# EXECUTIVE SUMMARY

## Introduction

Total E & P Uganda B.V. (hereafter referred to as 'TEP Uganda'), Tullow Uganda Operations Pty Limited (hereafter referred to as 'TUOP') and the CNOOC Uganda Limited (CNOOC) are joint venture partners in the Tilenga Project. The Government of Uganda (GoU) at award of the Production Licences elected to participate in this joint venture through its nominee, Uganda National Oil Company (UNOC). Negotiations for a Joint Venture Agreement between UNOC and the joint venture partners are ongoing. The overall objective of the Tilenga Project is to establish production of the oil fields located in the northern part of Albertine Graben area in an economically prudent manner using sound reservoir management principles and best industry practice, and to deliver crude oil to the market. The Tilenga feeder pipeline is being planned to transport crude oil from the Tilenga Project central processing facility (CPF) near Buliisa town in Buliisa District, Uganda to a manifold at the East African Crude Oil Pipeline (EACOP) pumping station (PS1) that will be located in the Kabaale Oil and Gas Industrial Park, in Hoima District.

The environmental and social impact (ESIA) is a report of the environmental and social impact assessment conducted to identify, describe and assess the likely interactions of the Tilenga feeder pipeline with environmental and socio-economic receptors, termed as "valued environmental and social components" (VECs).

The ESIA has been prepared pursuant to the National Environment Act cap 153 and the National Environment (Environmental Impact Assessment) Regulations, 1998 (SI No. 153-1), and conducted in accordance with the Scoping Report and terms of reference approved by the National Environment Management Authority (NEMA), dated 19 September 2017.

## Project Description

The Tilenga feeder pipeline comprises the following components:

- 95-km-long, 24-in.-diameter, insulated, electrically trace heated, buried pipeline from the Tilenga central processing facility (CPF), Buliisa District to the EACOP pump station-1 (PS1) at Kabaale Industrial Park
- pigging launching facilities at Tilenga CPF and receiver facilities at PS1 in the Kabaale Industrial Park
- aboveground installations (AGI): four intermediate main line block valves (MLBV) (three standalone, and one co-located with an electric substation)
- roads: 3.7 km of new and upgraded construction facility access roads
- one main camp and pipe yard (MCPY).

The Tilenga feeder pipeline route is shown in Figure ES1.

