EXECUTIVE SUMMARY

This section is equivalent to Section i, executive summary, of the legislative structure. If in doubt, please refer to Table 1.5-1 Environmental Impact Statement Structure on page 1-5.

Introduction

The East African Crude Oil Pipeline (EACOP) System is a planned export pipeline project that will transport oil from an inlet flange at the Kabaale pumping station (PS1), in Hoima district, Uganda, to an export flange at a proposed marine storage terminal (MST) at Chongoleani, Tanga district, on the East African coast of Tanzania. The Tanzania Petroleum Development Corporation (TPDC) and Uganda National Oil Company (UNOC), will be shareholders in a pipeline company with Total E&P Uganda B.V. (TEPU), Tullow Uganda Operations Pty Ltd (TUOP) and CNOOC Uganda Limited (CUL) that will develop, construct and operate the pipeline. Total East Africa Midstream (TEAM) BV is the developer of the project.

This environmental impact statement (EIS) is a report of the environmental and social impact assessment conducted to identify, describe and assess the likely interactions of the portion of the EACOP project in Tanzania with environmental and socio-economic receptors, termed as “valued environmental and social components” (VECs).

This ESIA has been prepared pursuant to the Government of Tanzania Environmental Impact Assessment and Audit Regulations G.N. 349 (2005), amended 2018 and conducted in accordance with the Scoping Report and terms of reference approved by NEMC, dated 15 September 2017.

Project Description

In Tanzania, the EACOP project comprises the following components:

- 1147-km-long, 24-in.-diameter, insulated, electrically trace heated, buried pipeline from the Uganda–Tanzania border to the marine storage terminal (MST) on the Chongoleani peninsula directly north of Tanga
- aboveground installations (AGI):
  - four pumping stations (PS) (PS3 through to PS6)
  - two standalone pressure reduction stations (PRS) (PRS1 and PRS2) and a pressure reduction system within the marine storage terminal
  - the marine storage terminal (MST)
  - an offshore load out facility (LOF) comprising a 1.9-km trestle and a loading platform for transfer of oil to tankers
  - 49 standalone main line block valve stations, 3 standalone electric trace heating substations, 11 electric substations combined with main line block valve stations, and 7 electric substations combined with AGIs and MST
- roads:
  - 47 km of new and upgraded permanent access roads

- 60 km of new and upgraded construction facility access roads
- construction facilities:
  - 12 main camps and pipe yards (MCPY5 through to MCPY16)
  - pipe coating facility.

The EACOP project in Tanzania is shown in Figure ES1. In general, the route initially crosses predominantly undulating to flat terrain, wetlands and seasonal wetland areas in Uganda before it crosses the border into Tanzania. As the route passes the western side of Lake Victoria, it traverses an area characterised by high rainfall and humidity. This area is sparsely populated although there is extensive cultivation across the corridor in this area. As the route turns toward the east at the southwest corner of Lake Victoria, it passes through undulating terrain in areas with greater population density and cultivated land. This area is much drier and as the route approaches the Rift Valley at the Tanzanian Divergence the area becomes sparsely populated. East of this point, the route traverses through the low undulating, dry, bushland of the southern Manyara region. Beyond this zone, the route crosses varied terrain with occasional agricultural land use and settlement as it approaches the coastal region, where the marine storage terminal is located.

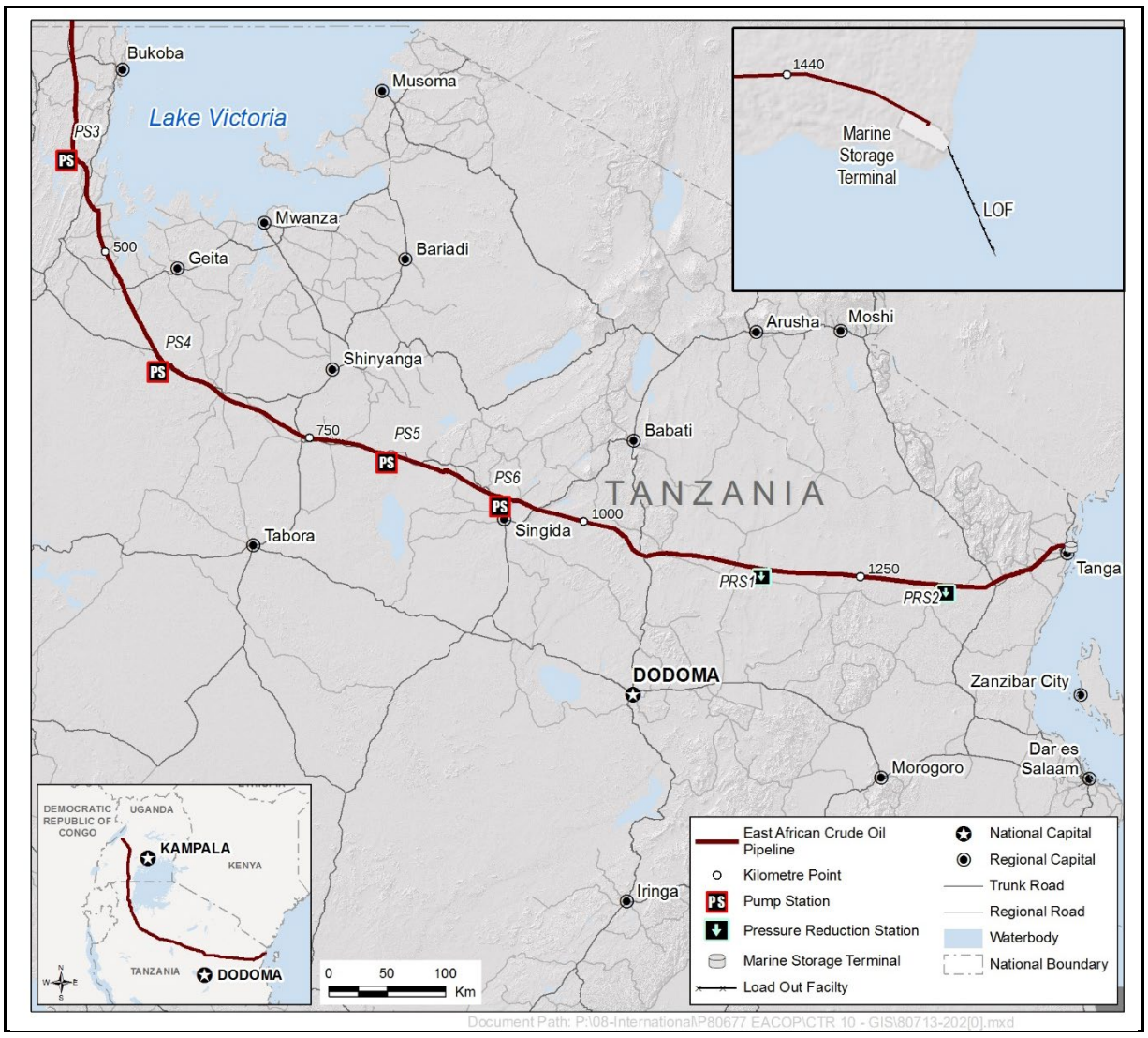


Figure ES1 EACOP Project

Project Alternatives

Project alternatives have been considered for:

- pipeline routing
- siting facilities:
  - AGIs
  - construction facilities
  - MST and the LOF
- technology
- construction techniques.

Routing

Several alternative pipeline routes were identified during the early stage of the development of the EACOP project.

The routing process began with the identification of starting point and a flexible end point, which was then followed by numerous screening studies to evaluate constructability, geohazards, terrain (river crossings and slopes), environment and social constraints for pipeline routing at a broad scale. This work culminated in the selection of eleven 50-km-wide corridor combinations for more detailed evaluation. Secondary information was then used to assess the potential corridors using a geographical information system (GIS) and three corridor options were selected:

- Kenya North
- Kenya South
- Tanzania.

Using higher-resolution satellite imagery, the corridors were refined through further analysis of the constraints noted above. Following this work, the Government of Uganda announced the selected Uganda-Tanzania route in April 2016.

Facility Siting

Alternatives were assessed for the number, location, layout and footprint of the following surface facilities:

- AGIs
- construction facilities including MCPYs and the coating facility
- MST and LOF.

The functional requirements of the surface facilities have been the main driver for the identification, screening and final location selection.

AGIs

The selection of appropriate sites for the PSs and PRSs was determined before front-end engineering and design (FEED) by pipeline hydraulic studies. Other criteria considered were:

- thermal design requirements
- safety and environmental risk factors
- site physical conditions (topography, accessibility, proximity to existing infrastructure)
- environmental and social constraints.

Satellite imagery and site visits were used to establish locations during FEED. Siting of the heat trace substations is ongoing and will be refined based on further electrical studies, whereas the block valve locations have been defined based on detailed technological risk analysis.

Construction Facilities

The construction facilities site selection process has taken into consideration the requirement to:

- minimise land acquisition
- minimise distance from road networks
- avoid populated areas and nationally protected areas of biodiversity value
- take cognisance of the terrain type and topography suitability.

MST

Numerous studies were conducted during the early stages of project development to identify, screen and evaluate suitable locations for the MST at the regional level using site selection criteria including marine access, environmental and social constraints and terminal constructability. The key drivers for the site selection were:

- vessel requirements and associated vessel draft depth, i.e., Suezmax and Aframax
- options for the LOF

The selection procedure was undertaken in three phases:

- screening to produce an initial list of potential options (50 sites)
- refinement of the initial list to a long list (34 sites)
- additional refinements resulting in a short list and candidate sites (4).

The selection of the Tanzania pipeline routing option dictated the requirement to locate the terminal in the Tanga region. As a result, locations on the Chongoleani peninsula, approximately 6 km northeast of the seaport of Tanga were evaluated.

Technical, environmental and social criteria were used during the evaluation of the Tanga MST locations and the options were narrowed to two potential locations with the preferred option being selected based on:

- greater distance from the settlement of Chongoleani and cultural sites (a Sharif Tomb and a sacred baobab tree)
- lower risk of impacts on groundwater compared with the other location

LOF

Trestle

During FEED, multiple options were investigated for the location of the trestle. Three options (one base case and two alternatives) were considered most appropriate for the position and length of the marine trestle structure. The main drivers for positioning of the marine trestle were to:

- avoid positioning on a coral pinnacle identified from bathymetry situated at the loading platform location and therefore avoiding impacts associated with piling and rock removal
- align and orientate the trestle structure with the export tie-in point at the MST
- reduce the overall length, footprint and seabed impacts associated with construction activities.

The base case option was selected because the loading platform could be sited away from the pinnacle, meaning less construction impact, minimising the overall length of the marine trestle and maintaining enough clearance at the loading platform for vessel movements.

Loading Platform

The initial location selection criteria for the loading platform were based on prevailing metocean conditions (wind and waves). Four potential locations were considered for the loading platform during pre-FEED, all of which are outside the nationally designated Tanga Coelacanth Marine Park (TCMP). The four locations were evaluated on environmental and social criteria, including proximity to the TCMP. Three of the potential sites require a much

longer trestle and, thus had greater potential for impacts during construction and increased interference with sea users. Relative to the other sites, the selected loading platform location offers the best potential to minimise impacts on the nearby marine environment (and mangrove stands) but is the closest to the northern boundary of the TCMP.

Technology

Technology alternatives for the following were considered:

- pipeline (diameter and wall thickness)
- pumps
- power generation
- insulation
- heating
- oil storage.

Pipeline

A partially above ground pipeline alternative was considered during early stages of project development but was discounted for numerous reasons including issues associated with security and safety, risk of interference by third parties, permanent land take, visual impacts and impacts to large wildlife movement. The concept selected for study was a trenched and buried pipeline.

Owing to the oil characteristics, two strategies were considered to enhance oil flow:

- a cold transport option requiring the partial removal of paraffinic components ensuring that gelling of the oil is prevented. This requires some oil processing and is extremely expensive. Consequently, this alternative was screened out.
- a hot transport option aimed at maintaining the fluid temperature above 50°C with the use of thermal insulation, and a combination of heating options. Hot transport was selected as the base case for further study.

Pumps

The pump technology selection has been determined by the characteristics of the Albertine Graben fluid (viscous with no gas volume fraction (GVF)) which means that volumetric pump types are not viable. Therefore, centrifugal pumps are the most suitable design for the fluid type because they are proven technology, robust, and cost effective.

