5 PROCESSES AND METHODS FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

This section is equivalent to Section ix, assessment of impacts and identification of alternatives, of the legislative structure. If in doubt, please refer to Table 1.5-1 Environmental Impact Statement Structure on page 1-5.

5.1 Introduction

This section describes and defines the project:

- environmental and social impact assessment (ESIA) process
- valued environmental and social components
- scoping process
- impact assessment method.

5.2 Environmental and Social Impact Assessment Process

The key steps of the EACOP ESIA process are illustrated in Figure 5.2-1, including those through to project implementation and the subsequent phase of reporting, audit and corrective actions.

Screening of potential project impacts was undertaken early in the development of the project, primarily by routing and siting studies that were undertaken and described in Section 3, Alternatives, in Volume 1 and 2.

A preliminary project description was prepared during the scoping phase and was further developed based on front-end engineering design and subsequent optimisation.

The ESIA progressed interactively with project planning and design. Project impacts were identified and mitigation measures developed iteratively during the interaction. The process will continue through the construction phase.

The impact assessment was based on the requirements and guidelines provided in Tanzanian legislation and described in Section 4, Legislative, Policy and Administrative Framework.

This impact assessment also complies with international guidance, also described in Section 4, including:

- International Finance Corporation's (IFC) environmental and social performance standards
- Equator Principles
- other relevant international standards and guidelines.

Baseline studies conducted during the scoping phase subsequently informed the project environmental and social baseline conditions. These are summarised, with survey methods, in Section 6 and are documented in Appendix A of Volume 1, and Section 4 and Appendix A of Volume 2.

Stakeholder engagement was conducted during the scoping phase, then throughout the baseline studies and impact assessment, and during the pre-submission of the ESIA. A summary of stakeholder concerns and stakeholder engagement methods are described in Section 7, Stakeholder Engagement. Appendix C provides additional information on stakeholder concerns.

The assessment of project impacts and determination of the significance of the impacts is included in Section 8 of Volume 1 and Section 5 of Volume 2, and a description of the methods is included in Section 5.5. The cumulative impact assessment (CIA) has been fully integrated into the ESIA process.

Environmental and social management and monitoring plans are described in Section 10 of Volume 1 and included in Appendix E4 of Volume 1 and Appendix C2 of Volume 2 with associated mitigation measures.

The intent is that this environmental impact statement will be submitted to the National Environment Management Council (NEMC), which will initiate a review process during which it will decide whether an EIA certificate can be issued.