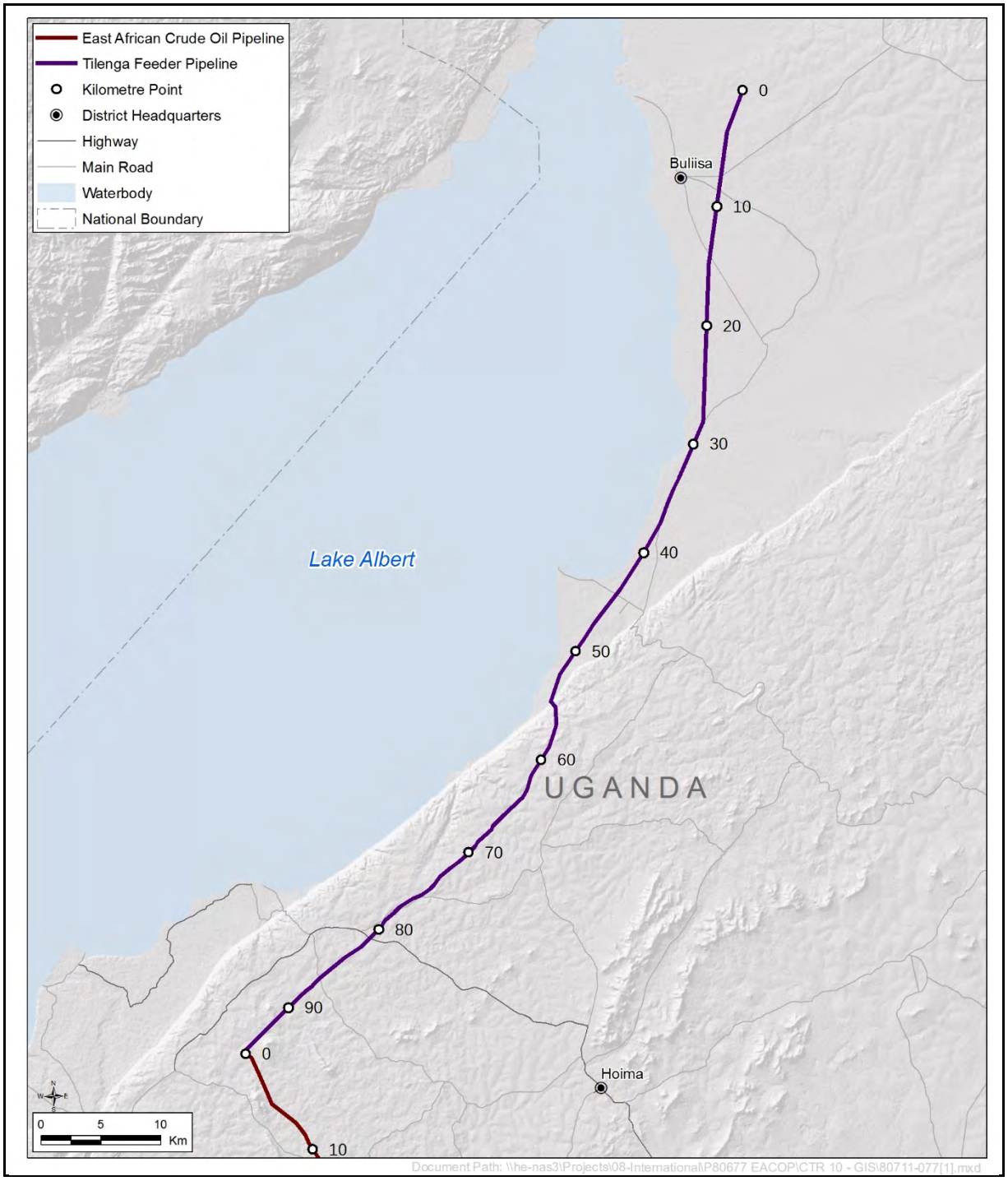


**Figure ES1 Tilenga Feeder Pipeline[1]**

[1] At the time of development of this ESIA, the Tilenga feeder pipeline traversed two districts, however this has since changed with the creation of a third district; Kikuube by the Government

The project activities will be sequenced as follows:

- construction, which will also include preparatory works where there is no existing infrastructure
- pre-commissioning, commissioning and start-up
- operations.
- decommissioning.

The construction phase is expected to phase generate the most impacts, albeit of temporary nature.

## Project Alternatives

Project alternatives have been considered for:

- pipeline routing
- siting facilities
- AGIs
- construction facilities
- technology
- construction techniques.

### Routing

The route from the Tilenga Project CPF to PS1 located at the Kabaale Industrial Park was determined when the delivery point of the Kingfisher Oil Project and Tilenga Project production developments was established.

Two routes (eastern and western) were identified and considered for the Tilenga feeder pipeline using a geographical information system (GIS), statistical analysis and least risk assessment. The two corridors were screened while applying constructability, geohazards, terrain (river crossings and slopes), environment, and socioeconomic criteria and using a range of secondary data. The screening assessment considered physical factors including topography, climate, hydrology and hydrogeology, geology and geohazards and soils.

Feasibility studies highlighted the potential benefits of pipeline corridor options to:

- be closer to existing infrastructure (roads)
- reduce the number of water crossings
- provide a more suitable elevation profile for pipeline hydraulic design.

The western-most route was selected based on these criteria.

### Facility Siting

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

- AGIs
- construction facilities including a MCPY.

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

### AGIs

The selection of sites for AGIs were considered based on:

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

Satellite imagery and site visits were used to identify potential site locations and to validate these locations during front-end engineering and design (FEED). An electrical substation will be co-located at one of the MBLV stations.

### Construction Facilities

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

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

## Technology

Technology alternatives for the following were considered:

- pipeline (diameter and wall thickness)
- insulation
- heating.

### 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, safety, risk of interference by third parties, visual impacts and impacts to large wildlife movement. The concept selected for study was a trenched and buried pipeline.

Due 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.

### Insulation

The pre-FEED assessed insulated and un-insulated pipeline options. The steady state analysis concluded that heat losses with the uninsulated case would require separate crude fired heating stations resulting in high crude consumption, larger project footprint, larger environmental impact and operational costs. Conversely, applying thermal insulation on the pipeline concluded that heating requirements could be optimised with lower crude

consumption, lower project footprint, less requirement for facilities, 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 as it offers the highest thermal efficiency with lowest capital expenditure (CAPEX).

#### Heating

Only one heating configuration was considered to maintain the oil temperature above 50°C:

- Case 1 – electric heat tracing (EHT) only case.

### Construction Techniques

Several aspects of 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, the auger boring technique will be used to prevent disruption to services. 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.

### Associated Facilities

The EACOP project, the Hoima-Butiaba-Wanseko road upgrade, concrete batch plants, borrow-pits and waste management facilities (where they meet the IFC definition of associated facilities) have been identified as associated facilities (AFs).

Where new facilities are required, TEPU will ensure that the requisite regulatory, legal and industry best practice requirements are met and complied with. Where existing facilities are used, due diligence of the operator will be conducted to ensure that all legal and regulatory requirements are met. Where required, independent environmental and social impact assessments will be conducted in consultation with the relevant authorities.

## Legislative, Policy and Administrative Framework

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

- the National Environment Act, Cap 153, 1995
- National Environment (Environmental Impact Assessment) Regulations, 1998 (SI No. 153-1)
- the Guidelines for Environmental Impact Assessment in Uganda, 1997

- the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014.

The ESIA will be submitted to NEMA.

The ESIA has been developed in compliance with relevant Ugandan legislation and with the International Finance Corporation Performance Standards (IFC) (2012).

The Government of Uganda is in the process of amending existing laws and regulations and developing new requirements that could become relevant to the project upon enactment. Once enacted, the provisions of the revised act and regulations will be complied with. For the laws under revision, the project has obtained drafts, where available, of the new or amended laws and has considered them when preparing the ESIA and developing mitigation commitments.

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

# 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.
- Scoping 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 sufficient 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).

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 by definition. 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 Tilenga feeder pipeline on VECs.

### Normal Operations

The assessment of impacts from normal project operations (which are expected during all project phases) 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.

To determine whether an impact is significant, the impact score is summed up 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 accidents, fire, collision of vehicles with equipment, damage of pipe due to unauthorised digging and oil spills).

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

# Environmental and Social Baseline Conditions

The following VECs have been selected for the assessment, with an overview of their baseline condition summarised below.

