

## Chapter 3

The EIA Process, Approach and Methodology

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### 3.1 OVERVIEW OF THE EIA PROCESS

This chapter outlines the approach to the EIA and the process and methodology that has been followed. The framework for policy, legislation and standards within which the EIA was undertaken has been described in detail in *Chapter 2*.

The purpose of the EIA is to:

- assess the potential impacts of the Project and Project-related activities on the biophysical and socio-economic environment;
- design mitigation to avoid or minimise negative impacts and enhance potential benefits; and
- report the significance of the residual impacts that remain following mitigation.

#### 3.1.1 EIA Requirements

The EIA process followed was designed to assess potential environmental, social and health impacts of the Project, to provide required documentation to MICOA during the approvals process, and to comply with the relevant Mozambican environmental requirements listed below and described in detail in *Chapter 2*:

- Environmental Regulations for Petroleum Operations (Decree no. 56/2010 of 22 November);
- General Guideline for the Environmental Impact Studies (Ministerial Diploma no. 129/2006 of 19 July); and
- Guidelines for Public Participation Process (Ministerial Diploma no. 130/2006 of 19 July).

### 3.2 OVERVIEW OF APPROACH

#### 3.2.1 EIA Process

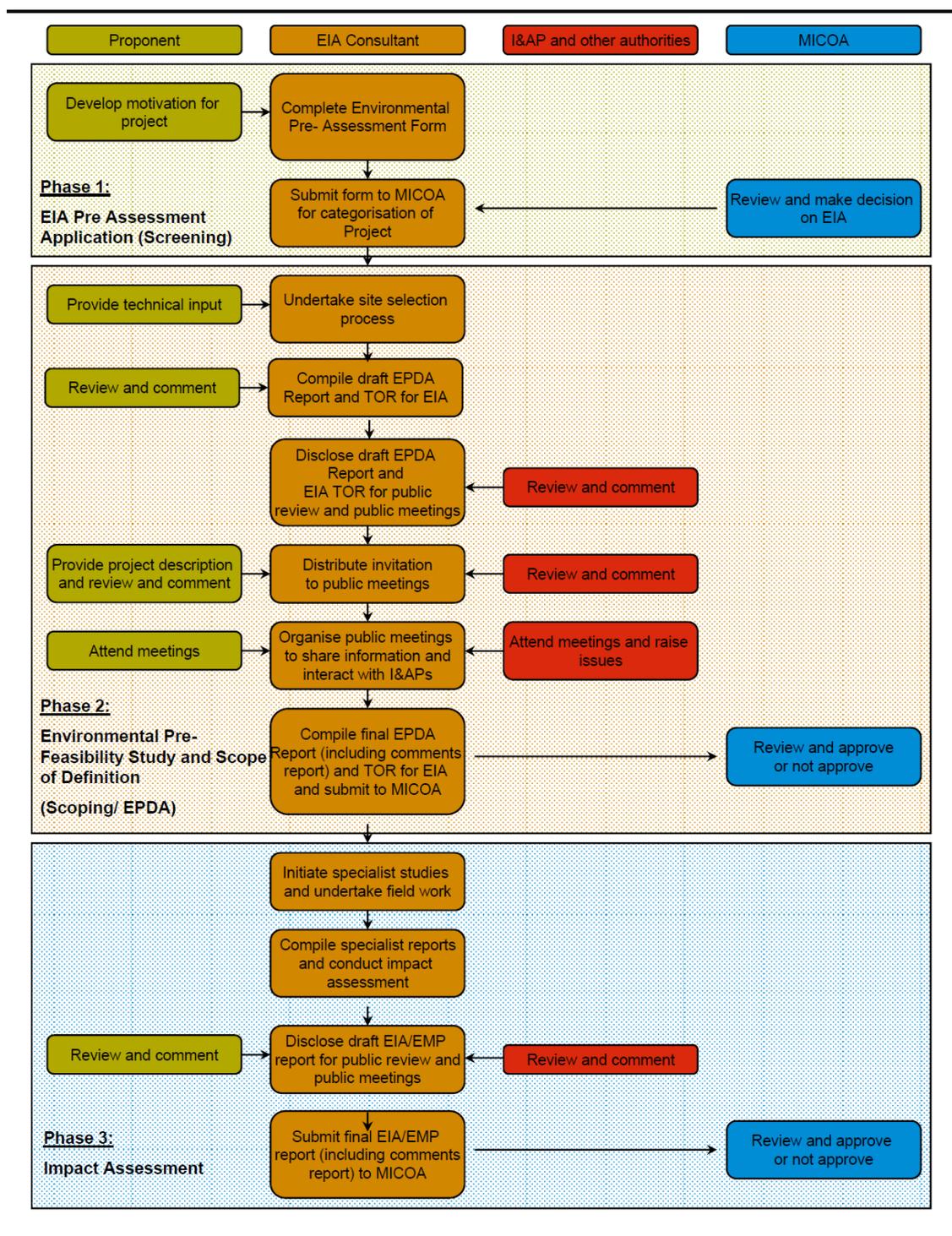
One of the objectives of the EIA process is to support decision making regarding the environmental licensing of a proposed activity and/or development. In achieving this, the EIA process consists of the following three key phases:

- **Phase 1- EIA Pre-assessment Application (Screening):** This phase, also known as screening, involves submitting a Pre-assessment application to Provincial Directorate of Environmental Affairs (Direcção Provincial de Coordenação da Acção Ambiental or DPCA) who then categorises the Project based on the level of environmental assessment required.
- **Phase 2- Environmental Pre-Feasibility Study and Scope of Definition (Scoping):** The scoping phase or EPDA <sup>(1)</sup> phase as it is known aims to identify key issues and concerns associated with the proposed development. These could include project-related activities which may have the potential to contribute to or cause potentially significant impacts to environmental and socio-economic receptors and resources in the area. The EPDA Report also defines the Terms of Reference (ToR) for the specialist studies and Impact Assessment phases to follow. The ToRs for specialist studies are intended to close any gaps in available information such that a reliable baseline can be established.
- **Phase 3- Impact Assessment:** This phase involves two discrete components:
  - **Specialist Studies:** Based on the findings of the scoping phase and any identified data gaps, specialist studies are undertaken to investigate and establish the existing baseline conditions and legislative requirements pertaining to the Project and its surroundings and also to highlight receptors and resources sensitive to potential impacts.
  - **Environmental Impact Assessment Report and Environmental and Social Management Plan:** The EIA Report identifies and evaluates the likely extent and significance of the potential impacts on identified environmental and social receptors and resources according to defined assessment criteria. The EIA Report also details recommended measures to avoid, minimise, reduce or compensate for any potential adverse environmental effects and reports the significance of the residual impacts that remain following mitigation. The impact assessment informs the development of an Environmental and Social Management Plan (ESMP). The ESMP presents specific measures and commitments by the Project to address identified impacts.

The phases of the EIA process are illustrated in *Figure 3.1* and are described in detail below.

(1) From the Portuguese, Estudo de Pré-Viabilidade Ambiental e Definição de Âmbito.

Figure 3.1 Flow Diagram of EIA Process



### 3.3 PHASE 1: EIA PRE-ASSESSMENT APPLICATION (SCREENING)

The screening phase initiated the EIA by liaising with the relevant authority to identify the level of environmental impact assessment required.

The screening process involved the submission of an Environmental Pre-assessment form (Ficha de Informação Ambiental Preliminar) to the provincial department of the Ministry for the Coordination of Environment Affairs (MICOA); namely the Provincial Directorate of Environmental Affairs

(Direcção Provincial de Coordenação de Acção Ambiental or DPCA). MICOA then categorises a project as either Category A, B or C. Decree no. 56/ 2010 of 22 November defines Category A activities as those activities related to the development, production, construction and operation of oil or gas pipeline systems and decommissioning and other activities to be carried out in sensitive ecosystems and conservation areas. Category B activities are defined as those activities that are related to exploration in areas that are not conservation areas and/ or sensitive ecosystems. Category C refers to activities which by their nature do not entail negative impacts on the Environment and public health.

The application for the Project was submitted to the DPCA of Pemba on 24 June 2011. On 22 August 2011, the Project was classified as a *Category A* project and is therefore subject to a comprehensive Environmental and Social Impact Assessment process.

### **3.4 PHASE 2: ENVIRONMENTAL PRE-FEASIBILITY STUDY AND SCOPE OF DEFINITION (EPDA/SCOPING)**

#### **3.4.1 Objectives and General Considerations**

The objectives of the EPDA Phase were to:

- complete a site selection process to identify the proposed Project Area for the onshore facility;
- gather baseline data about the Project Area in order to understand the sensitivity of the affected biophysical and social environment;
- identify potential significant positive and negative environmental and socio-economic impacts. This involved the systematic consideration of the potential for interaction between activities involved in developing the Project and aspects of the physical, biological and socioeconomic environment that may be affected;
- initiate a dialogue with Interested and Affected Parties (I&APs) by presenting details of the proposed development to stakeholders to enable contributions to Project planning by commenting on potential issues and concerns about the proposed development;
- develop the Terms of Reference (ToR) for the specialist studies portion of the Impact Assessment Phase; and
- compile specific environmental and social project information together with the results of the stakeholder consultation into a Final EPDA Report together with the ToR for the EIA, and submitting these to MICOA via the National and Provincial Directorates of Impact Assessment for review and consideration.