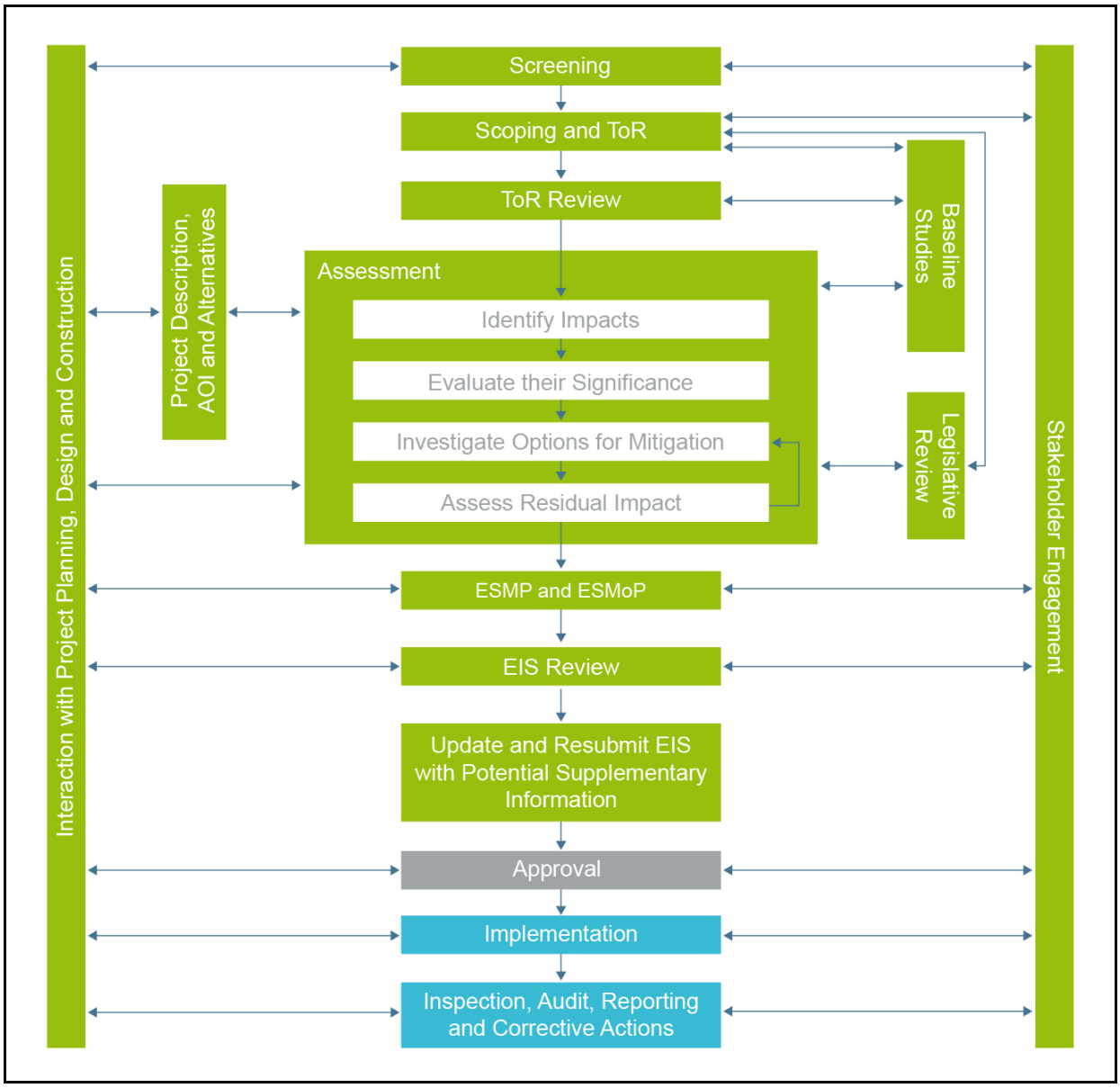

Figure 5.2-1 Key Steps in the EACOP Environmental and Social Impact Assessment Process

5.3 Valued Environmental and Social Components

The environmental and social features and receptors assessed in this ESIA are referred to as valued environmental and social components (VEC). Project and cumulative impacts on VECs, listed in Section 6 of Volume 1 and Section 4 of Volume 2, are assessed in this ESIA.

The IFC defines VECs as “environmental and social attributes that are considered important in assessing risks”, (IFC 2013). These attributes may be:

- physical features, habitats, wildlife populations (e.g., biodiversity)
- ecosystem services
- natural processes (e.g., water and nutrient cycles, microclimate)

- social conditions (e.g., health, economics), or
- cultural aspects (e.g., traditional spiritual ceremonies).

VECs generally all have a high sensitivity to project interactions, though some will be more sensitive than others. Hence, a ranking system has been used to describe their sensitivity. This is documented in Section 6 of Volume 1 and Section 4 of Volume 2, Environmental Baseline Conditions, and in Section 8 of Volume 1 and Section 5 of Volume 2, Impact Identification and Evaluation. For VECs with standards and thresholds, such as air quality, compliance to the standard or threshold may also be used to establish magnitude (see Section 5.6.2.5) or to inform significance directly.

A preliminary list of VECs was identified during the impact scoping activity. The list was refined during and after the scoping phase based on:

- stakeholder engagement in the affected communities to identify main concerns
- desk-based review of literature to identify public and scientific concerns
- surveys undertaken during and after scoping
- existing definitions of VECs in the IFC performance standards, such as labour and working conditions (Performance Standard 2)
- VECs included in scoping reports for upstream petroleum projects planned for the region.

During the preparation of the ESIA, the titles of two VECs changed slightly from those used in the scoping phase to reflect additional baseline information. A list of the priority VECs, summarising the key reasons for their selection, is provided in Section 6.1 of Volume 1 and Section 4.1 of Volume 2.

The baseline condition of the AOI for each VEC is described in Section 6 of Volume 1 and Section 4 of Volume 2, and more information is included in the baseline reports to be found in Appendix A of Volume 1 and Appendix A of Volume 2.

Ecosystem services have been considered for each VEC in Section 6 of Volume 1, respectively Section 4 of Volume 2 and the assessment of ecosystem services has been integrated into the impact assessment of VECs included in Section 8 of Volume 1, and Section 5 of Volume 2.

Human rights were also considered for social VECs in Section 6. An assessment of potential impacts on human rights was integrated into the impact assessment of social VECs included in Section 8. A stand-alone human rights impact assessment (HRIA) of the project is being conducted as part of the overall ESIA process and the HRIA team has provided input about human rights standards, potential impacts and mitigation measures that are integrated into the relevant sections of this ESIA report.

5.4 Screening

Two project briefs, one for the pipeline and one for the MST and load-out facility (LOF), were screened by NEMC. The screening results were issued by NEMC on 29 March 2017. It was recommended that there should be one ESIA process and report combining all project components: pipeline, construction facilities and permanent aboveground installation (AGI) including the MST and LOF.

5.5 Scoping

An impact scoping process was conducted in accordance with Tanzanian environmental impact assessment legislation, regulation and guidelines described in Section 4. A scoping report was prepared and submitted to the NEMC on 15 August 2017.

The main objectives of the scoping process were, first, to identify potentially significant impacts arising from interaction between project activities and the VECs that require evaluation in the ESIA and, second, to establish the ESIA terms of reference (ToR). During the scoping phase, project interactions with VECs were evaluated for:

- beneficial impacts. The potential to enhance beneficial impacts has been assessed in the ESIA.
- not significant impacts. The mitigation measures required to render these impacts not significant have been included in the ESIA.
- potentially significant impacts, which are the focus of the impact assessment, and for which mitigation measures have been included in the ESIA.

The scoping impact identification process was based on:

- a social and environmental identification (SENVID) process, comprising workshops and meetings with subject matter experts, the pipeline project team (PPT) and the engineering team
- a site visit to identify technical, environmental and social sensitivities, plus measures to avoid or reduce potential impacts
- stakeholder engagement.

Impact identification and risk analysis during scoping were based on the teams' collective pipeline, environmental and social impact knowledge and experience including:

- general and specific pipeline project engineering design
- impact assessment lessons learned from other pipeline projects
- other oil and gas projects in Tanzania
- environmental and social conditions within the project area acquired during route and site selection studies and knowledge of documentation available at the time of the assessment.

The results of the scoping study were used to develop the ToR that included, among other requirements:

- the scope of work of the baseline studies necessary to gain a better understanding of the environmental and social context of the AOIs
- the impact assessments to be undertaken.

The scoping report was approved on 15 September 2017 by the NEMC, with the provision to amend the ToR. The approval was accompanied by comments, which were taken into account during ESIA preparation.