## Biodiversity

### Habitats of Conservation Importance

The majority of habitat types in the area of influence (AOI) are modified (IFC 2012), with some natural habitats still remaining both within and outside of protected areas. Guineo-Congolian semi-evergreen forest and riverine and swamp forest (wetland forests) are of conservation importance in the context of habitat quality within the AOI. The International Finance Corporation (IFC) identifies a category termed 'critical habitat' which contain high biodiversity values as determined by species, ecosystems and ecological processes and provides criteria to be used to determine such habitat. Riverine and riparian forests are habitats of conservation importance within the AOI and trigger criterion 4 critical habitat: highly threatened and/or unique ecosystems (IFC, 2012).

### Flora and Fauna Species of Conservation Importance

Four vascular plant species within the AOI are rare and threatened or data deficient in Uganda according to the National Red List (WCS 2016), namely *Nymphaea nouchali* (critically endangered), *Milicia excelsa* (endangered and IUCN lower risk/near threatened), *Tamarindus indica* (vulnerable) and *Aeschynomene indica* (data deficient; IUCN least concern). Supplementary data identified the potential presence of two endemic/restricted-range (Black Star) species, namely *Tinospora orophila* (IUCN endangered) and *Ecbolium hastatum,* as defined by the Rapid Botanical Survey (the methodology used to characterise the baseline habitats and flora). These species trigger criterion 2, tier 2 critical habitat (IFC, 2012); further verification is required to confirm their presence in the RoW.

Baseline surveys confirmed the presence of 29 fauna species of conservation importance (i.e. large and small mammals, reptiles, dragonflies and butterflies). These species are nationally and / or globally rare or threatened and several species meet IFC (2012) critical habitat criteria. Fauna species of conservation importance triggering critical habitat include, but are not limited to, hippopotamus (*Hippopotamus amphibius;* IUCN vulnerable, Uganda vulnerable), bohor reedbuck (*Redunca redunca* spp *wardi;* Uganda endangered), smooth chameleon (*Chamaeleo laevigatu;* Uganda endangered), lion (*Panthera leo;* IUCN vulnerable, Uganda critically endangered) and African elephant (*Loxodonta Africana;* IUCN vulnerable, Uganda critically endangered, migratory). Chimpanzee (*Pan troglodytes* ssp. *Schweinfurthii* IUCN Endangered) inhabit Wambabya Forest Reserve, Bugoma Forest Reserve located outside of the AOI. Historic records and previous surveys identified chimpanzee activity along the Wambabya River by chimpanzees (which is crossed by the AOI at KP89.4) and Bugungu Wildlife Reserve. Chimpanzees trigger Criterion 1 tier 1 critical habitat and have a very high sensitivity to change.

Avifauna species of conservation importance within the AOI include African woollyneck (*Ciconia microscelis*; Ugandan vulnerable), Ovambo sparrowhawk (*Accipiter ovampensis; Ugandan vulnerable),* pallid harrier (*Circus macrourus;* IUCN near threatened, Ugandan critically endangered) and grey-crowned crane (*Balearica regulorum* IUCN Endangered*)*. Critical habitat trigger avifauna species include pallid harrier (criterion 1, tier 2) and grey-

crowned crane (criterion 1, tier 2). Bugungu WR and Albert Flats areas supported the greatest diversity and numbers of bird species of conservation importance and are sensitive receptors.

The Waiga, Waisoke, Sonso and Waki rivers support fish species of conservation importance. Nationally or globally rare or threatened fish were not identified during baseline surveys. However, fish species triggering habitat criterion 3: migratory and/or congregatory species (IFC, 2012) within the AOI are *Schilbe intermedius, Barbus jacksoni* and *Clarias gariepinus.*

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

### Legally Protected, Internationally or Nationally Recognised Areas

The Bugungu Wildlife Reserve and Key Biodiversity Area (KBA) is close to the pipeline route It is of high sensitivity and supports species of conservation importance including critical habitat-qualifying species.

The catchments of several rivers fall within protected areas and as such have a high to moderate sensitivity to change, namely the Waiga, Waisoke, Sonso, Waki and Wambabya Rivers.

## Physical Environment

### Geology

In Uganda, Precambrian crystalline rock, including gneiss and granite, constitutes approximately 90% of the land area. The remaining rock types are mostly younger volcanic and sedimentary rocks. The Tilenga feeder pipeline traverses Cenozoic alluvial and rift sediments, and Precambrian gneiss and granite complexes.

The occurrence of earthquakes in Uganda is associated with the East African Rift system which is traversed by the Tilenga feeder pipeline route.

Landslides and sinkholes have not been identified across the AOI. However, the Tilenga feeder pipeline traverses a scarp at approximately KP55, which is more likely to be prone to erosion and landslides.

*Soil*

Soil types with a high sand content, i.e., sandy clay loam and sandy loam, were found to be present along the majority of the route. Top soil depth within the majority of the AOI was found to be 20–30 cm depth, although thin topsoil (less than 5 cm depth) is likely to exist. Soil within the AOI is mainly characterised as low to medium productivity, supporting grazing and subsistence farming. Most topsoils were of low to medium organic matter content and high base status, indicating that soils could be productive if well managed. Continued use of the land within the study area for agriculture and grazing is likely to result in continuing deterioration in soil quality.

The landscape (except for the rift valley escarpment face) along the route is dominated by gentle slopes and light to medium textured soil with low to moderate erosion risk. However, there are two areas with very high erosion risk due to soil type and 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 existing anthropogenic contamination within the AOI. Although oil seeps from the Albertine Graben area have not been observed within the AOI, it is possible they may exist, or that hydrocarbons from seeps outside the AOI may migrate laterally to within the AOI.

