa jumla: Kilometa 69.747
  - Kina cha juu cha maji: Meta 830
  - Inavuka maeneo mawili ya ulinzi: Hifadhi ya Bahari ya Tanga Coelacanth na Hifadhi ya Pemba Channel
- **Njia za Kebo za Ardhi:**
  - Tanzania Bara: Kamba ya chini ya ardhi ya kilomita 8 kutoka sehemu ya kutua Mnyanjani hadi kituo cha umeme cha Majani Mapana.
  - Kisiwa cha Unguja: Kamba ya chini ya ardhi ya kilomita 9 kutoka sehemu mpya ya kutua karibu na Ras Mkumbuu hadi kituo cha umeme cha Wesha.
- **Ufungaji wa Kebo:**
  - Kebo za chini ya maji: kuzikwa kwa kutumia mbinu za kuchimba, kupanda, au kudunga maji.
  - Kebo za ardhi: kuwekwa moja kwa moja kwenye mitaro iliyofukuliwa.

Mradi



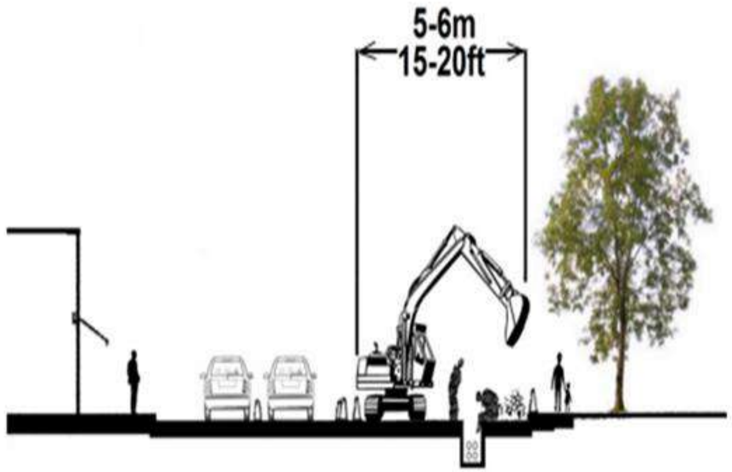
Njia ya kuweka kebo ya umeme yenye nguvu nyingi chini ya ardhi



Maelezo ya slab ya kinga kwa ujenzi wa barabara juu ya mfereji/kebo ya umeme

Mradi

- Mahitaji ya ardhi: Upana wa mita 1.5 kwa njia ya kupitisha (au upana wa shimo)
- Haki ya kudumu ya kupita inaweza kuwa takriban mita 1 kwa upana, ingawa ruhusa za muda zinahitajika kwa ujenzi na kupata ufikiaji wa vyumba vya kuunganisha kwa matengenezo. Njia imezingatia athari kwa wadau, mipango ya ujenzi wa baadaye kando ya njia na ufikivu.



Cable route Right of Way in a city street

Uchambuzi mbadala

- Mshauri amefanya tathmini ya chaguo la kutoendelea, maeneo ya kutua, njia za usafirishaji umeme, na maeneo ya vituo vya umeme. Suluhisho bora lilichaguliwa kulingana na mambo ya kiufundi, mazingira, na kiuchumi.
- Ziara za ukaguzi zilifanyika Machi na Aprili 2024 kutathmini hali ya eneo na kubaini mbadala.
- Kebo ya chini ya bahari na maeneo ya mpito yataanzia maeneo ya mbuko (mita 60 bara, mita 30 Zanzibar).
- Athari zinazowezekana za kuhama kwa watu kutokana na kebo ya chini ya ardhi zimezingatiwa katika Mpango wa Hatua za Kuhama.

Uchambuzi mbadala – Tanzania Bara

- Uunganisho wa chini ya ardhi wa kilovolt 132, ukiwa na sehemu zote mbili za kebo ya chini ya maji na chini ya ardhi, unaounganisha sehemu ya kutua ya Mnyanjani na kituo cha umeme cha Majani Mapana kilichopo (urefu wa takriban kilomita 8) ulibainika kuwa suluhisho bora kwa Tanga. Chaguo hili lilionyesha athari ndogo za mazingira na kijamii ikilinganishwa na njia mbadala zilizofikiriwa.

Landing point at Tanga

Uchambuzi mbadala – Zanzibar

- Ili kupunguza athari za mazingira na kijamii, hasa ununuzi wa ardhi, mpangilio wa kebo ya chini ya ardhi ulipangwa kimkakati kufuata barabara zilizopo.
- Sehemu nyingine ya kutua ilizingatiwa lakini ilikataliwa kutokana na vikwazo vya kiufundi.
- Njia madhubuti ya kubuni imeanzishwa kupunguza athari zinazowezekana kwenye mikoko kwenye sehemu ya kutua.