Power Generation

Several power generation alternatives were considered including:

- crude oil powered engines
- crude oil powered engine with additives or blending
- steam or organic Rankine cycle (ORC) turbine
- local treatment of crude (semi-centralised topping)
- decentralised topping and transport by pipeline
- gas oil

- self-generated electricity
- grid electricity
- gas
- solar.

Most of the alternatives had uncertainties associated with availability of infrastructure and technology as well as the matter of reliability associated with third party ownership, and environmental and social impacts associated with increased traffic, noise, dust and emission impacts. It was concluded that crude oil engines utilising crude from the pipeline is the most efficient, self-sufficient and technically feasible option. However, the proponent will continue to investigate the viability of solar power as a supplementary power supply option throughout detailed engineering.

Insulation

Early studies concluded that heat losses with un-insulated pipe would require 35 separate crude fired heating stations resulting in high crude consumption by the heaters, a larger project footprint, larger environmental and social impacts and higher operational costs. By applying thermal insulation on the pipeline, it was concluded that the heating requirements could be optimised with power for heating being provided from six stations with lower crude consumption, lower project footprint, less requirement for facilities and with a higher initial cost but more economical over the lifetime of the project.

Three types of insulation were considered:

- polyurethane foam (PUF)
- glass
- pipe in pipe (PiP).

PUF was selected as the base case as it offers the highest thermal efficiency with lowest capital expenditure (Capex).

Heating

Three heating configurations were considered to maintain the oil temperature above 50°C:

- Case 1 – electric heat tracing (EHT) only case
- Case 2 – bulk heating (BH) only
- Case 3 - EHT + BH (mixed heating architecture).

Case 3 was selected based on higher efficiency compared to Case 1 and the large heat loss associated with Case 2.

Oil Storage

Three types of tanks were considered:

- fixed roof
- external floating roof
- internal floating roof.

The external floating roof design was selected as the base case due to increased structural requirements for the required diameter and capacity of tank.

Construction Techniques

Several pipeline construction techniques have been considered for general pipeline construction and for crossings of watercourses and infrastructure:

- open cut
- horizontal directional drill (HDD)
- micro tunnel
- auger bore.

For tarmac roads and railways, the auger boring technique will be used to prevent disruption to services. For the larger rivers, HDD has been selected as the technique for the Kagera and Sigi river crossings and open cut method for the Pangani River crossing. Other techniques such as direct pipe and micro-tunnelling were discounted during FEED due to the requirement for a much larger construction footprint and greater Capex.

Legislative, Policy and Administrative Framework

The ESIA was developed in accordance with relevant legislation, policy, plans and regulations, including:

- the Environmental Management Act (EMA) No. 20, 2004
- the National Environmental Policy, 1997
- the Environmental Impact Assessment and Audit Regulations G.N.349, 2005, amended 2018.

The ESIA will be submitted to the National Environment Management Council (NEMC).

The ESIA has also been developed in compliance with the International Finance Corporation Performance Standards (IFC) (2012).

Project standards have been developed for air emissions, emissions to water and noise, taking into consideration the requirements of national legislation and international best practice.

Considering the transboundary nature of the project, the Governments of Uganda and Tanzania signed an intergovernmental agreement (IGA) with the aim of streamlining the legal regime for the EACOP across the two countries. Respective host government agreements (HGAs) will operationalise the IGA.

ESIA Methodology

ESIA Process

The ESIA has included the following steps:

- Screening of potential project impacts was undertaken early in the development of the project, primarily through routing studies.
- A scoping exercise to identify potentially significant impacts for taking forward as the focus for the further impact assessment phase, identify data availability and gaps, determine the spatial scope (area of influence, AOI) and temporal scope for the assessment and define baseline studies.

- Baseline studies (desk-based analysis and field surveys) to obtain enough information to characterise the environmental and social conditions.
- Identification of project impacts and development of mitigation measures iteratively with the project planning and design (the process will continue through the construction phase). Project-only and potential cumulative impacts with other projects have been considered.
- Collation of the mitigation and management measures into an environmental and social management plan (ESMP) and monitoring measures into an environment and social monitoring plan (ESMoP).

Stakeholder engagement has been undertaken throughout the ESIA process and results have been used to inform the ESIA.

Valued Environmental and Social Components

Environmental and social features and receptors assessed in this ESIA are referred to as valued environmental and social components (VECs). Project and cumulative impacts on VECs and their associated ecosystem services are assessed in this ESIA.

VECs are valued and have high sensitivity to project interactions. For VECs that exhibit gradations of sensitivity, a ranking system has been used to describe their sensitivity. VECs with standards and thresholds, for example, air quality, compliance to the standard or threshold have also been used to establish magnitude or to inform impact significance directly.

Impact Assessment

The ESIA systematically identifies, describes and assesses the potential impacts from the EACOP project on VECs.

Normal Operations

The assessment of impacts from normal project operations considered:

- generic and location-specific project impacts
- cumulative impacts
- transboundary impacts.

Impacts were considered before mitigation was applied and after mitigation was applied. The development of measures to mitigate the impacts was an iterative process and continued until an impact was deemed as not significant as reasonably practicable. Residual impacts were those that remained after the completion of this process.

For normal project operations, an impact is assumed to occur, i.e., 100% probability of occurrence.

The significance of impacts on VECs is determined based on scoring VEC sensitivity and the consequence of the impact taking account of:

- magnitude - measure of the degree of change that will be caused by an aspect or activity
- duration - the length of time over which an impact may occur
- extent - the geographical area that may be impacted.

The reversibility of an impact and hence the permanent or temporary nature of an impact is accounted for by considering the duration of an impact and the sensitivity of a VEC.

To determine whether an impact is significant, the impact score is a sum as follows:

magnitude + extent + duration + VEC sensitivity = impact score

A threshold score was set to determine if an impact was considered significant.

Abnormal or Unplanned Events

Abnormal operations and unplanned impacts were considered including:

- geotechnical events (e.g., earthquakes, landslides)
- accidental events (e.g., traffic incidents, fire, collision of vehicles with equipment, damage of pipe due to unauthorised digging, vessel incidents and marine related oil spills).

Given the inherent uncertain nature of potential unplanned events, the potential variability of such events in terms of geographic location and coverage, and limitations of directly relevant event statistics, no significance determination was undertaken but likelihood was estimated for terrestrial events and risk for marine events.

Environmental and Social Baseline Conditions

The baseline condition of VECs are summarised below.

Biodiversity

Habitats of Conservation Importance

The pipeline route passes through a variety of predominantly modified habitats (IFC 2012), with some natural habitats remaining both within and outside protected areas. Habitats of conservation importance within the AOI are: Itigi-like thicket, dry miombo woodland, coastal vegetation mosaic comprising coastal forest and woodland, riparian forest and other coastal vegetation types. These habitats are highly threatened and unique within the broader landscape, and as such have very high sensitivity to change.

The footprint of the coating facility at KP702 lies within the 1,932,500 million km^2 Central and Eastern miombo woodland ecoregion (which extends over ten countries in central and southern Africa as defined by the nongovernment organisation (NGO) the Worldwide Fund for Nature (WWF). The ecoregion comprises deciduous woodland and a mosaic of tropical grasslands, savannas and shrublands. The coating facility site comprises bushland and agro-pastoral/cultivated land. Habitat clearance for agriculture and grazing, uncontrolled burning and over exploitation of timber and nontimber forest products are the main threats to dry miombo woodland and this trend is likely to continue. The coating facility site is located primarily on land used for agriculture with scattered scrub.

The footprint of the MST at Chongoleani lies within a coastal vegetation mosaic which comprises agro-pastoral land interspersed with coastal woodland, shrubland, bushland and thicket. This landscape forms part of the East African Coastal Forest EBA and biodiversity hotspot which encompasses a total of 697 km^2. Habitat clearance driven by agro-pastoral activities, wildfires and over exploitation of timber (The REDD+ Desk 1018; Miles et. al.

2009) are the main threats to this habitat and this trend is likely to continue. Large areas of the MST footprint have been modified for agriculture activities and are semi-natural.

Flora and Fauna Species of Conservation Importance

Flora species of conservation importance include 34 species of vascular plants: 11 are listed by the IUCN (2017) as vulnerable, one is listed as endangered, and 22 have Black Star status as endemic and or globally restricted-range species as defined by the Rapid Botanical Survey. This methodology was used to characterise the baseline habitats and flora and defines a Black Star species of highest conservation concern because of their very small global area of occupancy. The majority of globally rare and restricted-range or endemic species of vascular plants were recorded in the dry miombo woodlands, Itigi-like thicket and coastal vegetation mosaic. All Black Star species have a high sensitivity to change, as do IUCN listed vulnerable species. The single species listed as IUCN endangered, *Stylochaeton bogneri*, has a very high sensitivity to change.

Fauna species of conservation importance include but are not limited to African wild dog (*Lycaon pictus*; IUCN endangered), elephant (*Loxodonta Africana*; IUCN vulnerable), hippopotamus (*Hippopotamus amphibious*; IUCN vulnerable), lion *(Panthera leo*; IUCN vulnerable), leopard (*Panthera pardus*), Temminck's ground pangolin (*Smutsia temminckii*) and giraffe (*Giraffa camelopardalis*). Several endemic and / or restricted range fauna species are also known to be, or likely to be, present in the AOI and include: Zanzibar galago (*Galagoides zanzibaricus*), Masiliwa snout burrower (*Hemisus brachydactylus*), bubbling puddle frog (*Phrynobatrachus bullans*), Maendeleo horseshoe bat (*Rhinolophus maendeleo*) and Hildegarde's tomb bat (*Taphozous hildegardeae*).

Seventeen avifauna species of conservation importance use habitats within the AOI. Bird species of conservation importance include, but are not limited to, hooded vulture (*Necrosyrtes monachus*; IUCN critically endangered); grey crowned crane (*Balaerica regulorum*; IUCN endangered), white-backed vulture (*Gyps africanus*; IUCN critically endangered) and steppe eagle (*Aquila nipalensis*, IUCN endangered). Several endemic and or range restricted birds use habitats in the AOI including papyrus yellow warbler (*Calamonastides gracilirostris*; IUCN vulnerable), Karamoja apalis (*Apalis karamojae*; IUCN vulnerable) and orange-bellied parrot (*Poicephalus rufiventris*; IUCN least concern).

Fish and aquatic macro-invertebrate species of conservation importance inhabit the Kagera River, River Pangani, Lake Victoria Wetlands, Wembere Wetlands, Sigi River and ephemeral watercourses within the AOI. These sites support natural habitats (IFC, 2012) of moderate to high sensitivity. Threatened species of fish present within these aquatic habitats include, but are not limited to, the endemic fish of very high sensitivity *Barbus profundus*, *Haplochromis victorianus* (IUCN critically endangered) and *Oreochromis esculentus* (IUCN critically endangered).

Habitat loss and fragmentation is driving declines in many species of conservation importance and this trend is likely to continue with increased population pressure, use of natural resources and conversion of natural habitats for agricultural use.

Legally Protected, Internationally or Nationally Recognised Areas

Legally protected areas within the AOI or directly affected by the project, that support natural habitats (IFC, 2012) and species of conservation importance are Minziro Nature Forest

Reserve (a groundwater supported forest), Burigi-Biharamulo Game Reserve (GR) and Swaga Swaga GR.

Internationally or nationally recognised areas within the AOI or directly affected by the project that support natural habitats (IFC, 2012 and species of conservation importance are the Wembere Steppe Key Biodiversity Area (KBA) and Important Bird Area (IBA), Talamai Open Area (OA), Mgori Community Forest Reserve, Singida Lakes IBA and the East African Coastal Forest Endemic Bird Area (EBA) which is also a biodiversity hotspot.

Physical Environment

Geology

The geological history of Tanzania is complex and represented by both relatively old and relatively young rock and sediment types. In general, the oldest strata are present in the centre of the country and form a granitic craton (part of the Earth's early continental crust). This craton is surrounded by younger metamorphic and igneous rocks. Around Tanga, the geology is characterised by sandstone, siltstone and shale of continental origin and, occasionally in association with limestones which are marine in origin.