5.6 Impact Assessment

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

The international standard ISO 14001:2015 defines an impact as “Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects”. Throughout the document an ‘impact’ is taken to be an adverse impact. Where there is a positive impact this is described as ‘beneficial’. An environmental aspect is defined as an “Element of an organisation’s activities or products or services that can interact with the environment”. Environment is defined as “Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.”

5.6.1 Identification of Project Impacts

Impacts were identified and categorised according to aspect, which is an element of an activity causing an impact. The list of aspects has been numbered for identification and is included in Appendix E1, Impact Assessment Tables, in Volume 1, and Appendix C in Volume 2.

This ESIA assessed impacts from normal operations, abnormal operations and unplanned events. This assessment has been an iterative process, as engineering has progressed and the project has become better defined.

Impacts are evaluated in terms of construction or operational phase; impact types associated with preconstruction are typically the same as during construction and have been treated as construction-phase impacts. Section 5.6.2.1 describes how generic and location-specific impacts are differentiated and treated in the ESIA and hence all impacts, preconstruction, construction and operational, are addressed.

5.6.2 Normal Project Construction and Operations

The assessment of impacts from normal project operations, described in Section 8 of Volume 1, and Section 5 of Volume 2, considered:

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

Minor unplanned events were included in the assessment of normal project operations, e.g., spills during refuelling or from the failure of a hydraulic hose.

5.6.2.1 Project Impacts – Generic and Location-specific

Generic

Generic impacts could occur from several aspects and activities and can be non-location and location-specific, such as:

- soil erosion from rain fall on bare soil along the pipeline right-of-way (RoW)
- sediment runoff to watercourses.

Location-Specific

Location-specific impacts are those that occur from aspects and activities:

- at specific locations that can be defined by KP points or KP ranges, e.g., at a particular river crossing, within a specific habitat or related to a specific soil type, proposed construction facility or above ground installation
- at locations where there is a particular environmental condition that could have implications for impacts, e.g., side slopes
- at locations where there is a particularly sensitive VEC, e.g., a shallow aquifer with overlying permeable geology.

Location-specific impacts are often associated with activity that has the potential to affect VECs at a specific location. For some impacts it is possible to define a kilometre point (KP) or range of KPs but for other impacts an activity may occur during construction and the locations will only be known when detailed design has progressed, e.g., benching of side slopes. In such instances, mitigation is described but no KPs are allocated.

Location-specific impacts usually require:

- specific mitigation measures in addition to, or instead of, standard good practice mitigation measures, or
- additional monitoring, inspection and audit, and communication with stakeholders to ensure that general mitigation measures are effective.

Examples of generic impacts of the project are summarised in Appendix E2 and location-specific impacts in Appendix E3 in Volume 1, and Appendix C1 in Volume 2.

5.6.2.2 Impact Types

Impacts can be classified as the following:

- **direct** – impacts that are from a direct interaction between a planned project activity and the receiving environment, e.g., between occupation of the RoW and pre-existing habitats (clearing the RoW causes habitat loss, if habitat is present)
- **indirect** – impacts that are from the primary interactions between the project and its environment because of subsequent interactions in the environment; e.g., loss of habitat affects the viability of a species population
- **induced** – impacts that result from other activities but which would not occur in the absence of the project; e.g., new business set up to cater for increased traffic on roads
- **in-combination** – in-combination impacts could occur when different types of impacts affect the same VEC; examples include different impacts on the same habitat or on community health that collectively cause a greater impact than the summed individual impacts. Given that individual impacts are expected to be mitigated, and that many of the impacts are assessed qualitatively, in-combination impacts were not considered
- **transboundary** – project or cumulative impacts that extend or occur across a national boundary.

5.6.2.3 Cumulative Impacts

Cumulative impacts were identified and assessed in accordance with the IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013), in addition to the legislation and guidance listed in Section 5.2. The handbook suggests that government and regional planners have ultimate responsibility for cumulative impact assessments (CIA). A broad approach on that scale was, therefore, not judged to be within the limits of this ESIA. Figure 5.6-1 summarises the CIA process adopted for the EACOP project, which is based on internationally recognised good practice from the Canadian Effect Assessment Practitioners Guide (1999), as referenced in the IFC Good Practice Handbook.