**Surface Water**

The pipeline route crosses several permanent and one ephemeral watercourse in the Lake Albert basin. Lake Albert is the largest surface waterbody within the AOI.

The morphology and stability of the watercourses throughout the AOI are mostly considered very stable, with the exception of Bubwe River. This is because the floodplains contain swamp vegetation that limits flow velocities and inhibits erosion. The Bubwe River is considered unstable, as papyrus swamp vegetation is absent and bank protection is reliant on degraded grasses and shrubs. Erosion and deposition processes are likely to be more active along this river.

Water quality is considered relatively good in the rivers in catchments with dispersed rural settlement, frequent use by livestock and people and for domestic purposes, and in which there is an abundance of swamp vegetation and high rates of biological activity. It is therefore sensitive to change. Sources of contamination are currently 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, irrigation and commercial uses.

**Groundwater**

Groundwater quality is generally good in the water basins of Buliisa and Hoima districts, which are traversed by the pipeline. Aquifers in the AOI ranged from having low to high vulnerability based on permeability and depth to the water table. All aquifers are recharged by rainfall.

In the AOI, groundwater is the most important source of public water being of high quality, used as drinking water and for domestic and agricultural purposes.

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

**Landscape**

The pipeline route traverses the Lake Albert coastal fringe, which is characterised by settled coastal lowlands adjacent to the eastern banks of Lake Albert, then ascends the steep slopes of the rift escarpment. South of the rift escarpment, the pipeline traverses a landscape of gently undulating grasslands and farmland, hills with open plateaus and bare rocky outcrops, forested areas and wetlands.

Most of the landscape AOI has been affected by farming and grazing, except for a few sections that are adjacent to forest reserves and the Bugungo WR.

Local residents did not perceive proposed project infrastructure as negative visual intrusions in the landscape. The area as whole, however, attracts international tourists, drawn by the Murchison Falls National Park and other wildlife attractions and the landscape is an integral part of the attraction.

### Air Quality

Concentrations of $NO_2$, $NO_x$, and $SO_2$ are low at all locations surveyed. The baseline environment is characterised by high levels of airborne fine particulate matter due to natural conditions (dry soils which are easily mobilised in windy conditions). Ground-level ozone concentrations were found to be moderately high. By design, much of the Tilenga feeder pipeline AOI is sparsely populated and composed of infrequently occupied areas. There is capacity in the atmospheric environment for gaseous emissions to increase without exceeding national standards.

### Acoustic

The noise environment in the AOI is dominated by human induced sources such as road traffic, farming and general human interactions, and by natural noise such as bird song and insects.

The noise environment at the locations proposed for the RoW and the MCPYs ranged between 24 and 47 dB(A) $L_{90,1hr}$.

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

## Socio-economic and Health

The pipeline traverses 2 districts, 11 parishes, 5 subcounties, 2 town councils and an estimated 38 villages and hamlets. The main livelihood activity in the AOI is agriculture and most settlements are concentrated along national and secondary roads. Villages often have a central trading place in which main business and social activities take place.

The main ethnic groups in the districts traversed by the AOI are the Bagungu, Banyoro and Alur. 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 and the districts in the AOI experience urbanisation. Hoima Municipality has become attractive to rural migrants due to employment and business opportunities and relatively better infrastructure.

Uganda experiences both in and out migration. Migration to Uganda has been driven by civil war and political instability in the Democratic Republic of Congo (DRC), Rwanda and South Sudan.

Adult literacy rates for persons above age 18 range between 54 % and 68% in the districts traversed by the AOI. Males are more literate than females. School attendance rates are improving, however educational services are faced with several challenges including lack of trained teachers, equipment and buildings.

### Economy

East Africa is the fastest growing economic region in Africa with recorded regional growth estimated at 6–7% for 2016 and 2017.

Uganda, as a member of the East African Community (EAC) since 2010, shares a common market with Kenya, Tanzania, Burundi and Rwanda. The EAC is economically more diverse than other regional African communities because it is less dependent on extractive industries.

Uganda's economy collapsed during the 1970s and 1980s due to political uncertainty and ongoing civil war (Byrnes 1990). Since then, the government has acted to rehabilitate the economy and economic reforms have ushered in a period of solid economic growth and lower inflation. Nevertheless, overall productivity remains hampered by supply-side constraints including underinvestment and high production costs in the agricultural sector (CIA 2017, Internet site).

The Ugandan economy is characterised by formal and informal economic activity with the informal sector accounting for approximately 45% of all economic activity (UBOS 2016a). The informal economy refers to a diverse set of economic activities, enterprises, jobs and workers that are not regulated or protected by the state.

The service industry typically contributes most to the formal economy with community services, wholesale and retail trade being the most important service sub-sectors, followed by transport and communication (Wiegratz 2009). Tourism is one of the fastest growing service sectors in the Ugandan economy and is the largest foreign exchange earner. Agriculture has traditionally been a significant economic activity however has decreased relative to other sectors in recent years primarily as a result of growth in other sectors such as manufacturing.

The industrial sector is relatively small but has recorded high growth rates over the past three decades. However, the industrial sector is dependent on imported equipment and energy (oil) and is impeded by poor infrastructure, high energy costs and low levels of private investment.

### Local Economy

Although agriculture and fishing are the most important livelihoods in the districts traversed by the Tilenga feeder pipeline AOI, the following economic activities are also important (Atacama Consulting 2017):

- small-scale processing of agricultural and fish products
- small-scale trade in retail merchandise and agricultural produce
- provision of services including tourism and transport.