The occurrence of earthquakes in Tanzania is associated with the East African Rift System. Central Tanzania is prone to earthquakes. The magnitude of the earthquakes is primarily between 4.0 and 4.8, less frequently between 5.0 and 6.4.

Landslides and sinkholes have not been identified across the AOI.

Soil

Soil types with a high sand content, i.e., loamy sand, sandy clay loam and sandy loam, were found to be present along most of the route. Top soil depth within the majority of the AOI was 20–40 cm, although thin top soils (<5 cm) are likely to exist. Soil within the AOI is mainly characterised as low to medium productivity, supporting cultivation and grazing, however there are also areas comprising soils that have high productivity, used for cultivating maize, sisal, mangoes and oranges.

The soil erosion risk varies across the AOI reflected by the change in soil and slopes. Throughout the AOI, there are sections with steep ridges, or moderate hills increasing the risk of erosion because of the increased slope. The AOI is subject to drought and flooding which may exacerbate weathering, making soil more prone to erosion and causing the loss of nutrients and organic matter.

There is no evidence of noteworthy existing contamination within the AOI.

Surface Water

The pipeline route crosses several permanent and ephemeral watercourses and wetlands belonging to the Lake Victoria basin, the Lake Tanganika Basin, the Internal Drainage Basin, the Wami/Ruvu Basin and the Pangani Basin. Most watercourses crossed are ephemeral with only a few permanent watercourses.

The morphology and stability of the watercourses varies throughout the AOI. Some of the watercourses are formed in sandy soils with scrub riparian vegetation and evidence of existing sheet or gully erosion, meaning the river channels are less stable.

Water quality is considered relatively good for most watercourses and is consistent with rivers in catchments with dispersed rural settlement, and is therefore, sensitive to change. There are currently few sources of contamination, limited to the frequent use by livestock and by people for domestic purposes in these areas, which could cause an increase in organic compounds within surface water bodies.

Local communities use surface water mainly for livestock watering and domestic purposes. As populations grow this may lead to increased abstractions for water supply and irrigation, reducing flows downstream in an area where water accessibility is already limited and water is scarce.

Groundwater

Groundwater quality is generally good in the water basins traversed by the pipeline (lakes Victoria and Tanganyika, Internal and the Pangani River). The aquifers in the AOI range from moderate to very high vulnerability based on permeability and depth to the water table.

In the AOI, groundwater is the most important source of public water supply being of high quality and used for drinking water and domestic purposes. Brackish and saline waters can occur within the groundwater near Tanga. Groundwater can also support habitats, such as the Minziro Forest.

Population growth is likely to increase the requirement for groundwater for domestic use. Groundwater in both the sedimentary and basement aquifers is therefore considered highly sensitive to change.

Landscape

The pipeline route traverses a mixed landscape of valleys, plains and ridges, wetlands and mixed farming areas. Most of the route has already been affected by human activity for farming and grazing and areas affected are of low landscape sensitivity. Exceptions to this include the more natural, scenic landscapes at PS3 and PRS1, the latter lies within the Talamai OA which has been partially affected by human activity. Two other sections of the route traverse more naturally scenic areas. KP438 to KP469 retains much of its vegetation, including patches of itigi thicket, old growth woodland, within the Ruiga River Forest Reserve and Burigi–Biharamulo GR. A second section of the route, KP1082 to KP1106, is remote from settlements and is characterised by a mixture of grassland with scrub and trees that lie between large areas of surface rock. At the MST and LOF the partially enclosed Tanga Bay opens to the Indian Ocean to the east. Islands and sand banks lie within the coastal waters, including the forested Kwale and Ulenge Marine Reserve Parks, creating a seascape of some natural scenic value.

Except for the RoW from KP438 to KP469 and KP1082 to KP1106 and PRS 1 the landscape can tolerate further similar modification without changing its present character, so it is not regarded as sensitive to change.

Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape. However, the tourist areas of Tanga and along the coast are ranked as high visual sensitivity.

Air Quality

Concentrations of NO_2, NO_x and CO are low at all locations surveyed (i.e. pump stations and pressure reduction stations). The baseline environment is characterised by moderate to high levels of airborne fine particulate matter due to natural conditions (dry soils which are easily mobilised in windy conditions). Much of the project's AOI is sparsely populated areas and infrequently occupied. There is capacity in the atmospheric environment for gaseous emissions to increase without levels which exceed National Standards (and Project Environmental Standards) being reached.

Acoustic

The noise environment in the AOI, particularly around the AGIs, is dominated by farming activities, wind through the vegetation, bird song and occasional local vehicle movements. Adjacent to MCPY9, 11 and 16, and the coating facility higher levels of traffic were generated noise were identified.

The noise environment at locations proposed for the RoW, MCPYs and pumping stations ranged between 24 and 52 dB(A) $L_{90,1hr.}$

There is an absence of industrial and commercial noise throughout the AOI.

Marine Environment

Marine Physical Processes

The nearshore geomorphology in the AOI is dominated by raised fossil reef islets with adjacent soft seabed consisting of sediment of biogenic origin and siliciclastic sediment which also dominate the beaches and intertidal areas. The current direction in the area is highly variable but current speed is low.

The seawater quality is high and therefore sensitive to change. The sediment is also relatively unpolluted and sensitive to change.

Marine Acoustic Environment

The baseline acoustic environment is characterised by low-level vessel movements and intermittent noise sources from blast fishing. These intermittent noise sources add to the more continual but usually low level ambient background noise resulting from marine physical processes and marine fauna.

The underwater environment acts as the carrier of noise from source to VECs such as fish and marine mammals, it is the sensitivity of those VECs which define the sensitivity of the underwater acoustic environment to change.

Intertidal and Subtidal Flora and Habitats of Conservation Importance

The marine and intertidal environment around Tanga is characterised by the presence of three main habitats of high conservation value: mangroves, seagrass beds and coral reefs, which support a variety of biodiversity.

There are well-established and extensive seagrass beds and mangrove forests in the AOI. The seagrass beds are species rich, supporting seven out of the ten seagrass species found in Tanzania. Mangroves are also species rich. Both habitats can tolerate short-term or

localised stress if regeneration capacity is available, however mangrove deforestation is occurring resulting in potentially low sapling regeneration.

These habitats, as well as coral reef described below, support a wide variety of biodiversity, including fish, shellfish, marine mammals, turtles and birds and are highly threatened and unique ecosystems (IFC, 2012), and have very high sensitivity to change.

Fauna Species of Conservation Interest

Coral reef development is fragmented in the Tanga region, with Ulenge and Kwawa reefs the closest coral reefs to the AOI. Coral reefs also support a wide variety of biodiversity, including fish, shellfish, marine mammals, turtles and birds. There are also corals present which are not reef-forming, and there is a strong likelihood that at least one of the three IUCN Indo-Pacific species of coral which are listed as endangered and known from this portion of the Western Indian Ocean, occurs in the AOI.

Many of the fauna species supported by the seagrass, mangroves and coral reefs are of high conservation value and many have economic value within the AOI, in particular shark, reef fish and shellfish species. Several species in the AOI are critically endangered and/or endangered species (IFC 2012) including, the coelacanth (*Latimeria chalumnae*; IUCN: critically endangered), hawksbill turtle (*Eretmochelys imbricata*; IUCN: critically endangered) green turtle (*Chelonia mydas*; IUCN: endangered), Indian Ocean humpback dolphin (*Sousa plumbea*; IUCN: endangered) and three species of sea cucumbers (IUCN: endangered).The migratory humpback whale (*Megaptera novaeangliae*) is a visitor to the AOI.

Legally Protected, Internationally or Nationally Recognised Areas

Marine nationally protected areas are present in the AOI. These include Tanga Coelacanth Marine Park (TCMP) and two Marine Reserves; Ulenge Island and Kwale Island. Others, such as Mwewe Island and Kirui Island are further to the north of Tanga city, and Maziwe Island is to the south. Mangrove forests are classified as legally protected Forest Reserves because of their highly threatened status and importance in Tanzania.

There are two Ecologically or Biologically Significant Marine Areas (EBSA) identified by the Convention on Biological Diversity in the AOI, the TCMP EBSA encompasses the whole of the TCMP (TCMP is designated because of the presence of coelacanths, dugongs (*Dugong dugon*) and turtles among several other species and habitats) and covers an area of 60,505-ha, while the other, Pemba-Shimoni-Kisite is further offshore its deep, fast flowing waters support pelagic fish, turtles, dolphins, whales and dugong (it has an area of 870,721-ha). There are two IBAs near Tanga; Tanga North–Kibo Saltpans 300-ha, designated because of the numbers of greater sand plover (*Charadrius leschenaultii*) and curlew sandpiper (*Calidris ferruginea*)) and Tanga South (over 4400 ha designated because of greater sand plover and crab plover (*Dromas ardeola*)). A marine Transboundary Conservation Area (TBCA) is also proposed between Tanzania and Kenya by the Marine Parks and Reserves Unit, Tanzania, and the Kenya Wildlife Service, Kenya. The purpose of this designation is to strengthen capacity for ecosystem level conservation and natural resource management. The site extends from just north of the TCMP boundary to the northern boundary of the Diani-Chale Marine National Reserve in Kenya.

Shipping, Navigation and Fisheries

Tanga Port, while being the second largest in Tanzania, is considered a small seaport in terms of land use and volumes of cargo handled per year. Shipping traffic comprises gas and oil tankers, passenger vessels and cargo ships. The weekly average for traffic transiting Tanga Port via the approach channel is one inbound and one outbound cargo or container vessel, and one inbound and one outbound vessel of another type.

Coastal communities are involved in fishing activities along Tanzania's coastline. The artisanal fleet is largely small dugout canoes of 3–5 m in length powered by paddle and sail, and larger 6–15 m wooden planked boats with inboard and outboard motors, with a very low level of motorisation in the fleet. Gillnets and lines, including longlines, are the most common gear used.

Socio-economic and Health

The pipeline traverses 8 regions, 24 districts, 116 wards and passes nearby an estimated 231 villages and hamlets. The main livelihood activity in the AOI is agriculture and most settlements are concentrated along national and secondary roads. Settlements often have a central market where both business and social activities take place.

The Wasukuma are the majority ethnic group in the northern districts of Kahama, Mbogwe, Bukombe and Chato and the Wanyamwezi have the largest representation in the west-central district of Nzega. The Wamaasai are the majority ethnic group in Kiteto District. The dominant religions in the AOI are Christianity and Islam often mixed with traditional beliefs.

The population is rapidly increasing, causing pressure on natural resources and social services. The population is young and highly mobile. Regions such as Geita, Tabora and Shinyanga experience high levels of in-migration. Tanzania shares borders with eight other countries and is sensitive to population flows from its neighbouring nations. Tanzania has a long history of accepting refugees from people fleeing conflict in the Great Lakes region; future conflict in this region or in any of Tanzania's neighbouring countries could cause additional influx.

The national literacy rate of the population above age 15 is 83.2% for males and 73.1% for females. In the AOI, the literacy rates vary between 56% to 91 %. Males are more literate than females in the AOI, a trend which is in-line with national literacy levels. Urban districts have higher adult literacy rates for both males and females than rural districts. School attendance rates are improving, however educational services are faced with several challenges including lack of trained teachers, equipment and buildings.

Economy

Tanzania's economy is currently one of the fastest-growing in Africa and the world. GDP increased by 5–8% per year from 2007 to 2015. The Tanzanian economy is diversified compared to other (more resource-rich) African countries, and recent economic growth has been relatively broad-based. Agriculture dominates the economy, accounting for 85% of exports and employing around 65-80% of the workforce. Twenty-two products make up 75% of Tanzania's export value. Tanzania's main exports (by value) are gold (15.5% of exports), tobacco (10.3%) and sesame seeds (6.5%).

Government policies during 2015 and 2016 focused on continued implementation of the Five Year Development Plan (FYDP), with emphasis on the completion of infrastructure projects,

notably rural electrification, rural water programme and human capital development to address the large infrastructure gap in Tanzania.

Tanzania reported a (consistently) very low unemployment rate of 3.9% in 2013, coupled with a high labour force participation rate of 78.6% (and 65% among youth 15-24 years old). This possibly reflects that most people (~75%) are classified as self-employed, though a large proportion of the (employed) population is impoverished.