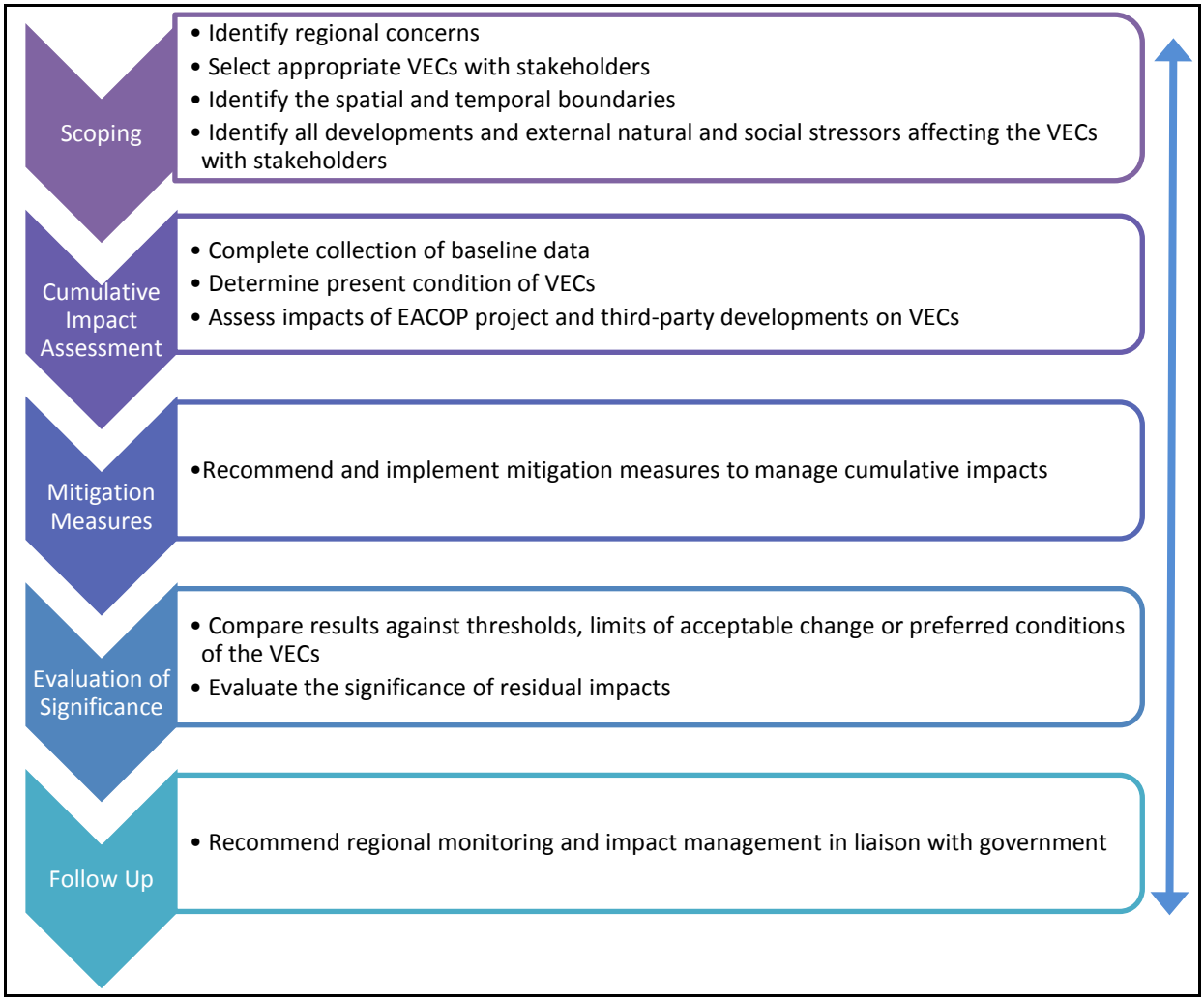

Figure 5.6-1 Cumulative Impact Assessment Process

Identification of Regional Concerns

Stakeholder engagement was conducted during both scoping and baseline data collection. This included national, regional, district and community level stakeholders, industry and the scientific community. The engagement identified regional environmental and social concerns to inform VECs.

VECs

The project VECs were used for the CIA, see Section 5.3.

Spatial and Temporal Boundaries

The spatial boundaries and temporal boundaries, i.e., area of influence (AOI) is provided in Section 6.3.

The spatial boundary defined for each VEC is the same for project and cumulative impacts. The temporal boundaries (duration) of project impacts were refined for the CIA to reflect the likely temporal duration of each cumulative impact.

Identification of Activities and Developments with Potential for Cumulative Impacts

Cumulative impacts comprise impacts from past and present activities that are the basis for the baseline conditions, see Section 6 and Appendix A of Volume 1, and Section 4 and Appendix A of Volume 2, the project residual impacts, and future developments within the AOI of the EACOP project VECs. Collectively, the project residual impacts and impacts from future developments are termed sources of cumulative impact (SCI).

Planned developments include:

- associated facilities
- third-party developments that are reasonably defined, reasonably predictable or foreseeable[1].

Associated facilities are defined in IFC Performance Standard 1, paragraph 8, as "facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable." This can therefore apply to both new and existing developments where project requirements exceed the associated facility's capacity and substantial expansion is required. Upstream projects and some other developments were identified, based on this definition, as associated facilities.

Third-party developments were identified by:

- review of the national and regional development plans
- review of the available district strategic investment plans
- review of sectoral plans, e.g., the National Transport and Trade Master Plan and the Tanzania Ports Master Plan
- information requests to key ministries and planning authorities responsible for approving environmental impact assessments
- information requests to NEMC on third-party projects within 20 km of the pipeline route and 50 km from the LOF, as cumulative impacts are unlikely to extend further

[1] Definition of projects that are "reasonably defined", taken from IFC Performance Standard 1. Definition of projects that are "reasonably predictable" or that are "foreseeable future developments", taken from the IFC Good Practice Handbook

- review of international finance institutions' (IFI) websites for projects receiving or applying for funding
- review of river basin business plans
- review of other publicly available information on key developments in the region, such as websites of known developers and the press
- consultation with stakeholders, which began during scoping.

An initial screening process was conducted to identify developments that are reasonably defined, reasonably predictable or foreseeable. The screening criteria were:

1. Is the development reasonably defined, as described in IFC Performance Standard 1?
    - Is the location confirmed?
    - Is an ESIA publicly available?
2. Is the development reasonably predictable or a foreseeable future development, as defined in the IFC CIA Handbook?
    - What is the likelihood of the project occurring?
    - Is it described as a "Flagship Project" in the National Development Plan?
    - Has the third-party ESIA been submitted or approved six months or more before submission of this ESIA?
    - Will the project occur within the same timescale as the Tanzania EACOP project?
3. What is the nature of the development?
    - Are there likely to be cumulative impacts with the Tanzania EACOP project based on the type and nature of the impacts of the third-party development?
4. Do the AOIs of the EACOP project VECs overlap with the third-party development AOIs?