Landing point of near Ras Mkumbuu, Pemba Island

Existing overhead line in Pemba Island

Shughuli za Ujenzi

KUFANYIA KAZI ENEO

- Ni kawaida kufanyia kazi eneo lote la njia kabla ya kuanza ujenzi wa laini. Miti, vichaka, na mimea mingine itatoweka kabla ya kuanza kazi za ujenzi. Hatua hii ni muhimu kuhakikisha nafasi ya kutosha kwa ajili ya ujenzi na pia kuwezesha matengenezo ya laini iwapo itatokea uharibifu.

UNUNUZI WA ARDHI

- Wajibu wa kununua ardhi upo mikononi mwa Mamlaka za Mitaa. Mamlaka za Mitaa zitashughulikia hatua maalum za fidia zinazohitajika kwa mujibu wa sheria za mitaa kwa maeneo yanayopitiwa na njia ya usafirishaji umeme. Aidha, fidia itatolewa kwa hasara ya mazao ya mwaka mmoja na ya kudumu wakati wa ujenzi.

Tathmini ya Athari

Kumefanyika tathmini ya athari za mazingira na kijamii (ESIA) ili kubainisha na kupunguza athari zinazowezekana kwenye mazingira ya kimwili, kibiolojia na kijamii. Athari kuu zinazotarajiwa wakati wa ujenzi na uendeshaji wa mradi zimeorodheshwa hapa chini.

Nyanja ya Ardhi

MAZINGIRA YA KIMAFISIKA

Athari hasi wakati wa ujenzi:

- **Maeneo ya mandhari na maono**: Mradi huu utakuwa na athari za kuonekana, hasa kutokana na ujenzi wa kituo cha umeme na ufungaji wa kebo chini ya ardhi. Ingawa mabadiliko haya ni ya muda mfupi, yanaweza kuonekana zaidi katika maeneo wazi. Kwa ujumla, athari za kuonekana za mradi zitakuwa za wastani na za muda mrefu.

Athari hasi wakati wa uendeshaji:

- **Maeneo ya mandhari na maono**: Athari kuu ya kuona ya mradi itakuwa kutoka kwa kuboresha na kupanua vituo vya umeme vilivyopo. Hata hivyo, athari hii inachukuliwa kuwa ya wastani kutokana na vituo vya umeme viko katika maeneo yenye watu wengi na upeo mdogo wa mabadiliko.

MAZINGIRA YA KIBIOLOJIA

Athari hasi wakati wa ujenzi:

- **Upotevu na uharibifu wa makazi**: Kebo za chini ya ardhi nazo huchangia katika upotevu na uharibifu wa makazi. Mchakato wa kufunga kebo hizi unahitaji kuchimba mitaro, ambayo inasababisha usumbufu kwa mazingira kwa kuharibu mashimo ya wanyama, kuvuruga wanyamapori, na kuondoa mimea. Ingawa uharibifu wa ardhi ni mdogo ikilinganishwa na mistari ya umeme ya juu, bado unasababisha upotevu wa makazi, hasa kwa wanyama wadogo wanao tegemea udongo wa juu.
- **Ugawanyiko wa makazi, kizuizi cha uhamaji**: Ufungaji wa kebo chini ya ardhi unaweza kugawa makazi na kuzuia uhamaji wa wanyamapori. Ingawa ardhi ndogo inasumbuliwa ikilinganishwa na mistari ya umeme ya juu, kuchimba mitaro kunasababisha usumbufu kwa mazingira na kuunda vizuizi vya muda kwa wanyama. Kelele na shughuli za ujenzi zinaendelea kuzuia wanyamapori, hata baada ya kuondolewa kwa kizuizi cha kimwili.

Tathmini ya Athari

Kumefanyika tathmini ya athari za mazingira na kijamii (ESIA) ili kubainisha na kupunguza athari zinazowezekana kwenye mazingira ya kimwili, kibiolojia na kijamii. Athari kuu zinazotarajiwa wakati wa ujenzi na uendeshaji wa mradi zimeorodheshwa hapa chini.

Nyanja ya Ardhi

MAZINGIRA YA KIBIOLOJIA

Athari hasi wakati wa ujenzi:

- **Utangulizi na kuenea kwa spishi za mgeni vamizi:** Ujenzi wa miundombinu ya kebo za chini ya ardhi unaleta hatari kubwa kwa mazingira ya ardhi. Kwa kugawanyisha makazi na kuunda athari za pembezoni, unaongeza udhaifu kwa spishi vamizi. Vipande vipya vidogo vya makazi hivi hutoa mazingira bora kwa mimea vamizi kuanzishwa na kustawi, ikiwezekana kusababisha kupungua kwa spishi asili na uharibifu zaidi wa makazi.
- **Usumbufu, uharibifu na upotezaji wa mikoko:** Ujenzi wa mistari ya umeme chini ya ardhi unaweza kuathiri vibaya mazingira ya mikoko kupitia upotezaji na mgawanyiko wa makazi. Hata hivyo, hakuna athari kubwa inayotarajiwa kwa mikoko katika mradi huu kwani eneo la ujenzi linaepuka uwepo wa moja kwa moja wa mikoko. Pale ambapo kuna hatari zinazowezekana, hususan kuhusu mfumo wa mizizi karibu na eneo la ujenzi, hatua za kuzuia zitatumika.