Local Economy

In the AOI, trade in retail merchandise and agricultural produce and provision of services (including hospitality) play an important role. Local economic activities are predominantly small-scale and informal. Challenges faced by small businesses include lack of entrepreneurial skills, lack of reliable electricity, high transport costs and lack of cash flow. The Five Year Development Plan aims to improve access to rural energy in rural areas to encourage growth in business. The government is also developing strategies to enhance entrepreneurial skills at local, district and national level.

Land-Based Livelihoods

The main livelihoods in the AOI are based on subsistence agriculture (crop farming, pastoralism, sedentary livestock farming), artisanal scale mining (ASM) and natural resource users.

Most farming activities are small-scale and characterised by low-input, low-output family farming with trading of surplus crops. Crop production is predominantly rain fed as irrigation infrastructure is absent in most districts in the AOI. Challenges faced by households engaged in crop farming include limited access to alternative sources of income, lack of education, skills and experience.

Livestock rearing occurs in all project affected communities (PAC) and is mainly a subsistence activity. The main livestock species are cattle, goats, sheep, poultry, pigs and donkeys. Key challenges include the lack of livestock support services and veterinary centres. Nomadic pastoralism also occurs in the AOI and is a distinct feature of the livestock sector in Tanzania. Pastoralism occurs across several districts including Muleba, Bukombe, Nzega, Igunga, Iramba, Hanang, Kiteto, Kondoa, Kilindi and Handeni Township. The number of pastoralists is decreasing due to a reduction in grazing land, extension of game reserves and campaigns by the government.

ASM in Tanzania focuses mainly on high-value minerals such as gold and gemstone. Other minerals extracted include salt, limestone, kaolin and gypsum. ASM is present in the AOI, however it is difficult to determine the exact numbers of people involved, since activities are informal in nature and operations are transient. Women and men whose sole livelihood depends on ASM are considered highly sensitive receptors as they have no access to land for farming or livestock as an alternative livelihood. Children involved in ASM are very highly sensitive since they may be exposed to safety risks and may lack access to education.

Natural resources play a vital part in the subsistence of rural communities in terms of energy for cooking, food security, construction materials for shelter, medicine and income. Key challenges for natural resource users includes a decrease in biomass reserves and loss of habitats due to clearing of vegetation and climate change. Female firewood collectors and wild food users are deemed highly sensitive receptors.

River-, Lake-, and Marine-Based Livelihoods

In the AOI, marine and inland fisheries are small scale and fishing is mostly a subsistence activity. There is increasing pressure on inland fish resources owing to increasing crop failures caused by drought or floods, while coastal project affected communities (PACs) rely heavily on fishing and gleaning activities due to lack of alternative livelihood activities. Fish stocks are reducing to unsustainable levels because of overfishing. Major challenges for fisherfolk in the AOI include low wages and lack of access to financial institutions, high prices of fishing inputs and poor quality of equipment. Fisherfolk are ranked as very highly sensitive receptors as they receive low wages and a small percentage of fish caught compared to boat owners. Women engaged in the processing and selling of fish and women engaged in intertidal gleaning activities are also considered very highly sensitive receptors.

Land and Property

There are three land categories in Tanzania: village land (land within the boundaries of a village and managed by a village council), reserved land (set aside for forest and parks and nature reserves) and general land. Most of the land is village land.

The Land Act provides the legal framework for land rights, recognises customary tenure and empowers local governments to manage village land. This framework provides two main processes for securing land rights:

- In rural areas, village land may be demarcated and land use plans created to provide for certificates of village land (CVL). Once a village has a CVL, people living within the village may apply for certificates of customary rights of occupancy (CCROs).
- In urban areas, people may apply for certificates of rights of occupancy (CROs). To acquire CCROs and CROs, parcel holders must have the boundaries of their lands mapped and their rights recorded and registered.

Villagers have a customary right of occupancy for village land under customary law or they may have received it as an allocation from the village council.

Customary rights of occupancy can be held individually or jointly, are perpetual and inheritable, and may be transferred within the village or to outsiders with permission of the village council. Village land allocations can include rights to grazing land, which are generally shared.

Holding a land deed (including CCRO and CRO) ensures compensation in case of land appropriation.

Holding land deeds is rare in rural Tanzania. Many villages have not had their land demarcated, do not have approved land use plans and CVL and hence there is no basis for issuing CCRO to individual villagers. Less than 10% of the population has formal certificates of ownership for the land.

Land and property sensitivity is ranked as potentially high for pastoralists, who depend on access to land and water sources to move livestock and youth, who have limited access to land outside their customary rights. Artisanal miners, land users in protected areas and landowners without formal title deeds, may not be eligible for compensation and as such are ranked as potentially sensitive receptors. Sensitivity is ranked as potentially very high for female headed households who are particularly vulnerable because of long standing discrimination that excludes women from owning, inheriting and controlling land.

Numerous land conflicts exist in the AOI, and most landowners are vulnerable due to lack of formal title deeds. There is also a lack of management plans and a trend of village land being purchased by outsiders.

Workers' Health, Safety and Welfare

Many companies in Tanzania have had little previous exposure to basic health and safety standards. It is estimated that less than 5% of the working population has access to Occupational Health and Safety (OHS) services (ILO 2017, Internet site). Workers active in informal economic sectors typically receive no OHS training and hazards are not identified by their employers. Baseline data revealed a low awareness level of health, safety and workers' rights in the PACs.

The sensitivity of the workers' health, safety and welfare is ranked as very high owing to the local workforce's generally low occupational health and safety awareness.

Social Infrastructure and Services

PACs rely on radio as the main means of receiving information, although mobile phone and internet is becoming increasingly important to exchange information. Rural electrification is still low, limiting general development. Waste management, particularly the disposal of liquid waste, is a challenge in Tanzania.

Social infrastructure and services sensitivity is ranked as low for PACs in relation to media; all households have access to one or more media information sources. PACs are ranked as moderately sensitive receptors in relation to electricity; most PACs do not have access to the electricity grid and rely on other means for cooking and lighting. Households without mobile phones and internet access are ranked as moderately sensitive receptors; they may not receive information shared through these media platforms.

Community Health

Most of the population residing in the AOI are depending on the formal health care system. This is attributed to ongoing efforts on health education and system strengthening including provision of outreach services. Use of traditional medicine has generally decreased as more people embrace modern healthcare.

There is an increasing trend in noncommunicable diseases, particularly hypertension, cardiovascular disease and diabetes, occurring nationwide which has been linked to urbanisation and associated changes in lifestyle. Chronic malnutrition rates have decreased at district level while acute malnutrition rates have generally remained low and stable at community population level.

There has been a decrease in the burden of diarrhoeal diseases in most of the districts traversed by the AOI. This has been attributed to improvements in hygiene behaviour. The potential for cholera, dysentery and typhoid outbreaks remain high in all parts of the AOI because of underlying challenges in environmental health conditions.

A decrease or stabilisation of HIV prevalence over the past five years was reported in the AOI and attributed to interventions such as health education, free condom distribution, increased availability and increase in HIV testing, care and treatment as well as reduction in HIV-related stigma.

Zoonotic diseases remain a risk to PACs, in particular those that are impacted by influx. Environmental sanitation, health care services and prophylaxis, vector control programmes and influx management are key for controlling vector-related diseases, such as malaria.

Community health sensitivity is ranked as potentially high for: children, the elderly, pregnant women, people living in crowded areas, PACs with decreased access to appropriate healthcare facilities, people with poor access to clean water, women headed households, sex workers and PACs near to artisanal mine sites. Sensitivity is ranked as potentially very high for immune-compromised individuals.

Community Safety, Security and Welfare

Crime and gender-based violence (GBV) in Tanzania are increasing. Vulnerable groups within the community include women, children, the elderly, youths, persons with disabilities (PWD), land users without title deeds, and hunter gatherers and nomadic groups, and many have little support available. However, efforts to reduce crime rates are being implemented through the establishment of government supported community policing and external programmes such as the World-Bank-supported Tanzania Social Action Fund (TASAF) which aims to “enable poor households to increase incomes and opportunities while improving consumption”.

Sensitivity regarding community safety, security and welfare is ranked as very high for women; cultural attitudes towards women and their role within the household hinders many females in PACs. Widow headed households and the elderly are ranked as very highly sensitive because they are challenged to meet basic household needs and afford healthcare. Children are ranked as very highly sensitive receptors, particularly those from poor households and AIDS orphans, who will be less likely to attend school and are more likely to be relied upon to perform household tasks. Youths are also ranked as very highly sensitive receptors due to their limited access to productive assets, lack of education, vocational skills and scarce employment opportunities. Nomadic groups and hunter gatherers are ranked as highly sensitive as they are vulnerable to loss of access to areas where they can graze, hunt and collect wild plants as they have no legal claim on those areas.

Among the various groups in the AOI, some might be considered as indigenous peoples according to different international criteria even though they are not formally recognised in domestic law. In Tanzania, there are the Akie (aka Ndorobo), Hadza (aka Hadzabe), Barabaig (aka Taturu), Burunge, Sandawe and Maasai. These are pastoralists or hunter gatherers. Additional research is being undertaken to identify the potential presence of indigenous peoples in the AOI.

Traffic

Outside cities, urban and rural roads are generally unsealed, and the use of the roads by pedestrians is common due to the lack of a pavement for walking in most rural areas. Cyclists and boda boda also use the roads extensively, particularly in the more urban areas and the risk of accidents involving pedestrians, cyclists and boda boda is considered high.

Traffic levels are low in the AOI, so congestion is rare, except at the border with Uganda and in Dar es Salaam. In other areas of the country vehicle volume is relatively low and congestion only occurs when vehicles are travelling along routes with high volumes of pedestrians walking in the road.

The government is implementing a programme to improve the condition of the road network in Tanzania. TANROADS is upgrading unsealed trunk road sections that will also be used by the project.

Cultural Heritage

The definition used by the project for tangible cultural heritage is that it is moveable or immovable objects, sites, structures, or groups of structures having archaeological, palaeontological, historical, cultural, artistic, and religious values. Intangible cultural heritage is defined as cultural resources, knowledge, innovations and practices of local communities embodying traditional lifestyles.

The tangible and intangible cultural heritage identified in the AOI is considered a representative sample. More features will be present in the AOI which, will be identified by pre-construction surveys, further consultations with local communities and during construction.

There are no known nationally or internationally designated sites or critical cultural heritage (as defined in IFC PS8) sites identified within the AOI.

Onshore, 44 high sensitivity archaeological sites or cultural heritage with a physical location and a strong intangible sensitivity are in the AOI of which 26 sites (24 cemeteries and 2 archaeological sites) are within the project footprint and 18 others are within 100 m of the footprint. The archaeological sites include pottery, stone tools, rock-art sites and iron working sites.

Intangible cultural heritage is closely linked to individual and group identity and therefore sensitive to cultural change. Examples of this type of heritage include sacred natural sites and trees, traditional dances, ritual involving the ancestors, traditional healing and medicine, meeting places and sacred rivers.

Offshore, there are no tangible or intangible cultural heritage sites within the AOI.

Climate

The global climate has undergone unprecedented change and continuing change is predicted by climate scientists. Tanzania's climate has changed and further change is predicted.

Tanzania is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods is projected to increase.

Global anthropogenic greenhouse gas (GHG) emissions, together with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century. Tanzania has low levels of GHG emissions per capita, estimated at 5.5 tCO_2e per capita for 2014, totalling absolute emissions of 290 $MtCO_2e$, which is approximately 0.58% of the world total.

Tanzania has 35.3 million ha of forests, one of the highest forest covers in Eastern and Southern Africa. The forests are a carbon sink, absorbing all emissions produced at national level and more, making Tanzania a net GHG sink.

Ecosystem Services Provided

Biodiversity

The habitats of conservation importance provide provisioning services such as the collection of timber and other wood fibres for fuel, charcoal production and construction, the collection of plants for food and medicinal purposes and the collection of fibres, resins and other materials. They also provide regulating services (water, erosion, local air quality and local climate regulation) and cultural services (sense of place/way of life, spiritual, sacred and religious values, inspiration for culture, art and design and cognitive development. Habitats also provide important refuge, feeding, watering breeding and nursery areas for a host of terrestrial and aquatic wildlife.