The screened-in SCIs were mapped and compared with the location of the EACOP VECs AOIs. Each SCI has been given a unique identification number to assist with mapping and screening.

For an SCI impact to be assessed as cumulative, the EACOP VEC AOI and the SCI VEC AOIs must overlap and the residual impacts of the EACOP project and the SCI must occur in the same timescale, see Figure 5.6-2. Transboundary cumulative impacts were identified where the shared AOI and impacts may cross a national border.

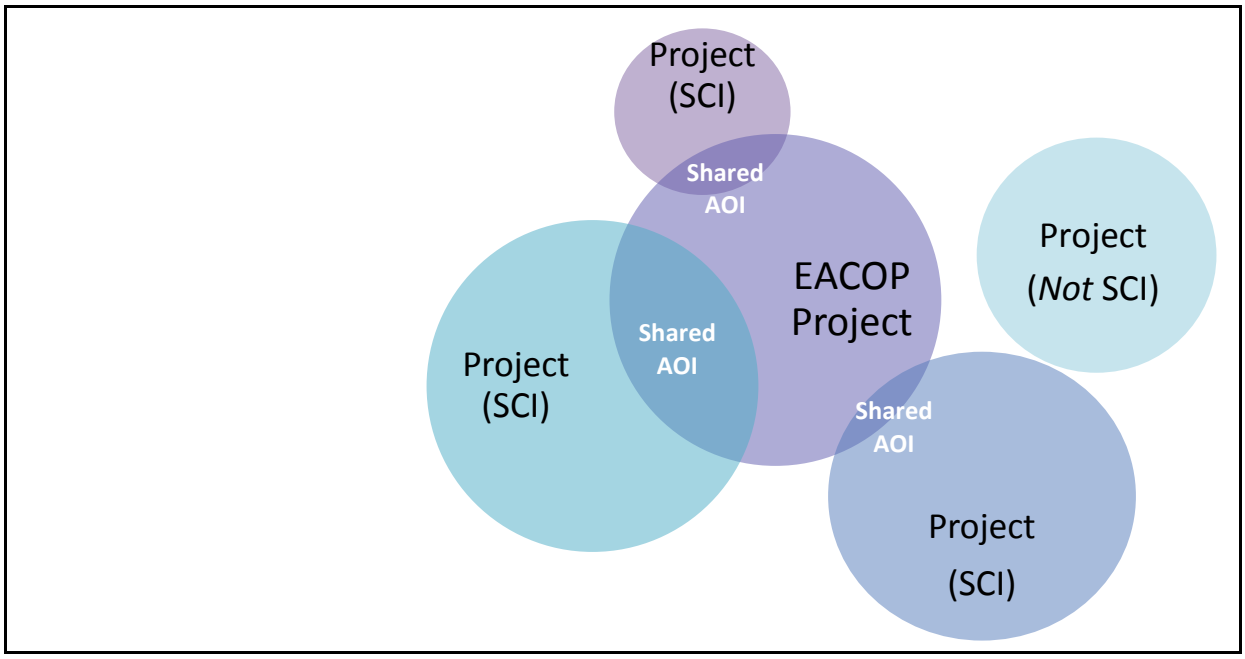

Figure 5.6-2 Schematic of the Shared Areas of Interest

The initial screening of the developments to be includes in the CIA was refined by a further process that defined interactions between EACOP VECs and the screened-in developments into three categories:

- Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.
- Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.
- Category 3: The residual EACOP project impacts have a limited contribution to cumulative impacts.

When the interactions are categorised as 1 or 2, the cumulative impacts are described and assessed in the VEC CIAs in Section 8 of Volume 1 and Section 5 of Volume 2.

In the VEC CIAs, the potential impacts on the VEC are summarised and described based on the information available. When information was limited, professional judgement was used to predict the likely impacts of the third-party project.

Section 2.5 (Volume 1) contains the list of developments included in the CIA.

Appendix H of Volume 1 includes information on the SCIs and the screening process and comprises:

- H1: a description of the screened-in developments
- H2: location maps of the screened-in developments
- H3: a matrix showing the interactions between the EACOP VECs and the impact interaction category (1, 2, or 3, see above)
- H4: a matrix showing the developments screened-out during the initial screening process.

There are no screened-in developments in Volume 2. Appendix F of Volume 2 lists the marine developments screened-out during the initial screening process.

Description of Present Condition of the VECs

The present condition, the sensitivity of the VEC to change, and any trends and stressors affecting the VECs are described in the baseline condition for each VEC in Section 6 of Volume 1 and Section 4 of Volume 2.

The VEC thresholds, limits of acceptable change or preferred condition were defined on a case-by-case basis during the impact assessment process depending on the VEC and the nature of the cumulative impact being assessed. Where objective threshold values are included in the Project Standards, these were adopted, if relevant to the cumulative impact. For most VECs, however, threshold values are not defined, and a preferred condition, or limits of acceptable change, were used based on their pre-construction condition.

Cumulative Impact Assessment

The CIA includes:

- identifying potential activities and impacts from the SCI on VECs
- predicting the cumulative impact on the VECs from the EACOP project and SCI
- predicting the contribution of the EACOP project to the cumulative impact
- predicting the contribution of the SCI to the cumulative impact
- qualitatively determining the significance of the cumulative impact (see Section 5.6.2.5).

Transboundary cumulative impacts were also identified and assessed in Section 8 of Volume 1.

Where there is no cumulative impact identified on a VEC, this VEC was scoped out of the CIA. This is explained in Section 8 of Volume 1 and Section 5 of Volume 2.