Athari hasi wakati wa uendeshaji:

- **Upotevu, uharibifu na ugawanyiko wa makazi:** Mistari ya umeme na miundombinu inayohusiana inaweza kuvuruga makazi ya wanyama pori kwa kuunda vizuizi vya kuona, kupunguza harakati, na kupunguza ufikiaji wa rasilimali. Shughuli za matengenezo, kama vile kuondoa mimea, zinaweza kuzidisha matatizo haya kwa kusababisha upotezaji wa makazi na kuvuruga wanyama pori.
- **Utangulizi na kuenea kwa spishi za mgeni vamizi:** Matengenezo ya mistari ya umeme, yanayohusisha kuondoa mimea na kukata nyasi, yanaweza kusababisha kuenea kwa spishi za mgeni vamizi bila kukusudia. Kwa kuondoa mimea asili, shughuli hizi huunda mazingira mazuri kwa mimea vamizi kuanzishwa. Kwa kuongezea, vifaa na wafanyakazi wa matengenezo wanaweza kusafirisha mbegu za vamizi kwa umbali mrefu.
- **Usumbufu wa binadamu:** Uendeshaji na matengenezo ya mistari ya umeme yanaweza kusababisha usumbufu kwa wanyamapori na makazi yao kupitia kelele, uchafuzi, na uwepo wa binadamu. Ingawa usumbufu huu ni wa mara kwa mara, unaweza kuwa na athari mbaya kwa mazingira. Kwa kuongezea, uwezo wa mradi huu wa kukuza utalii unaweza kusababisha ongezeko la shughuli za binadamu, na hivyo kuendelea kuvuruga usawa wa mazingira tete.

Tathmini ya Athari

Kumefanyika tathmini ya athari za mazingira na kijamii (ESIA) ili kubainisha na kupunguza athari zinazowezekana kwenye mazingira ya kimwili, kibiolojia na kijamii. Athari kuu zinazotarajiwa wakati wa ujenzi na uendeshaji wa mradi zimeorodheshwa hapa chini.

Nyanja ya Ardhi

MAZINGIRA YA KIJAMII

Athari hasi wakati wa ujenzi:

- **Ununuzi wa Ardhi, Vikwazo vya Matumizi ya Ardhi na Uhamaji Wasiokuwa wa Hiari:** Ufungaji wa kebo za chini ya ardhi unahitaji njia ya kudumu yenye upana wa mita 1.5, na kusababisha upotezaji wa ardhi wa kudumu. Kutikisika kwa ardhi kwa muda na uharibifu wa kilimo pia kutatokea wakati wa kuchimba mitaro. Hata hivyo, suluhu ya kebo za chini ya ardhi inapunguza ununuzi wa ardhi kwa kutumia hifadhi za barabara iwapo inawezekana.
- **Afya na Usalama wa Jamii:** Utekelezaji wa mradi unaleta hatari kubwa kwa jamii za eneo hilo. Kuongezeka kwa magari, uvamizi, na usumbufu wa mazingira kunaweza kusababisha ajali, majeraha, na upotezaji wa mali. Kwa kuongezea, kuongezeka kwa wafanyakazi kunaweza kusababisha hatari za kiafya, kutokuwa na utulivu wa kijamii, na kuongezeka kwa udhaifu kwa wanawake na wasichana kwa unyanyasaji wa kingono na ukatili.
- **Miundombinu na Huduma za Umma:** Utekelezaji wa mradi unaweza kusababisha kuongezeka kwa msongamano wa magari, uharibifu wa miundombinu, na usumbufu wa muda mfupi katika upatikanaji wa huduma muhimu. Wakazi wa eneo hilo wanaweza kupata vikwazo katika kufikia vituo vya afya na huduma za matumizi kutokana na shughuli za ujenzi.

Athari chanya wakati wa uendeshaji:

- **Uongezeko wa Ugavi wa Umeme:** Uongezeko wa ugavi wa umeme unakuza maendeleo ya uchumi, unaboresha maisha ya watu, unimarisha usalama wa nishati, na unaruhusu ujumuishaji wa vyanzo vya nishati mbadala kwenye gridi ya umeme.
- **Ukuaji wa Uchumi:** Ulioanzishwa hasa na kuongezeka kwa uhakika wa ugavi wa nishati, kuvutia viwanda vinavyotegemea umeme imara, kuunga mkono biashara za ndani, na uwezekano wa kuongeza thamani ya mali katika maeneo yenye ufikiaji bora wa umeme.