Local economic activities are predominantly informal, meaning that they are neither taxed nor regulated by the state and offer little social protection to workers (WIEGO 2018, Internet site).

Artisanal fish processing (e.g., drying, smoking) takes place in Buliisa District with landing sites on the shores of Lake Albert. Agro-processing facilities such as cassava and millet grinding mills are found in the area and Hoima District boasts a number of tea, coffee and tobacco estates with small-scale processing factories (NomoGaia 2012).

Small-scale trade occurs in the districts traversed by the Tilenga feeder pipeline AOI. The sale of retail goods and agricultural produce by micro-enterprises occurs predominantly on roadsides and at markets in trading centres, towns and cities due to ease of access to customers. The proximity of the districts to international borders has created great potential for import and export trade.

Tourism-based livelihoods are particularly important in the districts traversed by the Tilenga feeder pipeline AOI. Buliisa and Hoima districts are within the Albertine Graben, a region which accounts for over 70% of Uganda's tourism revenue (Total E&P Uganda and Tullow Oil 2016). The main attractions in Buliisa District are the Murchison Falls National Park (MFNP), River Nile and natural reserves (i.e., Budongo Forest Reserve, Bugungu Wildlife Reserve) (DDP 2015).

Hoima district is a hub for tourists travelling from Murchison Falls to Queen Elizabeth National Park and contains a number of hotels and guest houses. Plans are underway for the construction of the Kabaale International Airport in Hoima district which is intended to serve as a regional airport.

**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 subsistence farming with trading of surplus crops. Crop production is predominantly rain fed as irrigation infrastructure is absent in the districts traversed by the Tilenga feeder pipeline 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 is an important economic activity at household level. The main livestock species are cattle, goats, sheep, poultry, pigs and donkeys. Key challenges include the prevalence of diseases and livestock theft. Localised nomadism, which involves movements of livestock herds (usually cattle) between villages within and occasionally between districts, is common in the sampled PACs and essential for the larger herds of cattle.

Artisanal scale mining (ASM) in the districts traversed by the Tilenga feeder pipeline AOI focuses mainly on construction materials such as sand, stone for aggregates and laterite soils for brick making. Miners who are engaged as casual labour on an informal basis and pursue ASM as a sole occupation are deemed very highly sensitive as they do not have access to alternative livelihood sources. Children involved in ASM are very highly sensitive since they may be exposed to safety risks and may lack access to education as a result of working in mining activities. Non-Ugandan nationals engaged in ASM are also very highly sensitive; these people hold no identity papers and have no legal standing in Uganda.

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 include the high cost of alternative sources of energy for cooking and lighting and pressure on natural resources due to a growing population encroaching on wetlands and forest areas for dwellings, farming and grazing. Female firewood collectors and wild food users are highly sensitive VECs. Shell collectors are

deemed very highly sensitive as this activity is mostly undertaken by women, many of whom are solely reliant on shell collecting for income.

### River and Lake based Livelihoods

Lake fishing and aquaculture are small-scale subsistence activities. There is pressure on the fisheries sector due to increasing crop failures caused by drought or floods forcing crop farmers to look at fishing as an alternative means of generating an income. Young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable. Fish stocks are decreasing due to overfishing with decreasing fish stocks encouraging the use of illegal fishing gear (e.g., fine-meshed nets), which is a major challenge facing lake fisheries. Other major challenges for fisherfolk in the Tilenga feeder AOI include competition for resources, which can become violent. Lake fisherfolk who fish full time, women dependent on lakeshore fishing, women who process and market fish and employees of aquaculture enterprises are deemed very highly sensitive receptors as they have no or limited alternative income generating opportunities.

### Land and Property

The Land Act (1998; 2010) identifies four forms of land tenure: customary, leasehold, freehold and mailo. Most citizens hold their land under customary tenure, which applies to specific land areas that are governed by customary laws. Over 60% of land is held under a customary tenure system, most of which is found in the northern, western and southern parts of the country and in Buliisa and Hoima Districts. Key problems associated with this tenure include lack of security for landowners and disadvantages for women (MLHUD 2013).

The Land Act (1998; 2010) provides for two mechanisms in which rights held under customary tenure can be formally recognised:

- acquiring a Certificate of Customary Ownership (CCO). Any person, family or community holding land under customary tenure on former public land may acquire a certificate of customary ownership. A CCO can be acquired through a tiered application process. Applications are reviewed by the Area Land Committee and certificates are eventually issued by the District Land Board.
- forming a Communal Land Association (CLA) by any group of persons under the Land Act for any purpose connected with the communal ownership and management of land, whether under customary law or otherwise (GOU 2013b).

Under the mailo tenure system, land is registered under the Registration of Titles Act, which grants the holder a certificate of title and absolute ownership in perpetuity.

The third land tenure system (freehold) is similarly governed by the Registration of Titles Act. Under this system, a registration of title in perpetuity and conferment of full powers of ownership is provided to the land holder, who may use the land for any legal purposes. Only national citizens are legally entitled to own land under the freehold system and there is little land held under freehold tenure.

Land and property sensitivity is ranked as very high for female headed households, who are particularly vulnerable due to long-standing discrimination that excludes women from owning, inheriting and controlling land. Households and individuals who have been previously displaced and resettled are also deemed very highly sensitive.