The flora and fauna species of conservation importance provide provisioning services such as wild food via hunting, fishing and foraging of plants for personal use or for trade. Keystone predatory bird and large mammal species provide pest and control and regulate ecosystems, while certain fauna species, large mammals and their associated habitats can be vital for eco-tourism. Cultural ecosystem services provide inspiration for culture, art and design and cognitive development.

Onshore protected areas provide provisioning services (wild foods by hunting and foraging), regulating services (water regulation, local climate regulation and erosion regulation) and cultural services (inspiration for culture, art and design and cognitive development). Certain protected areas are vital for eco-tourism.

Physical Environment

Soil provides both regulating ecosystem services (e.g., erosion regulation and soil quality regulation) and provisioning ecosystems services (e.g., aggregate for construction).

Surface watercourses provide water as a vital provisioning service, for both local people in rural communities and their livestock. People collect water for domestic purposes and small-scale subsistence agriculture. The watercourses and associated floodplains also provide two important regulating services. Firstly, they help to regulate floods by slowing water velocities; storing water on their floodplains; and transmitting water relatively slowly downstream and reducing peak flows. Secondly, the water courses help to regulate water quality where aquatic vegetation is present.

Groundwater is an important provisioning ecosystem service, supplying freshwater for community use. Groundwater also plays an important habitat support role for aquatic and riparian habitats and wildlife, both directly where groundwater feeds habitats (such as Minziro Forest) and indirectly (where groundwater maintains surface water flows).

Landscape has the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape.

Air quality and the acoustic environment do not provide ecosystem services.

Marine Environment

Marine physical processes provide ecosystem services through sea water and sediment. They provide provisioning (e.g., sediment as a source of building material), regulating (e.g.,

protection against wave erosion, sustenance for coral reefs and seagrass beds), supporting (e.g. habitats for marine flora and fauna) and cultural services (e.g. transport pathways and recreational activities).

The marine acoustic environment does not provide ecosystem services.

The intertidal and subtidal flora and habitats of conservation importance provide provisioning services such as direct products for building and the collection of mangroves for medicinal purposes and other chemical products, as well as being a source for fisheries. They also provide regulating services (erosion, water and water regulation) and cultural services (inspiration for culture, art and design, ecotourism and as a research platform). Habitats also support a host of marine fauna through nutrient and sediment retention and recycling, shelter and nursery sites.

The fauna species of conservation importance provide provisioning services such as local food sources, income and employment through fisheries, and medicinal and genetic resources. Species also provide regulating services through carbon storage and sequestrations, nutrient and energy cycles, and regulation of key habitats. Cultural ecosystem services are provided for in the inspiration for culture, art and design, as a research platform and as ecotourism.

Offshore protected areas provide renewable and nonrenewable goods to coastal communities (provisioning), while regulating services range from the protection of shorelines from erosion and sea level rise to the generation of sand for beaches and carbon sinks. Supporting services include recreational activities, while cultural services include the combined maintenance of the biodiversity and genetic richness of the entire coastal ecosystem incorporated in the protected areas supporting various habitats and food webs including those beyond the immediate boundaries, such as those involving pelagic and migratory species.

Socio-economic and Health

The Tanzanian economy is heavily dependent on agriculture, forestry, fishing and mining (all provisioning services).

Crop farming is a vital provisioning ecosystem service and undertaken throughout the PACs, sometimes providing their only source of food. Livestock rearing also provides a provisioning service, primarily as mitigation against shock events. Land provides a provisioning service resource for livestock keeping; grazing, water sources, range land allowing for livestock herd movements and trees for shelter and medicinal herbs. Natural resources such as fuel (firewood, charcoal), wild foods (honeys, insects, mushrooms, bush meat), timber, medicinal plants and grasses are also provisioning ecosystem services in the form of energy for cooking, construction materials, traditional medicine and income. Artisanal and small-scale mining (ASM) is an abiotic provisioning ecosystem service undertaken primarily in the dry season throughout the AOI.

Fishing exploits a provisioning ecosystem service, as well as a cultural ecosystem service due to its long-standing importance in communities, in particular for the lake and marine fisherfolk.

Local economy does not have any ecosystem services but relies on ecosystem services discussed in land-based livelihoods.

Workers' health, safety and welfare, social infrastructure and services, community health and community safety, security and welfare do not have any ecosystem services associated with it.

Cultural Heritage

Cultural heritage provides cultural ecosystem services, including knowledge systems which provide a framework for understanding the natural environment and ecosystems, and influence social systems, social relations and sense of place in a complex and changing world, and functioning cultural systems which support subsistence activities, control the use of land, the resolution of conflicts and the day-to-day performance of all the social duties that make the local society 'work'.

Climate

There are no ecosystem services associated with climate.

Stakeholder Engagement

Stakeholder engagement has been an integral part of the development of the EACOP. It is also an integral component of the environmental and social impact assessment (ESIA) process and the foundation for developing and maintaining the project's social licence to construct and operate. It has been undertaken in accordance with the requirements of Tanzanian legislation, international requirements as set out in the Equator Principles III and the International Finance Corporation Performance Standards (IFC) (2012) and EACOP principles, protocols and policies for stakeholder engagement.

Stakeholder engagement has been inclusive of all stakeholder categories, including government, civil society, directly and indirectly affected people and communities, with attention paid to the needs of women and those vulnerable to potential impacts. It also included engagement activities regarding human rights.

Stakeholder engagement has been tailored to fit the EACOP project, the ESIA process and the local context, including the nature of the stakeholders. A Stakeholder Engagement Plan (SEP) to support effective engagement throughout the ESIA process was developed. It provides direction for the ESIA engagement approach, stakeholder identification, specific engagement plans for the different ESIA phases and the key deliverables from engagement activities. It focuses on:

- a stakeholder identification and analysis process
- methods, materials and protocols for stakeholder engagement including information disclosure, consultation, and reporting to stakeholders
- the ESIA stakeholder engagement activities
- a data management system for all stakeholder data and minutes of meetings for analysis and follow up
- a project grievance procedure, which also serves as the ESIA grievance procedure.

Stakeholder engagement was conducted during: the scoping phase, the baseline and impact assessment phase and pre-ESIA submission to fulfil the objectives. The objectives of stakeholder engagement included:

- obtaining an understanding of the number and types of stakeholders in the socioeconomic study area
- informing stakeholders about the ESIA baseline studies in the areas traversed by the project and associated infrastructure
- obtaining stakeholder input into the scope of the ESIA, including the development of valued environmental (and social) components (VECs), impact identification, mitigation measures and potential sources of cumulative impact and impact mitigation
- listening to questions and concerns from stakeholders and ensure these are addressed in the ESIA
- conducting pre-submission meetings to consult a sample of potentially impacted local stakeholders, before the submission to NEMC to acquire their feedback on ESIA findings (impacts and mitigation measures), cumulative impact assessment and mitigation measures.

The engagement provided stakeholders with information about the project and the ESIA, including the engagement process and grievance management. It also provides a mechanism for ongoing stakeholder engagement.

Stakeholder Concerns

A summary of the stakeholder concerns raised and how the project intends to address them is provided below.

Socio-economic and Health

Most stakeholder concerns related to socio-economic and health matters.

A common concern during community consultation was the compensation process, including: timely compensation for land or properties, resettlement, and livelihood restoration. An additional concern was the management of grievances associated with land acquisition and how this would be handled.

Stakeholders were informed that the project will manage land acquisition by developing a resettlement action plan (RAP) and a livelihood restoration plan (LRP) and that compensation will be provided in accordance with national law and international standards and before construction begins. Stakeholders concerned with the project resettlement process to date were informed that their grievances would be passed onto the project. The project is aware of these concerns and is addressing them as part of the ongoing resettlement planning activities.

Concerns were raised about project induced in-migration (PIIM), influx management and PIMM related impacts. Stakeholders were informed that an in-migration management plan will be developed and implemented with the objective of reducing the number of people that come to the project-affected communities (PACs) for either direct or indirect project opportunities.

Stakeholders raised concerns about health impacts, particularly HIV and AIDS, the lack of capacity of medical facilities and measures to protect children from road traffic accidents. In response, information was provided about the health impact assessment included in the ESIA and the community health, safety and security plan containing the appropriate mitigation. It was noted that the project construction workforce would be accommodated in

camps with health and recreational facilities to avoid impacts on local health and other public infrastructure, that camps would be closed and that interactions with local communities would be discouraged. The development and implementation of a Community HIV and AIDs programme was discussed with stakeholders. Information about the medical emergency response plan and health and safety programmes to prevent and respond to accidents was also provided.

Stakeholders also raised concerns about increased cost of living due to the project and about employment opportunities and procurement opportunities for local people, particularly youth. In response, stakeholders were informed that a transparent recruitment strategy would be developed and shared with communities; about the local content plan developed to maximise the purchase of goods and services from within Tanzania; and about the procurement and supply chain management plan which reinforces the use of local workers and suppliers.

Physical Environment

Stakeholders raised concerns about potential impacts on water resources (access, increased demands and quality), air quality and noise pollution. In response, they were informed about the water assessments being undertaken by the project and the associated measures to address the findings, as well as about the pollution prevention plan that will minimise impacts such as air and noise pollution.

Biodiversity

Stakeholders raised concerns about potential impacts on ecologically important habitats, particularly Swaga Swaga GR. They also emphasised the presence of protected species in the project area of influence (AOI). Tanga Municipal Council stakeholders stressed that species such as coelacanth, dugong, humpback whales, bottlenose dolphins and turtles are present in the marine environment. Stakeholders were informed about measures that will be implemented to ensure biodiversity is not affected if the pipeline is to pass through protected areas and about the biodiversity management plans which will contain such measures for terrestrial and marine environments.

Project and ESIA-Related Matters (Including Stakeholder Engagement)

Questions were asked about the, pipeline routing and characteristics, camp locations and their potential use after construction, the project lifespan and measures to ensure the safety and security of the pipeline. Stakeholders also raised questions about a marine emergency response plan. In response, stakeholders were informed about the selection process for the pipeline route, pipeline engineering design, and water course crossings, and that the permanent RoW required for the pipeline is 30 m. Stakeholders were advised that negotiations with regards to the location and final use of the camps between the government and project are ongoing. They were also assured that emergency and oil spill response plans will be prepared and it was emphasised that safety is a priority for the project.

Further engagement was recommended by stakeholders at national, regional, district, ward and community level, and throughout the project lifecycle. Stakeholders were advised that the project aims to engage stakeholders throughout the ESIA process, other preliminary studies and construction activities. Recommendations for stakeholder engagement in the

operational phase of the project were noted and will be implemented. Plans for ongoing stakeholder engagement are discussed in the section below.

Grievance Mechanism

EACOP has established a nonjudicial grievance mechanism to respond to stakeholders' concerns and to facilitate resolution of stakeholders' grievances. The grievance mechanism is compliant with the United Nations Guiding Principles on Business and Human Rights effectiveness criteria for project level grievance mechanisms.

The grievance mechanism describes the process available to stakeholders for lodging a grievance during pre-construction, construction and project operations, and is accessible to all stakeholders at no cost and without retribution. Judicial and administrative options can also be pursued by stakeholders.

The project's grievance mechanism has been presented to stakeholders during each consultation phase and is managed by EACOP staff (CLO and grievance administrator).

Ongoing Stakeholder Engagement

The project stakeholder engagement team will continue to engage with key stakeholders at national, regional and local level throughout the project lifecycle to further discuss the results of the ESIA and how stakeholder concerns have been considered in the ESIA. The engagement strategy will also include targeted engagement with identified vulnerable stakeholders or their representatives.

Engagement activities will be adjusted to reflect evolving project activities, stakeholder preferences and concerns over the life of the project. The project will also seek to build partnerships with NGOs, CSOs and communities to support the development and implementation of practical impact management strategies.

During the construction phase of the EACOP project, local community offices will be established at locations along the route to provide stakeholders direct access to community relation coordinators (CRCs), community liaison officers (CLOs) and grievance officers.

The RAP team will continue stakeholder engagement throughout the RAP process.

The grievance mechanism will continue to provide opportunities for stakeholders and PACs to express grievances about project activities.