Tathmini ya Athari

Kumefanyika tathmini ya athari za mazingira na kijamii (ESIA) ili kubainisha na kupunguza athari zinazowezekana kwenye mazingira ya kimwili, kibiolojia na kijamii. Athari kuu zinazotarajiwa wakati wa ujenzi na uendeshaji wa mradi zimeorodheshwa hapa chini.

Nyanja ya Bahari

MAZINGIRA YA KIBIOLOJIA

Athari hasi wakati wa ujenzi:

- **Upotevu, uharibifu, ugawanyiko wa makazi na athari ya kizuizi:** Ufungaji wa kebo utasababisha usumbufu kwenye mazingira ya baharini. Viumbe vya chini ya bahari na samaki wataathiriwa na kutikisika kwa sakafu ya bahari, na uwezekano wa kuwa na athari kwenye miamba ya korali na maeneo ya kuzaa samaki. Kobe wa baharini na nyangumi wa kuhama wanaweza pia kuathiriwa, hasa wakati wa vipindi vya kutaga mayai na kuhama.
- **Utangulizi na kuenea kwa spishi za mgeni vamizi:** Kuongezeka kwa trafiki ya vyombo vya baharini wakati wa ujenzi kunaweza kuingiza spishi za mgeni vamizi. Meli zinazosafirisha wafanyakazi na vifaa zinaweza kusambaza viumbe vamizi bila kukusudia.
- **Usumbufu, uharibifu na upotezaji wa miamba ya korali:** Ufungaji wa kebo za chini ya maji unaleta hatari kubwa kwa miamba ya korali. Kuchimba mitaro, kutua nanga, na kuongezeka kwa matope kunaweza kusababisha uharibifu wa kimwili, kuzika korali, na kuvuruga mfumo wao wa ikolojia dhaifu.

Mapendekezo

- Kuhakikisha kufuata viwando vya kitaifa na kimataifa vya mazingira na kijamii (kwa mfano, Mapitio ya Usalama wa Uendeshaji wa Benki ya Maendeleo ya Afrika).
- Kuendeleza hatua za kupunguza madhara kama ilivyoelezwa katika tathmini ya mazingira na kijamii ili kupunguza athari.
- Kuanzisha michakato madhubuti ya ufuatiliaji kulingana na tathmini zilizofanywa katika tathmini ya mazingira na kijamii ili kuhakikisha usimamizi wa kubadilika na matokeo endelevu ya utendaji.
- Kuhakikisha utekelezaji madhubuti wa mpango wa usimamizi wa mazingira na kijamii kupitia mifumo madhubuti ya ukaguzi.
- Kuhakikisha uwasilishaji wa ripoti za kawaida na ufunuo wa umma na usambazaji wa habari kuhusu matokeo ya tathmini ya mazingira na kijamii.

Hitimisho

- Utaratibu kamili wa Tathmini ya Maendeleo ya Mazingira na Kijamii (ESIA) ulifanyika kwa mradi huu. Mchakato na ripoti za Tathmini ya Maendeleo ya Mazingira (EIA) ziliandaliwa kufuata mahitaji ya maeneo husika. Ripoti mbili tofauti ziliandaliwa na kuwasilishwa kuunga mkono maombi ya idhini ya mazingira nchini Tanzania na Zanzibar. Kwa Tanzania, idhini inatafutwa kutoka Baraza la Taifa la Usimamizi wa Mazingira (NEMC). Kwa Zanzibar, idhini inatafutwa kutoka Mamlaka ya Usimamizi wa Mazingira Zanzibar (ZEMA).
- Mkandarasi anahitaji kufuata mahitaji mbalimbali ya Benki ya Maendeleo ya Afrika (AfDB), na haja ya kutoa Ripoti za Utekelezaji wa Mazingira italazimika kutajwa na kuelezwa kikamilifu katika mikataba.
- Mradi huu utakuwa na athari chanya na hasi. Uongezeko wa ugavi wa umeme utafaidisha uchumi na kuboresha maisha ya wananchi wa Zanzibar. Hata hivyo, kuna pia athari mbaya zinazowezekana kwa mazingira na jamii za eneo hilo. Athari hizi zinahitaji kuzingatiwa kwa makini na kupunguzwa kupitia mipango na hatua za ulinzi zinazofaa.
- Kwa ujumla, faida za mradi zinaweza kuzidi gharama, lakini ni muhimu kuzingatia kwa makini na kupunguza athari mbaya zinazowezekana.