Sensitivity is ranked as high for landholders without title deeds as these are sometimes vulnerable and prone to evictions without due process and adequate compensation. Youths are potentially highly sensitive VECs as a result of having limited access to land outside their customary rights.

Land conflicts form the highest percentage of disputes reported both in formal and informal dispute resolution systems in Uganda. Common concerns reported are landlord-tenant relations on mailo land, disputes over land expropriation by the Government and the implications of oil exploration and mining for local land tenure systems and rights (MLHUD 2013).

**Workers' Health, Safety and Welfare**

Many companies in Uganda have had little previous exposure to basic health and safety standards and occupational health and safety lacks regulation enforcement. Legislation on workers' rights and working conditions exists, however, in practice workers are not always provided with adequate information regarding their terms of employment and their labour rights, particularly workers active in informal economic sectors. Baseline data revealed a low awareness level of health, safety and workers' rights and of a non-discriminatory work culture in the PACs.

The sensitivity of the workers' health, safety and welfare is ranked as very high for the local workforce owing to low levels of 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.

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; the majority of PACs do not have access to grid electricity and rely on other means for cooking and lighting. Households without mobile phones and internet access are also ranked as moderately sensitive VECs; they may not receive information shared through those platforms.

**Community Health**

Most of the population residing in the districts traversed by Tilenga feeder AOI are now using the formal health care system as well as traditional medicine. This was 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, heart disease and diabetes, occurring nationwide which has been linked to urbanisation and associated changes in lifestyle. Chronic malnutrition rates have decreased and acute malnutrition rates have generally remained low and stable at district level.

The districts traversed by Tilenga feeder pipeline reported a decrease in the burden of diarrhoeal diseases. This was partly attributed to improvements in hygiene behaviour, with access to safe drinking water and basic sanitation facilities improving. The potential for

cholera, dysentery and typhoid outbreaks remains high in all the project districts as a result of underlying challenges in environmental health conditions.

A decrease of HIV prevalence over the past three years was reported in the Tilenga feeder pipeline AOI and attributed to the scale up of 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 in-migration. Environmental sanitation, health care services and prophylaxis, vector control programmes and the management of in-migration 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 safe water and adequate sanitation, female headed households, PAC members with less access to wild foods and PACs near to artisanal mine sites. Sensitivity is ranked as potentially very high for immune-compromised individuals and commercial sex workers.

**Community Safety, Security and Welfare**

There are effective established mechanisms for conflict resolution and support groups at village level. Although PACs are generally peaceful, conflicts may arise as a result of changing demographics for example, underlining the requirement for effective stakeholder engagement. There are vulnerable groups, including widow-headed households, children and people living with illnesses, which will need special considerations.

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 from engaging in income generating activities and decision making processes. Widow headed households, the elderly and the disabled are ranked as very highly sensitive because they are challenged to meet basic household needs and afford health care. Children are ranked as very highly sensitive receptors, particularly those from poor households, AIDS orphans and boys from pastoralist and plantation agriculture communities. Youths are also ranked as very highly sensitive receptors due to their limited access to productive assets, lack of education and vocational skills and scarce employment opportunities. People living with illnesses are ranked as very highly sensitive as they rely on others for financial and food security. Land users without land titles are also deemed very highly sensitive because they are sometimes vulnerable and prone to evictions without due process and adequate compensation.

**Traffic**

Roads in Uganda vary in condition; they can have sealed and unsealed surfaces. 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. The only location within the project area where some congestion can be experienced is Hoima Municipality.

Many of the unsealed roads in the project area are being upgraded and new roads are being constructed by UNRA.

### 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 however more surveys will be undertaken during pre-construction and construction, and further consultations held with local communities which may lead to the identification of additional features.

There are no heritage sites with a national, international or critical cultural heritage (as defined in IFC PS8) designation in the Tilenga feeder pipeline AOI.

Archaeological sites identified include pottery, stone tools, rock-art sites, and iron working sites. Religious structures are the most common cultural heritage with both a physical location and a strong intangible sensitivity, including two churches within 100 m of the project footprint.

Cultural heritage is closely linked to individual and group identity and therefore sensitive to cultural change. Examples of intangible and tangible cultural heritage include sacred natural sites and trees, traditional dances, ritual involving the ancestors, traditional healing, meeting places and beliefs about twins.

### Climate

Since 1960, mean annual temperatures have risen by 1.3°C and annual and seasonal rainfall has decreased considerably across Uganda. Rainfall has also become more unpredictable and evenly distributed over the year.

Uganda is vulnerable to increased climate variability and climate change; in relation to which the severity and frequency of extreme events such as droughts and floods is expected to increase.

Global anthropogenic 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. Between 1990 and 2014 Uganda's GHG emissions increased by 71%. However, Uganda has one of the lowest levels of GHG emissions in the world, estimated at 1.6 $tCO_2e$ per capita for 2014, totalling absolute emissions of 59.9 $MtCO_2e$ which is approximately 0.12% of the world total.

## 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 control and regulate ecosystems, whilst certain fauna species, in particular 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.

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 in particular 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 wetlands) 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 natural environment. However, stakeholders did not perceive proposed project infrastructure as a negative visual intrusion in the landscape.

Air quality and acoustic do not provide ecosystem services.

**Socio-economic and Health**

The Ugandan economy is heavily dependent on agriculture, forestry, fishing, mining and tourism.

Crop farming is a vital provisioning ecosystem service and undertaken throughout the AOI PACs, sometimes providing their only source of food. Livestock rearing also provides a provisioning service, primarily as mitigation against shock events (e.g. drought). 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 within portions of 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 fishermen.