A stakeholder engagement monitoring and evaluation programme will be developed to ensure efficient and effective stakeholder engagement, in parallel with community awareness programmes.

Impacts – Normal Operations

A primary project objective is to design, construct and operate and decommission a pipeline and its AGIs with minimal risk, injury or harm to personnel, host communities and their ecosystem services.

Project effects that were considered likely to result in adverse or beneficial impacts on biodiversity, the physical environment, the marine environment, socio-economic and health, and archaeology and cultural heritage during the construction and operation phases have

been evaluated in the ESIA. This process was informed by professional, industry-specific experience and the characteristics of the AOI.

The key impacts considered, with no priority in the ordering, include:

- biodiversity:
  - direct and indirect impacts on legally protected areas and internationally recognised areas that have species of conservation importance including the Minziro Nature Forest Reserve, Burigi-Biharamulo and Swaga Swaga GR and the Talamai OA
  - terrestrial habitat loss and disturbance to species of conservation importance such as Itigi-like thickets
  - aquatic habitat loss and disturbance to fish and aquatic macro-invertebrate species of conservation importance inhabit the Kagera River, River Pangani, Lake Victoria Wetlands, Wembere Wetlands, Sigi River and ephemeral watercourses.
- terrestrial physical environment:
  - change to the quantity and quality of surface and groundwater used for drinking water and agricultural use
  - change in the air quality near the pumping stations that generate power
  - increase in the noise environment near the construction of pipeline and AGIs, and near the AGIs during operation
- marine environment:
  - destruction of coral during construction of marine facilities
  - change to marine acoustics during the construction and operation of marine facilities and the related impacts on marine flora and fauna
- socio-economic and health environment:
  - competition over employment opportunities
  - loss of grazing land
  - loss of access to artisanal mining
  - loss of, or restriction of access to, existing fishing grounds, transit routes, fish landing sites and market sites due to the Marine Exclusion Zone
  - displacement of fishing effort (from loss of, or restriction of access to, grounds) into adjacent grounds
  - loss caused by land acquisition
  - occupational health and safety incidents causing diseases, injuries and mortality
  - transmission of communicable diseases
  - damage, disturbance or disruption of access to tangible and intangible cultural heritage.

The pre-mitigation significant impacts assessed, and associated management plans are summarised below in Table ES1.

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
Biodiversity		
Habitats of conservation importance	None[1]	
Flora and fauna species of conservation importance	*Generic*	
	Disturbance or harm to wildlife	Biodiversity management plan Labour management plan Community health, safety and security plan Stakeholder engagement plan
	Temporary habitat fragmentation causing disrupted species movement during construction of RoW	Biodiversity management plan
	Location Specific	
	Burigi–Biharamulo GR and KBA: Loss of breeding and foraging habitat Facilitated access leading to habitat loss	Biodiversity management plan Reinstatement plan Community health, safety and security plan Labour management plan
	Itigi-like thicket: Loss of endemic and or range-restricted plant species	Biodiversity management plan
	MCPY12: Facilitated access leading to habitat loss	Biodiversity management plan
	Talamai OA and PRS1: Loss of breeding and foraging habitat Facilitated access leading to habitat loss	Biodiversity management plan Reinstatement plan Biodiversity management plan Reinstatement plan Labour management plan Community health, safety and security plan Stakeholder engagement plan
	Talamai OA and Kitwai GCA (part of the Masai Steppe IBA): Loss of breeding and forage habitat to species of conservation importance	Biodiversity management plan Reinstatement plan

[1] Management plans and mitigation further reduced the predicted impacts

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
	MCPY13 and MCPY14: Loss of breeding and foraging habitat Disturbance	Biodiversity management plan Reinstatement plan Project induced in-migration management plan Pollution prevention plan
	PRS1: Facilitated access leading to habitat loss	Biodiversity management plan Labour management plan Community health, safety and security plan Stakeholder engagement plan
	Sigi River: Loss of high and very high sensitivity plant species	Biodiversity management plan Reinstatement plan
	MST: Loss of high and very high sensitivity plant species Habitat loss	Biodiversity management plan Reinstatement plan
Legally protected, internationally or nationally recognised onshore areas	*Location Specific* Burigi–Biharamulo GR and KBA: Loss of ecological function and integrity of protected site through impacts on species and habitats	Biodiversity management plan Reinstatement plan
Physical Environment		
Soil	None	
Surface water	None	
Groundwater	None	
Landscape	None	
Air quality	PS3 and PS5: Increased NO_2 concentrations Increased PM_{10} and $PM_{2.5}$ concentrations	Pollution prevention plan
Acoustic	PS3 and PS5: Increase in baseline noise environment	Pollution prevention plan
	MST: Increase in baseline noise environment	

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
Socio-economic and Health Environment		
Local economy (non-land-based livelihoods)	*Location Specific* Tanganyika: Competition over employment opportunities Putini and Chongoleani: Dissatisfaction arising from unmet expectations Competition over employment opportunities	Project-induced in-migration management plan Stakeholder engagement plan
Land-based livelihoods	*Generic* Permanent loss of land used for crop farming Permanent loss of access to artisanal mining sites *Location Specific* PACs near all MCPYs: Permanent loss of grazing land Zongomera and Kimana villages: Permanent loss of access to artisanal mining sites Mbogwe district (KP583.9 and 639.7), Kahama Township Authority, Geita district: Permanent loss of access to licensed mining concessions PACs near all pumping stations and MST: Permanent loss of grazing land	Pollution prevention plan Resettlement action plan Monitoring and reporting plan

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
River-, lake- and marine-based livelihoods	*Location Specific* Mleni mtaa, Mabokweni mtaa, Helani hamlet, Putini mtaa and Chongoleani mtaa: Loss of, or restriction of access to, existing fishing grounds, transit routes, fish landing sites and market sites due to the Marine Exclusion Zone Loss of, or restriction of access to, intertidal gleaning sites due to the Marine Exclusion Zone Displacement of fishing effort (from loss of, or restriction of access to, grounds) into adjacent grounds	Resettlement action plan (includes a marine livelihoods restoration plan) Stakeholder engagement plan Monitoring and reporting plan
Land and property	*Generic* Permanent loss of private land due to project land acquisition Permanent loss of physical structures due to project land acquisition Permanent loss of local enterprises	Occupational health, safety and security plan Community health, safety and security plan Labour management plan Pollution prevention plan Monitoring and reporting plan
	Location Specific	
	PACs near all MCPY and coating facility: Permanent loss of private land due to project land acquisition Land speculation by third parties New disputes and exacerbation of pre-existing disputes and conflict around land and property Permanent loss of physical structures due to project land acquisition	Resettlement action plan Stakeholder engagement plan Community health, safety and security plan Monitoring and reporting plan Resettlement action plan Stakeholder engagement plan Occupational health, safety and security plan Community health, safety and security plan Labour management plan Pollution prevention plan Monitoring and reporting plan
	Masusu: New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan Stakeholder engagement plan Community health, safety and security plan Monitoring and reporting plan

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
	PACs between KP1380 and KP1410: Permanent loss of private land due to project land acquisition New disputes and exacerbation of pre-existing disputes and conflict around land and property Permanent loss of physical structures due to project land acquisition	Resettlement action plan Stakeholder engagement plan Community health, safety and security plan Monitoring and reporting plan
Workers' health, safety and welfare	*Generic* Other occupational health and safety incidents causing diseases, injuries and mortality	Community health, safety and security plan Occupational health, safety and security plan Labour management plan Transport and road safety management plan
Social infrastructure and services	*Generic* Deterioration of road conditions	Infrastructure and utilities management plan
Community health	*Generic* An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	Community health, safety and security plan Occupational health, safety and security plan Pollution prevention plan Waste management plan Stakeholder engagement plan
	Location Specific	
	PACs near all MCPY: The transmission of communicable diseases Outbreaks of infectious diseases	Community health, safety and security plan Occupational health, safety and security plan Natural resource management plan Pollution prevention plan Waste management plan Stakeholder engagement plan
	The transmission of communicable diseases between the project's externally contracted workforce and PACs	Project-induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan

Table ES1 Pre-mitigation Significant Impacts

Valued Environmental Component	Pre-mitigation Significant Impacts	Management Plans
	Reduction in the availability of potable water	Project-induced in-migration management plan Community health, safety and security plan Occupational health, safety and security plan Resettlement action plan Natural resource management plan Pollution prevention plan Waste management plan Stakeholder engagement plan
	PACs near PS3, PS5 and MST: Increased risk of respiratory diseases due to project activities	Pollution prevention plan
Community safety, security and welfare	*Generic* Conflict between PACs and project security personnel *Location Specific* Mleni mtaa, Mabokweni mtaa, Helani hamlet, Putini mtaa and Chongoleani mtaa (KP1429–1442.5): Conflict between PACs and project security personnel	Community health, safety and security plan Stakeholder engagement plan
Tangible and intangible cultural heritage	*Generic* Damage, disturbance or disruption of access of unknown tangible cultural heritage, such as evidence of previous settlement and graves Damage, disturbance or disruption of access of unknown intangible cultural heritage, such as meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism) Damage or disturbance of tangible cultural heritage Damage or disturbance of intangible cultural heritage	Cultural heritage management plan

The following section presents the significant residual impacts remaining after proposed mitigation is applied, and the procedure for decommissioning. Beneficial project impacts are also discussed. All potentially significant ecosystem-services-related impacts are addressed by the VEC impact assessments and associated management plans.

Beneficial Impacts

Several potential project impacts predominantly relating to socio-economic VECs will be beneficial. Where possible, enhancement measures described below in Table ES1 will be implemented to increase the benefits to local people, and the local and national economy.

Table ES2 Beneficial Project Impacts

Beneficial Impacts	**Phase** **Construction (C)** **Operation (O)**	**Enhancement Measure**
Biodiversity		
Permanent change of land use on the RoW from crop land to grassland in agricultural areas, which will have a direct biodiversity benefit	O	None
Socio-economic and Health		
Contribution to the national economy from investment	C and O	None
Changes to the fiscal balance	C and O	None
Generation of national and local employment opportunities	C and O	The procurement and supply chain management plan, local content plan, labour management plan and the stakeholder engagement plan
Provision of training and skill development opportunities for local workers	C and O	The procurement and supply chain management plan and the labour management plan
Opportunities for national and local businesses through project procurement	C and O	The procurement and supply chain management plan, local content plan and the labour management plan
Improved road conditions due to TANROAD road widening and resurfacing, benefiting business owners and public transport, and improving ability to sell crops to nearby markets for farmers and traders	C and O	The infrastructure and utilities management plan, procurement and supply chain management plan, monitoring and reporting plan and the stakeholder engagement plan
Improvement in the health and safety of employees from disease awareness and reduction programmes	C and O	The occupational health, safety and security plan
Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	C	None
Increased knowledge of tangible and intangible cultural heritage	C and O	The cultural heritage management plan

Table ES2 Beneficial Project Impacts

Beneficial Impacts	Phase Construction (C) Operation (O)	Enhancement Measure
Employment of people to survey and investigate cultural heritage affected by the project	C and O	The cultural heritage management plan

Significant Residual Project Impacts

The impact assessment process included a process of applying proposed mitigation to the potential project impacts identified for each VEC. Table ES2 summarises the number of generic and location specific impacts assessed and the mitigation measures for each VEC group. The significance of impacts was then re-assessed. The significant residual project impacts after mitigation are presented below in Table ES3, and the reasons why they remain significant are described.