5.6.2.4 Mitigation Measures

Project Impacts

Mitigation measures are actions or systems that have been or will be used to enhance the benefits provided by the project or avoid, remove, reduce or compensate for adverse impacts. Mitigation of potential impacts was an integral part of the EACOP project design and the ESIA process (and will continue to be during detailed design, construction, operation and decommissioning). This has included:

- an evaluation and selection of the pipeline corridor and AGIs based on environmental, social and engineering considerations. This evaluation is described in Section 3.
- avoidance of locations of high environmental and social sensitivity by planning a construction strategy that reduces the number of work sites.

The design and construction of pipelines has evolved over many years and a substantial body of good design, construction and operational practices exist to

mitigate impacts. Standard good practices[2] are being implemented by the project, including for the onshore pipeline, permanent and construction facilities:

- minimisation of the overall footprint
- burying the entire pipeline along the route to reduce permanent habitat fragmentation, interference by third parties and security concerns
- measures to reduce sediment release during watercourse crossings
- measures to reduce sediment runoff to watercourses, such as silt fences
- reinstatement of the RoW and construction facilities after completion of construction
- waste reduction and waste segregation
- soil-management measures to enhance natural revegetation after reinstatement including topsoil segregation and erosion control

LOF:

- controls over the discharge of effluents from construction and operational vessels
- soft start procedures during pile installation
- construction vessel management plan – including definition of anchoring areas.

Design and good practices are described in Section 2 and the evaluation and choice of alternatives in Section 3 of Volume 1 and Volume 2.

The generic type impacts described in Section 5.6.2.1 are mitigated mostly by standard good practice. The ESIA process included identifying potential significant impacts and technically feasible and financially cost-effective means of mitigating the location specific impacts described in Section 5.6.2.1. Where a potential significant impact was identified, a hierarchy of options for mitigation was considered, including:

- avoid at source – remove the source of the impact
- abate at source – reduce the source of the impact
- attenuate – reduce the impact between the source and the VEC
- abate at VEC – reduce the impact at the VEC
- remedy – correct the impact after it has occurred
- compensate or offset – replace in kind or with a different resource of equal or better value. The EACOP project will develop and implement a biodiversity action plan incorporating enhancement and conservation measures to meet this requirement.

The application of mitigation measures is an iterative process, as shown in Figure 5.2-1. The iteration process continues until an impact is deemed as not significant as reasonably practicable. Residual impacts are those that remain after the completion of this process.

The key management plans for mitigating project generic and location specific impacts are described in Section 8 of Volume 1 and Section 5 of Volume 2. The

[2] These are referred to in IFC guidelines as good international industry practice.

specific mitigation measures for each management plan are included in Appendix E4 of Volume 1 and Appendix C2 of Volume 2.

Cumulative Impacts

For EACOP the planned management of cumulative impacts is based on the category of cumulative impact, which are described in Section 5.6.2.3.

Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC. The residual impacts from the EACOP project represent a main contributor to the predicted cumulative impacts on a VEC.

In addition to implementing project mitigation measures, the EACOP project will design and implement monitoring or management strategies to appropriately manage cumulative impacts to the extent that it has leverage or influence over the other developers. This will be greater for associated facilities and third-party projects being developed by partners to the EACOP project.

Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.

The EACOP project will design and implement mitigation measures commensurate with the magnitude and significance of its residual contribution to the cumulative impacts. However, the project will use best efforts to engage other developers, governments, and other stakeholders in acknowledging the cumulative impact and in designing management strategies to mitigate them.

Category 3: The residual EACOP project impacts have a limited contribution to cumulative impacts. The EACOP projects contribution to the cumulative impacts on a VEC is negligible.

No cumulative impact mitigation measures are considered necessary.

EACOP will comply with IFC Guidance Note 42, which specifies that commercially reasonable attempts should be made to engage relevant stakeholders (e.g., government authorities, affected communities, other developers) in the assessment, design and implementation of coordinated mitigation measures to manage the potential cumulative impacts resulting from multiple developments in the project's area of influence.

When engaging with other parties, EACOP will endeavour to:

- inform others of the potential cumulative impact
- exchange information, if necessary, to assist in the further definition of the cumulative impact
- discuss and agree on responsibilities, if necessary, for the management of cumulative impacts
- agree on monitoring measures as appropriate.

IFC Guidance Note 40 states that CIAs typically require the cooperation of many diverse stakeholders to agree and coordinate the implementation of potential management and mitigation measures associated with the cumulative impacts and the active participation of government authorities to:

- assess the incremental contribution of each project to the cumulative impacts
- monitor and enforce the implementation of the mitigation measures corresponding to each project.

5.6.2.5 Impact Significance

Project Impacts

The significance of EACOP impacts on VECs was determined by scoring the VEC sensitivity and the impact's magnitude, duration and extent.

For normal project operations, an impact was assumed to occur, i.e., 100% probability of occurrence, so assessing the likelihood of such an impact was not necessary.

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 evaluate impact significance. For instance, a short-term impact is likely to be "reversible" (and hence not permanent) in 1–5 years (see Table 5.6-1) whereas a very-long-term impact would require more than 25 years for the effects of an impact to be reversed. The sensitivity of a VEC accounts for the resilience of a VEC to withstand impact; VECs of low resilience are unlikely to withstand impact and hence impact is likely to be not reversible (and hence potentially permanent) whereas impact on a resilient VEC, i.e., a VEC that is not sensitive to environmental change, is likely to be reversible.