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

Natural resources used for the generation of electricity from hydro, fossil fuels and solar energy, and cooking fuel from biomass and firewood are important provisioning services.

Safe water as a natural resource is a significant provisioning service and plays an important role in the general health and livelihood activities.

Workers' health, safety and welfare 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, influences social systems, social relations and sense of place in a complex and changing world, and 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 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 Tilenga feeder pipeline. It is also an integral component of the ESIA process and the foundation for developing and maintaining the social licence to construct and operate the pipeline. It has been undertaken in accordance with the requirements of Ugandan legislation, international requirements as set out in the Equator Principles III and the International Finance Corporation Performance Standards (IFC) (2012) and the TEP Uganda 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 particular attention paid to the needs of women and those vulnerable to potential impacts. It has also included engagement activities on human rights.

Stakeholder engagement has been tailored to fit the Tilenga feeder pipeline, 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 to capture all stakeholder data and minutes of meetings for analysis and follow up
- a grievance procedure, which also serves as the ESIA grievance procedure.

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

- obtaining an understanding of the number and types of stakeholders in the socio-economic study area
- informing stakeholders about the ESIA baseline studies in the areas traversed by the pipeline 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 meetings to consult a sample of potentially impacted local stakeholders, prior to the submission to NEMA 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 pipeline and the ESIA, including the engagement process and grievance management. It also provides the foundation for ongoing stakeholder engagement.

## Stakeholder Concerns

A summary of the stakeholder concerns raised and how they will be addressed is provided below.

### Socio-economic and Health

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

Stakeholders raised concerns over land acquisition and compensation for loss of land, livelihoods and properties. The difficulty of finding and acquiring replacement land, given existing pressure on land and the importance of including vulnerable groups in all compensation and resettlement-related discussions was also emphasised. Clarifications were sought about the pipeline right-of-way (RoW) as to whether this would be associated with permanent or temporary land take across its width.

Concerns over land and property were noted and stakeholders were informed that a resettlement action plan will be developed and agreed with the Ministry of Lands, Housing and Urban Development. It was explained that compensation will be provided before construction, appropriate compensation rates will be identified, and that during construction and operation a permanent 30-m RoW would be required.

Concerns were raised about project induced in-migration (PIIM), including the spread of sexually transmitted diseases. Stakeholders were informed that an in-migration management plan will be developed and implemented with the objective of managing impacts that could arise from project induced migration.

Stakeholders were interested in employment opportunities and other benefits, particularly for women and youths. They were advised that job opportunities will range from casual, unskilled, semi-skilled to skilled, and will enhance the skills of persons involved. Local people, including the youth and women, will be prioritised for non-skilled jobs.

Community health and safety concerns were raised, with questions asked about the potential health impacts of the pipeline and clarification sought about the likely risks of fire and potentially toxic emissions. Stakeholders were advised that the pipeline will have an extensive monitoring and control system to detect abnormal situations, and with regards to potential emissions, that mitigation measures have been proposed.

### Physical Environment

Concerns were raised about the potential impact on climate change of the pipeline and about the impact of hydrotesting on the water table. Stakeholders were informed that impacts on climate change and of hydrotesting were evaluated in the ESIA and that mitigation measures have been proposed.

### Biodiversity

Stakeholders raised concerns about the impact of the pipeline on Lake Albert fisheries and animal and plant biodiversity in the project area of influence. Impacts, in particular during the construction phase, on sensitive ecosystems such as forests and wetlands, which provide habitats for species of conservation concern was also a concern. Concerns regarding connectivity to protected areas and potential impacts on endemic species were also raised.

In response to these concerns, stakeholders were informed that one of the primary criteria for selection of pipeline route was avoidance of environmental and social sensitivities and that the pipeline will be constructed along existing infrastructure corridors where feasible.

### Pipeline and ESIA-Related Matters (Including Stakeholder Engagement)

Questions were asked about the ESIA schedule, a definition of the AOI and the community grievance procedure. Stakeholders also requested information about pipeline routing and project design and gave recommendations on emergency preparedness.

The stakeholder engagement team informed stakeholders about the envisaged ESIA submission, women participating in the ESIA process and audits to be undertaken on the efficiency of the grievance mechanism. Feedback was also provided on project design such as pipeline routing, pipeline insulation and markers, oil spill contingency and emergency response planning as well as security planning and the grievance mechanism.

## Grievance Procedure

A non-judicial grievance procedure was established to respond to stakeholders' concerns and to facilitate resolution of stakeholders' grievances. The grievance procedure is compliant with the United Nations Guiding Principles on Business and Human Rights (2011) effectiveness criteria for project level grievance mechanisms.

The grievance procedure describes the process available to stakeholders for lodging a grievance during pre-construction, construction and pipeline 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 procedure has been presented to stakeholders during each consultation phase and is managed by community liaison officers (CLOs).

### Ongoing Stakeholder Engagement

Post submission stakeholder engagement on the disclosure of the ESIA report will be undertaken after the ESIA report has been submitted to the regulators. Government ESIA disclosure will be conducted in concordance with the National Environment (Environmental Impact Assessment) Regulations, 1998 (SI No. 153-1).

Engagement activities by the project stakeholder engagement team will also continue, and 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 nongovernmental organisations, civil society organisations and communities to support the development and implementation of practical impact management strategies.

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

The grievance procedure will continue to provide opportunities for stakeholders and project-affected communities to express grievances about project activities.