Table ES3 Impacts Assessed and Mitigation Measures

	Generic Impacts	Generic Impact Mitigation Measures	Location Specific Impacts	Location Specific Impact Mitigation Measures
Biodiversity	33	53	33	32
Physical Environment	26	40	338	41
Social	59	64	479	58

Table ES4 Significant Residual Project Impacts

Significant Residual Impacts	Phase Construction (C) Operation (O)	Post-Mitigation Significance Rationale
Biodiversity - Flora and Fauna Species of Conservation Importance		
Loss of breeding and foraging habitat for IUCN critically endangered (CR) species (white-backed vulture), IUCN endangered (EN) species (steppe eagle and ashy red colobus monkey) and keystone species (raptors, owls, lion, leopard) in Burigi-Biharamulo GR and Key Biodiversity Area (KBA).	C and O	The loss of 73 ha of habitat, from the construction of the pipeline through 7.9 ha of old growth forest, which supports plants and animals of conservation importance will have impacts of very long duration (as forest will take a long time to return to their original condition), national extent on very high sensitivity species. A Biodiversity Action Plan incorporating enhancement and conservation measures will be developed and implemented.
Use of upgraded access road from pressure reduction station (PRS) 1 and main camps and pipe yards (MCPY) 13 and 14 into Talamai OA and Kitwai Game Controlled Area (GCA) by nonproject persons, facilitating access leading to habitat loss and disturbance to bird and mammal species in Talamai OA through increased deforestation, noise, lighting, hunting and human activity during construction and operation.	C and O	The construction of PRS1, its new road and the construction camps are still likely to cause PIIM of people who will cause significant impacts on species of conservation importance in the Talamai OA and Kitwai GCA. This residual impact is considered of very long duration, as the road will be permanent, of national extent and effecting species of very high sensitivity. A Biodiversity Action Plan incorporating enhancement and conservation measures will be developed and implemented. As the project cannot avoid or fully mitigate for impacts associated with the development within Talamai OA then further enhancement and conservation measures will be developed and implemented.

Table ES4 Significant Residual Project Impacts

Significant Residual Impacts	Phase Construction (C) Operation (O)	Post-Mitigation Significance Rationale
Habitat loss during construction of pipeline and MST the East African Coastal Forest biodiversity hotspot for endemic and migratory species from site clearance.	C	Construction of the MST site and the sterile zone will cause 73 ha of habitat loss, in an area which supports fauna and flora of conservation importance. This residual impact is considered of very long duration as the habitat loss will be permanent, of national extent and effecting species of high sensitivity. A Biodiversity Action Plan incorporating enhancement and conservation measures will be developed and implemented. This will include a site-specific vegetation clearing protocol that considers the potential for tree-roosting bats.
Marine Environment - Fauna Species of Conservation Importance		
Sedimentation causing smothering of coral on Kwawa Reef with lethal and sublethal effects on coral and reef health.	C	As corals are highly sensitive, with species present intolerant to sedimentation the impact remains significant. A monitoring programme will be undertaken by the project that focuses on annual trends with respect to quality and health of coral reefs within the project AOI. The project will seek collaboration with the Marine Parks and Reserves Unit on common, beneficial objectives regarding coral reefs within the AOI.
Underwater noise from construction activities causing physical/physiological effects (mortality and potential injury, recoverable injury and temporary (TTS) in hearing) in various fish species (including IUCN CR Napoleon wrasse), as well as mortality and potential injury to fish eggs and larvae.	C	The Napoleon wrasse is critically endangered (very high sensitivity), the impact will be of long duration and current project commitments will not mitigate the magnitude of the impact on this species. The biodiversity action plan will include marine conservation measures, which will be developed and implemented.

Table ES4 Significant Residual Project Impacts

Significant Residual Impacts	Phase Construction (C) Operation (O)	Post-Mitigation Significance Rationale
Marine Environment - Legally Protected, Internationally or Nationally Recognised Areas		
Underwater noise from the construction activities causing physical/physiological effects in the Napoleon Wrasse, influencing fish community structure and populations (cited as an important nursery ground), a designated feature of the TCMP, which could affect the integrity of the protected area.	C	The role and abundance of Napoleon wrasse within the fish community structure of the TCMP is unknown, however, a change in the fish community structure and population is a significant effect to the integrity of the TCMP. Marine conservation measures developed to reduce the impact to Napoleon wrasse will also reduce the impact on the integrity of the protected area.

Climate

Direct operational emissions in Tanzania will range between 201–282 ktCO_2e/a throughout the 25-year life, which represents around 0.2–0.3% of Tanzania's total GHG emissions in 2030. The contribution of EACOP to national emissions is therefore low and will not affect Tanzania's ability to meet its emission reduction targets published as part of the UNFCCC's Paris Agreement.

Transboundary Impacts

There are no significant residual transboundary impacts identified.

Cumulative Impacts

No marine or transboundary cumulative impacts have been identified.

One potential cumulative impact remains significant after mitigation measures have been implemented.

The impact on high sensitivity fauna of conservation interest in the Talamai OA from the EACOP project access road to PRS1 and the national road upgrade between Handeni and Singida by TANROADS in the area of KP1143 and KP1223.5.

The national road is outside the Talamai OA boundary but the EACOP access roads to PRS1 and MC13 depart from this main road. The operation of the national road and the EACOP project access roads to MC13 and PRS1 cumulatively have the potential to cause increased pressure on natural resources in the OA from increased human access and activity. MCPY13, which is outside the OA, will be restored once construction is complete and the effects of PIIM may be lessened as the draw from this area of habitation will be removed. However, as the access road to PRS1 is permanent and will provide access directly into the OA, cumulative impacts are still considered significant. When enhancement and conservation measures are developed and implemented cumulative impacts are expected to be reduced.

Potential Impacts – Unplanned Events

The project has adopted engineering design criteria with the intent to reduce the probability and consequences of unplanned events that could lead to impacts to social or environmental receptors. At each stage of the design process, a series of health, safety and environment (HSE) studies has been, and will continue to be undertaken.

The project has completed a detailed Technological Risk Assessment (TRA) during front end engineering design (FEED) in accordance with the EACOP Project HSE risk assessment methodology.

Risk assessment has been undertaken to inform:

- the design process
- the ESIA process, and the development of mitigation measures.

Additional risk assessment will be undertaken during detailed engineering and construction planning.

An emergency response plan will be prepared which identifies possible emergency scenarios, sets out actions to be taken in the event of an emergency, and defines resources that will be made available to respond to an emergency event. It will comprise management plans and procedures, such as an oil spill contingency plan (OSCP) spill management and response plan and a community health, safety and security plan.

Work has been undertaken that supports the establishment of a preliminary rating of the risks and related significance, based on existing engineering knowledge and project design, and professional judgement.

The project will reduce risk through:

- design and construction mitigation
- health, safety, security, society and environment (H3SE) systems and procedures
- emergency response planning.

The project has considered design and construction opportunities to reduce risk during construction and operation throughout the design process and will have in place an HSE Management system with which contractors will be required to comply during construction.

Unplanned Events - Pipeline and the Marine Storage Terminal

During the construction phase, the unplanned events include:

- traffic accidents
- fires
- horizontal directional drilling mud breakout
- damage to third party assets
- release of diesel from fuel storage tanks at the MCPYs and construction sites
- release of chemicals stored at the coating facility
- release of hydrotest water during commissioning.

During operation, the unplanned loss of oil from the pipeline, whether due to geophysical hazards, deliberate sabotage, corrosion, or for any other reason, is the main significant risk. Oil spill modelling has been conducted for the pipeline and MST to consider the risks associated with oil loss during operation. The oil that will be transported is considered heavy oil, characterised by a pour point of 31–40°C (the temperature at which a liquid becomes semi-solid and loses its flow characteristics) and a waxing temperature of 45–57°C (the temperature at which the oil first precipitates). The general chemical and physical properties of the heavy oil influences the potential migration and impact of a release, as it tends to solidify when exposed to air or water which are at temperatures below those stated above.

A summary of the unplanned events with respect to the pipeline and MST, their potential impacts, and the key mitigation measures which will be in place to prevent or manage impacts is provided below.

Table ES5 Summary of Unplanned Events – Pipeline and MST

Unplanned Event	Potential Impact	Management Plan(s)	Likelihood of Event (Low, Medium, High)
Construction			
Traffic accidents	Vehicle collision causing injury or mortality to member of public/workforce or livestock, or physical damage to community asset/structure or project asset	Transport and road safety management plan Emergency preparedness and response plan	Medium to High
Traffic accidents	Vehicle collision leading to spillage of transported fuel or chemical and causing contamination of soil and/or water, toxicity affecting living organisms		Medium to High
Fire	Impact to environmental and social VECs including biodiversity, community safety, security and welfare and land and property (e.g., sensitive habitats, local community assets and the health of local community residents)	Emergency preparedness and response plan	Low
Breakout of drilling mud at horizontal directional drilling crossings	Downstream impacts on water quality at Kagera (KP324) and Sigi (KP1424) Rivers	Water management plan	Medium
Damage to third party assets	Physical damage to third-party property	Transport and road safety management plan Infrastructure and utilities management plan	Low
Diesel release from oil storage tanks at the MCPYs and construction sites	Diesel release causing contamination of soil and/or water, toxicity affecting living organisms	Pollution prevention plan Water management plan Emergency preparedness and response plan	Low (MCPYs) Medium (construction sites)
Chemical release from the coating facility	Spillage, fire and/or toxic release from the bulk storage of chemicals required for the coating process	Emergency preparedness and response plan	Medium
Loss of hydrotest water during commissioning	Localised erosion	Emergency preparedness and response plan	Low

Table ES5 Summary of Unplanned Events – Pipeline and MST

Unplanned Event	Potential Impact	Management Plan(s)	Likelihood of Event (Low, Medium, High)
Operation			
Traffic accidents	Vehicle collision causing injury or mortality to member of public/workforce or livestock, or physical damage to community asset/structure or project asset	Transport and road safety management plan	Low
Traffic accidents	Vehicle collision leading to spillage of transported fuel or chemical and causing contamination of soil and/or water, toxicity affecting living organisms	Emergency preparedness and response plan	Low
Fire	Impact to environmental and social VECs including biodiversity, community safety, security and welfare and land and property (e.g., sensitive habitats, local community assets and the health of local community residents)	Emergency preparedness and response plan	Low
Geophysical hazards	Rupture of pipeline and/or slope failure leading to land-slides, and oil spills	Emergency preparedness and response plan	Low
Sabotage	Deliberate damage with environmental and social impacts	Emergency preparedness and response plan	Medium (political) – Low (theft)
Modelled oil spill from pipeline or AGIs	Impact to surface water via migration of oil components dissolved in groundwater	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline or AGIs	Impacts to groundwater via migration of oil components dissolved in groundwater	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline or AGIs	Impacts to soil from NAPL in the unsaturated zone	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline	Oil dispersal on surface water following leak at pipeline crossings	Emergency preparedness and response plan	Low
Large oil leak from storage tanks at the MST	Impact to underlying soil and groundwater environment	Emergency preparedness and response plan	Low

Unplanned Events at the LOF

Unplanned events have been identified and assessed for:

- activities in all phases:
  - marine traffic accidents
  - fires
- construction, and commissioning phase activities:
  - vessel collision with other vessels
  - vessel collision with marine mammals
  - damage to third party assets
  - release of diesel from fuel storage tanks on construction vessels
  - release of hydrotest water during commissioning
- operation
  - vessel collision with LOF
  - oil spill scenarios
  - spill from the loading arm
  - loss of the product from the pipeline along the trestle.
  - potential external causes of a pipeline breach:
  - sabotage
  - modelling of oil spills at sensitive locations.

If an unplanned event does occur during the project's lifetime, including the construction phase, EACOP's response planning will be consistent with international best practice and designed to minimise the consequences of any such accident.

A summary of the unplanned events, their potential impacts, key management plans and risk is provided below.