Significance was determined for impacts before the application of the proposed mitigation (see Appendix E2 for generic impacts and Appendix E3 for location-specific impacts in Volume 1 and Appendix C1 of Volume 2) and determined again on the residual impact after the proposed mitigation. The pre-mitigation significance determination for each VEC is included in Appendix E, and Appendix C of Volume 2, and the residual impact significance determination is shown in Section 8 and Appendix E of Volume 1, and Section 5 and Appendix C for Volume 2.

Magnitude of Impact

The magnitude of an impact is a measure of the degree of change that will be caused by an aspect or activity. The grading was as follows:

- negligible = 2
- small = 4
- medium = 6
- large = 8
- very large = 10.

Grading was from 1 to 10 to give greater weight to magnitude than duration, extent or sensitivity. Impacts recorded as beneficial were not graded.

Appendix D of Volume 1 and Appendix B of Volume 2 include magnitude tables for the VECs, using quantitative measures when possible. Professional judgement was used when quantitative information was not available, e.g., for dust emissions from construction equipment. Even though air and noise impacts can be compared to

national, international or project standards, gradings were, nevertheless, defined. Where predictive modelling indicated that the project environmental standards (PES) would be exceeded, impacts were automatically designated significant.

For the cultural heritage VECs in Category 1 (tangible cultural heritage) and Category 2[3] (tangible cultural heritage with strong intangible elements), impacts are nonreplicable; hence, the cultural heritage sensitivity range was based on a maximum score of ten, as per the following section on sensitivity, and the magnitude scores were halved:

- negligible = 1
- small = 2
- medium = 3
- large = 4
- very large = 5.

Duration of Impact

Impact duration is the length of time over which an impact may occur. Table 5.6-1 shows the grading.

Table 5.6-1 Impact Duration Grading

Score	Duration	Example
1	Transient: <1 year	Noise, dust and air emissions from construction activities on the RoW Disruption of movement of people and animals across the RoW
2	Short term: 1–5 years	Noise, dust, air, solid and liquid waste emissions from construction facilities Almost all other construction impacts except for habitat degradation or loss and impacts on sensitive soils
3	Medium term: 6–15 years	Recovery of some sensitive soils, flora, fauna and habitats
4	Long term: 16–25 years	Mainly operational impacts that end when the project ends
5	Very long term: >25 years	Permanent land take Impacts that may exist after the end of the project, e.g., removal of mature forest

Extent of Impact

The extent of impact describes the geographical area that may be impacted by the proposed development. Table 5.6-2 shows the grading.

[3] See Appendix D for information on the cultural heritage categories

Table 5.6-2 Impact Extent Grading

Score	Environmental VECs	Socio-economic VEC
1	Site, e.g., the impact is restricted to the boundaries of: • the construction RoW • construction facilities and access roads • the operational RoW • AGIs and permanent access roads.	Some individuals in the potentially affected communities (PACs).
2	Local, e.g., affecting communities, habitats or land that are close to the construction working areas or facilities or AGIs	Entire PACs
3	Subnational, e.g., affecting habitat that may support species of regional importance, impact on individuals of a species that may have a national designation, but the impact is only on the subnational, and not national population	Districts or regions
4	National, e.g., effects on local populations of species that have effects on the national population	National
5	International, e.g., greenhouse gases and transboundary species	International

Sensitivity

The sensitivity of a VEC is based on its vulnerability, value and resilience. It was graded as follows:

- very low = 1
- low = 2
- moderate = 3
- high = 4
- very high = 5.

For the cultural heritage VEC Category 1 (tangible cultural heritage) and Category 2 (tangible cultural heritage with strong intangible elements), the sensitivity scoring was doubled to account for the lack of resilience of such features, plus their high value and vulnerability, as follows:

- very low = 2
- low = 4
- moderate = 6
- high = 8
- very high = 10.

Impact Significance Score

For the determination of impact significance, the following formula was used:

magnitude + extent + duration + VEC sensitivity = significance score

A score of 19 or more is considered a significant impact.

Impact significance scoring was undertaken for each VEC, except for Category 3 (intangible cultural heritage with a less well defined tangible component), when a qualitative approach was applied. This is owing to the:

- sensitivity and value of a Category 3 receptor being defined by the local community who visit, use or engage in an intangible practice that is not objectively measurable. It takes a greater amount of time and the development of relationships of confidence and trust to enable a valuation of the sensitivity associated with intangible cultural heritage, making it difficult to get a real sense of importance to the communities during the baseline work, see Section 6.4.3.16.
- spatial extent of sites often not being defined clearly and may not be relevant to an understanding of the magnitude of effects. For example, a sacred tree occupies a small area but the belief system attached to it may extend to the whole potentially affected community.

A qualitative determination of the significance of a limited number of impacts was undertaken, as described within the VEC assessments in Section 8.

Cumulative Impacts

Residual cumulative impacts were assessed, taking into consideration:

- the residual impacts of the EACOP project
- the additional management strategies and mitigation measures proposed to manage cumulative impacts, see Section 5.6.2.4.

The significance of cumulative impacts was determined qualitatively based on a predicted exceedance of VEC thresholds, limit of acceptable change or preferred condition.

If the governmental agencies identify the need to implement regional management or regional monitoring plans, the project will participate in their development and implementation.

Human Rights

Many social impacts can be understood in human rights[4] terms. This includes recognising project-affected individuals and communities as human rights-holders with legal entitlements, including the right of legal redress for impacts on their human rights. Thus, when a project creates social impacts, it may also have implications for its responsibility to respect human rights. A stand-alone HRIA is being conducted for the project. As per international good practice for human rights impact assessment, this assessment is being made with reference to international human rights laws and standards and focuses on the severity and likelihood of potential adverse impacts on affected stakeholders or rights-holders.