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

## Potential Impacts – Normal Operations

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

Potential impacts on biodiversity, the physical environment, socio-economic and health, and cultural heritage during the construction, operation and decommissioning phases are assessed in the ESIA.

### Potential Beneficial Impacts

Several potential project impacts, predominantly relating to socio-economic VECs will be beneficial, including:

- contribution to the national economy from investment
- generation of national and local employment opportunities
- provision of training and skill development opportunities
- opportunities for national and local businesses through project procurement
- improvement in the health and safety of employees from disease awareness and reduction programmes
- increased knowledge and recording of tangible and intangible cultural heritage.

Where possible, enhancement measures will be implemented to increase the benefits to local people, and the local and national economy.

## Potential Negative Impacts

The impact assessment process included the application of mitigation to the potential pipeline impacts identified for each VEC. Potential impacts include:

- biodiversity:
  - permanent loss of habitat from operational RoW
  - PIIM to areas around the MCPY causing increased pressure on natural resources
  - stress or mortality to flora and fauna
  - reduced primary productivity in watercourses
  - temporary or permanent loss of breeding and foraging habitat
  - modified habitats due to non-native species establishment
  - loss of ecological function and integrity of protected sites
- physical environment:
  - loss of soil structure, drainage, fertility and seed bank
  - soil contamination
  - contamination of surface and groundwater
  - deterioration of water quality
  - decreased water level due to abstraction for project use
  - reduced air quality from combustion of fuel in construction equipment and vehicles
  - disturbance or nuisance from noise from construction on the RoW and traffic movement
- socio-economic and health:
  - dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities
  - competition over employment opportunities
  - inflation and effects on supply owing to project procurement
  - increased transportation costs and travel time with economic consequences
  - permanent loss of land used for crop farming and grazing
  - permanent loss of natural resources
  - temporary loss of access to fishing grounds (rivers, Lake Albert, dams and ponds)
  - permanent loss of private land due to project land acquisition
  - land and property speculation by land owners and third parties
  - increased risk of vector-related diseases amongst the local workforce
  - traffic congestion leading to delays
  - increased pressure on regional waste management facilities due to project activities
  - an increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases
  - nutrition of PACs compromised by reduced food security
  - community health and safety incidents associated with accidents during construction
  - change in local community dynamics due to employment opportunities
  - damage, disturbance or disruption of access to cultural heritage.

The potential impact of the project on climate change has also been assessed.

In order to align with the Tilenga Project, tabular summaries of impacts on critical habitat and critical habitat qualifying species were included.

### Significant Residual Project Impacts

Based on the mitigation measures proffered, including for aspects of biodiversity, for which further enhancement and conservation measures will be developed and implemented, no significant residual impacts are predicted.

### Transboundary Impacts

There are no significant residual transboundary impacts identified.

### Cumulative Impacts

The Hoima Municipality is likely to benefit from a general economic boost due to the beneficial cumulative impacts from employment, training and purchasing associated with the Tilenga feeder pipeline, the EACOP project) and other developments such as the Kingfisher Oil Project.

The Tilenga feeder pipeline and associated facilities will participate in regional cumulative environmental management initiatives led by the government and developed in collaboration with operators of current projects and developers of proposed projects. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

After mitigation measures have been implemented, potential cumulative impacts are predicted to be not significant.

### Associated Facilities

The EACOP project, the Hoima–Butiaba–Wanseko road upgrade project, concrete batch plants, borrow-pits and waste management facilities (have been identified as associated facilities (AFs) where they meet the IFC definition. The locations of the concrete batch plants, borrow-pits and waste management facilities have yet to be defined.

## Potential Impacts – Unplanned Events

Unplanned events considered include:

- traffic accidents
- fires
- damage to third-party assets
- release of diesel from fuel storage tanks at the MCPY and construction sites
- release of hydrotest water during commissioning
- oil spills
- sabotage
- geophysical hazards.

The pipeline engineering design criteria were adopted with an aim to reduce the probability and consequences of unplanned events that could lead to impacts on social or

environmental receptors. At each stage of the design process, a series of health, safety and environmental (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 Tilenga feeder pipeline HSE risk assessment methodology. The TRA 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 clearly 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 of several management plans and procedures, such as an oil spill contingency plan, 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 pipeline will have risks reduced 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.

## Decommissioning

The project components (i.e., the pipeline and AGIs) will be decommissioned based on Ugandan 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 at that time and the scope will be developed in consultation with stakeholders.

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 consistent with Tilenga feeder pipeline requirements.

## Environmental and Social Impact Management Plans

In accordance with the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014, an environmental and social management plan (ESMP) has been developed.

The pipeline ESMP is consistent with the corporate Total and TEP Uganda documents, including code of conduct, and H3SE charter.

The ESMP presents monitoring parameters and 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, each will include the relevant mitigation commitments developed throughout the ESIA.

The following management plans will be developed before construction and operation activities begin:

- 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, including national content 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.

Changes to the pipeline design may occur subsequent to 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 HSSE disciplines
- consultation with NEMA on the need for amendments to the ESIA permit
- management of change approval process.

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

## Conclusions

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

The Tilenga feeder pipeline is strategic because of the anticipated benefits for the country including improved infrastructure and job opportunities (skilled and unskilled). The Project is also anticipated to provide businesses with opportunities to supply goods and services to the oil companies and their contractors.

The pipeline project team will implement the proposed mitigation measures in line with the mitigation hierarchy to manage any potential environmental and social impacts that could arise from the implementation of the project.