Table ES6 Summary of Unplanned Events - LOF

Unplanned Event	Potential Impact	Key Management Plans	Risk[2]
Construction			
Vessel collision with other vessels	Collisions between construction vessels and fishing vessels, construction vessels and commercial vessels, and between construction vessels causing fire or sinking of vessel potentially resulting in loss of life, disturbance of the seabed and/or contamination.	Marine stakeholder engagement plan, marine community health safety and security plan; marine vessel management plan; marine pollution prevention plan; marine emergency preparedness and response plan	High (between construction vessels and fishing vessels) Medium (between construction vessels and commercial vessels, and between construction vessels)
Vessel collision with the LOF while under construction	Collisions between construction vessels, fishing vessels or commercial vessels and the LOF potentially causing loss of life, or spill of bunker oil with consequences for local community livelihoods, habitats and species.	Marine stakeholder engagement plan, marine community health safety and security plan; marine vessel management; marine pollution prevention plan; marine emergency preparedness and response plan	Low (between construction vessels and LOF) Medium (Fishing or commercial vessels and LOF)
Vessel collision with megafauna	Collisions between construction vessels and megafauna (turtles and marine mammals) causing injuries or fatalities to megafauna.	Biodiversity management plan	Low
Vessel collision with divers/snorkelers	Collisions between construction vessels and divers/snorkelers causing injuries or fatalities to divers/snorkelers.	Marine stakeholder engagement plan, marine community health safety and security plan, marine vessel management plan	Medium

[2] Risk was assessed by likelihood and consequence using the risk matrix in Volume 2 Section 6 (Table 6.2-1). Likelihood and consequence for vessel collisions is described in the text, Consequence of the oil spills is discussed in the text, and likelihood for oils spills in this summary table was assumed to be low

Table ES6 Summary of Unplanned Events - LOF

Unplanned Event	Potential Impact	Key Management Plans	Risk[2]
Operation			
Vessel collision with other vessels	Collisions between tankers/tugs and fishing or commercial vessels, causing fire or sinking of vessel potentially resulting in loss of life, disturbance of the seabed and/or contamination.	Marine stakeholder engagement plan, marine community health safety and security plan; marine emergency preparedness and response plan	Low
Vessel collision with megafauna	Collisions between tankers/tugs and megafauna (turtles and marine mammals) causing injuries or fatalities to megafauna.	Marine stakeholder engagement plan, marine community health safety and security plan; marine emergency preparedness and response plan	Low
Vessel collision with the LOF	Collision of tankers with LOF causing an oil spill with consequences for local community livelihoods, habitats and species.	Marine stakeholder engagement plan, marine community health safety and security plan; marine emergency preparedness and response plan	Medium
Sabotage	Deliberate damage with environmental and social impacts.	Emergency preparedness and response plan	Medium (political) – Low (theft)
Modelled oil spill release during loading	Impacts to local community livelihoods, habitats and species.	Marine pollution prevention plan; marine emergency preparedness and response plan; terrestrial emergency preparedness and response plan; terrestrial pollution prevention plan	Medium
Modelled oil spill from the pipeline along the trestle	Impacts to local community livelihoods, habitats and species.	Marine pollution prevention plan; marine emergency preparedness and response plan; terrestrial emergency preparedness and response plan; terrestrial pollution prevention plan	Medium

Decommissioning

The project components (i.e. pipeline, PS, PRS, MST, LOF), will be decommissioned based on Tanzanian regulations and standards and international standards and protocols.

A decommissioning plan, which includes a social management component that addresses the impact of decommissioning (loss of jobs, economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time. The decommissioning plan for the construction facilities will ensure that all the project components that were required for constructing the pipeline, but that will no longer be required during the operational phase, are removed and land is returned to the Government. The decommissioning plan will include specific consideration of unplanned events which may occur during decommissioning in line with EACOP project requirements.

Environmental and Social Impact Management and Monitoring Plans

In accordance with the Tanzania Environmental Impact Assessment and Audit Regulations, 2005, an environmental and social management plan (ESMP) and an environmental and social monitoring plan (ESMoP) have been developed.

The project ESMP is consistent with the EACOP code of conduct and H3SE policy and charters.

The ESMoP contains monitoring parameters, proposed performance indicators and targets that will steer environment and social performance toward continuous improvement. A comprehensive reporting system will also be developed.

A suite of management plans will be prepared to support implementation of the ESMP and the ESMoP. Minimum content of these management plans are the mitigation commitments developed throughout the ESIA.

A separate suite of management plans will be drafted for:

- terrestrial construction
- terrestrial operations
- marine construction
- marine operations.

The following is a list of the management plans that will be developed before the commencement of construction and operation activities. A separate suite of management plans will be developed for terrestrial and marine.

Terrestrial management plans:

- biodiversity management plan
- pollution prevention plan
- waste management plan
- natural resource management plan
- soil management plan
- cultural heritage management plan
- reinstatement plan

- stakeholder engagement plan
- resettlement action plan
- labour management plan
- project induced in-migration management plan
- procurement and supply chain management plan
- infrastructure and utilities management plan
- community health, safety and security plan
- occupational health, safety and security plan
- transport and road safety management plan
- emergency preparedness and response plan
- monitoring and reporting plan
- decommissioning plan.

Terrestrial management subplans:

- chemical management plan
- horizontal directional drilling management plan
- hydrostatic testing management plan
- rock blasting management plan.

Marine management plans:

- biodiversity management plan
- pollution prevention plan
- waste management plan
- natural resource management plan
- cultural heritage management plan
- reinstatement plan
- stakeholder engagement plan
- labour management plan
- procurement and supply chain management plan
- infrastructure and utilities management plan
- community health, safety and security plan
- occupational health, safety and security plan
- vessel management plan
- emergency preparedness and response plan
- monitoring and reporting plan
- decommissioning plan.

Changes to the project may occur after preparation and submission of the ESIA. A management of change procedure will be implemented that includes:

- environmental and social appraisal of the change, including the identification of new or revised mitigation measures
- health and safety evaluation

- consultation with engineering and H3SE disciplines
- consultation with NEMC on the need for amendments to the ESIA permit
- management of change approval process.

After management of change approval, changes to the ESMP, ESMoP and supporting management plans will be implemented.

Cost Benefit Analysis

The cost benefit analysis was developed before finalisation of the HGA between the Government of Tanzania and the project. The HGA is needed to inform the final investment decision. A positive final investment decision will be taken only if the project will provide a positive return on investment and if it has a positive economic benefit to all stakeholders.

The costs and benefits of the EACOP project, for the most part, are synonymous with the impacts (negative and positive). The costs and benefits considered include:

- costs
  - project investment
  - environment
  - socio-economic
- benefits
  - income
  - environment
  - socio-economic.

As it is challenging to monetise financial costs associated with some environmental loss or disturbance and costs to communities, the costs considered are those associated with mitigating and monitoring impacts. The costs are based on current engineering and design, and are subject to adjustment.

The main costs include:

- estimated capital investment in Tanzania of USD 3 billion (TZS 6.8 trillion)
- RAP implementation in excess of USD 100 million (subject to final approval of the valuation reports and signing of the agreements with project affected people)
- annual operation of approximately USD 90 million (TZS 205.4 billion)
- environmental mitigation through design and engineering for an estimated USD 32 million (TZS 72.7 billion), other environmental management and mitigation measures for an estimated USD 1.9 million per year (TZS 4.3 billion), and environmental monitoring for an estimated USD 3.8 million (TZS 8.6 billion)
- approximately 9,500 project affected people, some of whom will lose land to the project; others will lose other types of assets (mainly crops, economic trees and structures); and some will be physically displaced (i.e., will lose residential structures)
- management and mitigation of community impacts for an estimated USD 8.6 million (TZS 19.5 billion)
- those associated with government project-related responsibilities which are currently not quantifiable.

The main overall benefit of constructing a pipeline to transport 216,000 barrels of oil per day to the world market is the creation of considerable cashflow to the oil producing country of Uganda which will enhance regional economic activity, creating a positive effect in East Africa including generating income for the transit country Tanzania.

The main benefits include:

- transportation of petroleum products via a pipeline carrying much less environmental risk than transportation by trucks or rail
- contribution to the economy (income) of USD 3 billion (TZS 6.9 trillion) over the three-year construction period
- provision of business opportunities for different sectors of the economy and enhancing the capacities of local companies
- provision of direct, indirect or induced jobs (21,000 during construction and 2,255 during operation), and knowledge transfer and skills development opportunities
- operation contribution per year of USD 90 million direct and USD 150 million indirect and induced (TZS 548 billion).

Based on the project cost aspects that can be monetised, the project has the potential to provide substantial benefits to Tanzania, nationally and locally, and for many stakeholders, improving their standard of living. There will be costs in terms of environmental and social impacts that are challenging to monetise. However, the project has management plans with mitigative measures funded by project investment to minimise those costs.

Generally, given the relatively few and manageable residual impacts that will be mitigated to a minimum, as much as feasible, and considering the relatively long 1147-km footprint, the overall project benefits, including those for the regional economy, are considered to outweigh the costs.

Recommendations

The ESIA has been prepared by an experienced team with extensive pipeline engineering, environmental and social impact assessment knowledge, including Tanzanian partners with expertise in ESIA development in the Tanzanian oil and gas sector. The team has quantitatively and qualitatively identified and assessed potential interactions between the project and VECs in the project AOI. The recommended measures, consolidated in the ESMP, which are either incorporated into project design, or actioned during project implementation, are intended to mitigate the impacts and their significance.

The EACOP project, with due consideration to the management of associated environmental and social impacts, will:

- contribute to economy
- provide business opportunities for different sectors of the economy and enhance capacities of local companies
- provide employment, knowledge transfer and skills development opportunities during construction and operation.

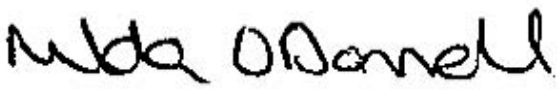
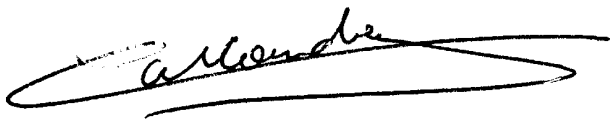
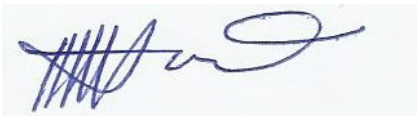
As these are benefits in the public interest, it is requested that NEMC approve this environmental impact statement.

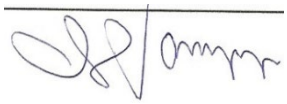
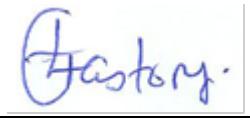
ESIA Team

The ESIA has been undertaken by a team comprising:

- the proponent's ESIA environmental and social team
- representatives of the FEED team
- an international environmental and socio-economic consulting firm (RSK Environment Ltd) that is certified and approved as a firm, in accordance with the provisions of the Environment (Registration of Environmental Experts) Regulations, 2005
- teams from the registered Tanzanian environmental and socioeconomic consulting firms COWI Tanzania Ltd and JSB EnviDep Ltd, including experts who are individually certified and approved in the same manner, complete the ESIA project team.

The following certified consultants conducted this ESIA:

Name	Area of Expertise	Signature
1. Nicola O'Donnell	Biodiversity expert	
2. Hilde Van Vlaenderen	Socio-economic and health expert	
3. Navonaeli Kaniki	Natural Resources Management Expert	
4. Moses Shimba	Terrestrial fauna	
5. Ignatius Ngamesha	Offshore social and stakeholder engagement	
6. Juma Kayonko	Acoustic Specialist	
7. Jamidu H.Y.Katima	Environmental Engineer	
8. Saada K.Juma	Environmental & Social Planning and Management	

Name	Area of Expertise	Signature
9. Mwajuma Nuru	Stakeholder Engagement Specialist	
10. Godrey Kamukala	Environmental and Social Management Expert	
11. Leonard Gastory Lugali	Civil and Water Resources Expert	

The following specialists contributed to the ESIA report:

Name	Area of Expertise
1. Katrina Cooper	Project Management
2. Joanne Nightingale	Botany
3. William Hawthorne	Botany
4. Henry Ndangaksi	Botany
5. Corin Simmonds	Fauna
6. Bernard Agwanda	Bats
7. Bruno Nyundo	Invertebrates
8. Chacha Werema	Herptiles
9. Tom Smith	Avifauna
10. Neil Baker	Avifauna
11. Tom Coyne	Aquatic
12. Rashid Tamatamah	Aquatic
13. John Cornell	Critical Habitat
14. Tim Newton	Soils
15. Peter Bauer	Surface water
16. Hamdi El-Ghonemy	Groundwater
17. Daniel Leaver	Landscape
18. Srinivas Srimath	Air quality
19. Daniel Clare	Acoustic
20. Khatira Morrison	Social
21. Mark Divall	Health
22. Izak Olivier	Health
23. Ian Wickett	Traffic
24. David Maynard	Cultural Heritage
25. Gerry Wait	Cultural Heritage

Name	Area of Expertise
26. Richard Appleyard	Climate and Air quality
27. Dave Watson	Marine
28. Matthew Richmond	Marine
29. Jody Edmunds	Marine
30. Angela Lowe	Marine
31. Andy Bendell	Marine
32. Alec Moore	Marine