[4] Human rights risks are understood to be the business enterprise's potential adverse human rights impacts. Potential impacts should be addressed through prevention or mitigation, while actual impacts – those that have already occurred – should be a subject for remediation. See UN Guiding Principles on Business and Human Rights, 17 and Commentary.

It is important to note that according to the UN Guiding Principles on Business and Human Rights, the criteria for assessing human rights uses a combination of severity and likelihood, which differs from the ESIA approach of determining significance. Regardless, both processes identify risks present in the project baseline that could materialise as project impacts and both processes identify potential mitigation measures for those impacts.

The findings of the HRIA were used in the ESIA where this could further inform the social impact assessment. This inclusion did not change the significance criteria used in the ESIA. Rather, the identification of risks in the project setting and mitigation measures that support proactive "human rights due diligence"[5] were incorporated into the social impact assessment where they were relevant to bolster the understanding of the project setting or of mitigation for inclusion in the environmental and social management plan.

5.6.3 Abnormal Operations and Unplanned Events

Abnormal operations and unplanned events include:

- geotechnical events (e.g., earthquakes and landslides)
- accidental events (e.g., fire, collision of vehicles with operational plant and damage of pipe due to unauthorised digging on land; and for the marine environment, collision of vessels, collision of vessels with the LOF or oil spill from the loading arms).

Section 9 of Volume 1 and Section 6 of Volume 2 describe the impact assessment for abnormal operations and unplanned events and include:

- measures considered during engineering design to avoid risks
- description of the hazard analysis and risk assessment studies conducted to identify
  - risks during project construction and operation
  - mitigation measures to reduce risks to a level as low as is reasonably practicable
- an assessment of impacts of traffic accidents during construction and identification of mitigation measures.

In addition, oil spill modelling (see Appendix I for Volume 1) for the potential impacts of oil spills on land was conducted to inform the design of the project and response planning.

The oil spill modelling included a qualitative assessment of environmental and social risks on the pipeline route and preliminary quantitative fate and transport modelling for locations sensitive to spills.

[5] Companies must implement a system of human rights due diligence in order to identify, prevent, mitigate and account for how they address their adverse human rights impacts. The process should include assessing actual and potential human rights impacts, integrating and acting upon the findings, tracking responses, and communicating how impacts are addressed. Human rights due diligence should be initiated as early as possible in the development of a new activity or business relationship. See UN Guiding Principle 17 and Commentary.

For the marine environment, fate and transport modelling of oil spills was undertaken to assess the potential risks to marine VECs, see Appendix E of Volume 2.

Qualitative Risk Framework

A qualitative model framework was developed to assess risks posed to key VECs (surface water, groundwater, community health, biodiversity, land) from potential oil release on the pipeline route on land. The model framework takes account of VEC sensitivity, potential oil release volumes and the likelihood of a pipeline failure event.

Sensitivity screening was undertaken using the risk assessment model and applied to select and justify the most suitable locations for preliminary quantitative risk assessment (PQRA).

Preliminary Quantitative Risk Assessment

Risk-based-corrective-action fate and transport modelling of spills was undertaken to assess the potential risks to VECs on land, including:

- the spatial extent of the area that may be affected
- the temporal extent, e.g., the length of time over which water quality standards might be exceeded.

This included modelling of:

- dissolved-phase oil migration in the ground, laterally to surface water VECs (base-flow contribution) and vertically to aquifers
- modelling of free-phase oil in-ground migration to either surface waters or groundwater
- modelling of the dispersion of oil as a result of spills directly into a watercourse.

Management and mitigation measures for developing the oil spill contingency plan were identified.

A more fulsome description of the methodology is provided in the oil spill modelling in Appendix I of Volume 1.

For the marine environment, fate and transport modelling of oil spills was undertaken to assess the potential risks to marine VECs, including the spatial extent of the area that may be affected at two time intervals after release.

This has included modelling of the dispersion of oil from spills from the LOF directly into the marine environment, see Appendix E of Volume 2.

Management and mitigation measures for developing the marine oil spill contingency plan were identified.

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 has been estimated.

5.6.4 Environmental and Social Management and Monitoring Plans

The development of an environmental and social management plan and monitoring plan was part of the ESIA process.

The management plans are included in Section 10 and the ESMP (Appendix J) reflects the findings of the ESIA and for terrestrial impacts is based on the impact assessment tables presented in Volume 1 Appendices E2 and E3, and for marine impacts Volume 2 Appendix C1 and the master commitments register included in Appendix E4 of Volume 1 and Appendix C2 of Volume 2, described below.

The terrestrial aspects, potential project impacts, proposed mitigation measures and significance scores before and after mitigation (residual impact) for VECs are presented in three tables in Appendix E:

- Appendix E1 identifies the EACOP project aspects that could interact with and cause impacts on VECs.
- Appendix E2 identifies generic impacts caused by the aspects identified in Appendix E1 and provides a determination of significance of the impact before mitigation. The table also summarises the generic mitigation measures and provides post-mitigation significance.
- Appendix E3 identifies location-specific impacts caused by project aspects identified in Appendix E1 and, as Appendix E2, provides a determination of significance of the impact before mitigation, summarises the mitigation measures, and indicates post-mitigation significance.

Appendix E4 includes the master commitments register, containing a list of the management plans and mitigation measures proposed.

Appendix E5 contains cover sheets and tables of content for each management plan.

For the marine impact assessment Appendix C1 identifies impacts caused by the aspects, Appendix C2 of Volume 2 contains the mitigation measures that are proposed.