The Final EPDA Report was submitted to MICOA on 21 November 2011.

It should be noted that although scoping was initiated early in the EIA process, it is an activity that has continued as new issues and information emerged during further studies, site visits and stakeholder consultations, and as a result of development of the Project design. The ToR for the EIA and for specialist studies have evolved in response to this new and updated information.

The activities undertaken as part of the EPDA Phase are described below.

### 3.4.2 *Site Selection and Preliminary Baseline Data Gathering*

A high-level analysis of baseline sensitivities was undertaken as part of the initial Project planning, in particular to identify an appropriate location for the onshore facility and near shore infrastructure prior to commencing the EIA process. Initial environmental and socio-economic baseline information was gathered in early 2011 via review of existing reports including previous EIAs and studies <sup>(1)</sup> undertaken during the exploration of Area 1. The aim of the preliminary baseline sensitivity analysis was to highlight key baseline sensitivities, red flags, or fatal flaws from a socio-economic and biophysical perspective of several sites along the northern coast of the Cabo Delgado Province that had been identified as potentially suitable sites for the onshore facility.

Preliminary site visits were then conducted in May 2011 and August 2011 of several potential LNG sites by environmental and social specialists and by the Engineering Team in June 2011 and August 2011. The purpose of these site visits was to gather environmental and social information on alternative sites as well as investigate the suitability of the site from a technical perspective to supplement the site selection evaluation (refer to *Chapter 5*). These preliminary investigations formed the basis for the baseline information gathered for EPDA Phase and the site selection process.

Workshops were held between the EIA Team, including a number of key environmental (terrestrial ecologist and marine ecologist) and a social specialist and the Engineering Team to understand the sensitivities and constraints of the various site locations under consideration. The evaluation process considered technical, environmental, health, and social impacts associated with using each alternative for development of an onshore LNG facility. The available information indicated that the Afungi site was the preferred alternative (refer to *Chapter 5*).

(1) The other EIAs are in the public domain and were undertaken by Impacto. These include two EIAs for deep water seismic and exploration drilling (2007 and 2008 respectively), as well as a shallow water seismic and exploration drilling EIA undertaken in 2008. Other studies were undertaken or commissioned by government or by independent scientists. All reports and studies used are in the public domain and referenced in this report.

### 3.4.3

#### *Public Participation during the EPDA Phase*

Public participation is a critical component of the EPDA phase allowing for the identification of public expectations and concerns that need to be considered and addressed as part of the EIA process. In this regard, the key objectives of the public participation process undertaken during the EPDA Phase were as follows:

- identify stakeholders;
- consult with relevant government departments and key stakeholders;
- notify the public of planned meetings in Palma, Pemba and Maputo through newspaper and radio advertisements and letters of invitation;
- distribute the Draft EPDA Report to public for comment;
- arrange and facilitate public meetings in key locations;
- gather public comment on the Draft EPDA Report; and
- consider and consolidate public comments into the Final EPDA Report.

For the purposes of this EIA process, a stakeholder is defined as ‘any individual or group who is potentially affected by a project or can themselves affect a project’.

The stakeholder consultation process undertaken to date is described in detail in the Public Participation Report (PPR) in *Annex A*. Copies of all relevant documentation such as meeting minutes, attendance registers, advertisements and letters of invitation are included in the PPR. A summary of the activities undertaken during and after the EPDA Phase is presented in *Table 3.1*.

**Table 3.1** *Summary of Public Participation Process (PPP) during EPDA Phase*

<b>Activity</b>	<b>Purpose and discussion</b>	<b>Date of activity</b>
Compilation of stakeholder database	Identify stakeholders to be included in the consultation process	July- August 2011
Compilation and distribution of draft EPDA Report for public review (including on Impacto website)	Provide information on the EIA process, the proposed development and dates of public meetings	July- September 2011
Distribution of invitations to public meetings	To invite stakeholders to public meetings	September 2011

<b>Activity</b>	<b>Purpose and discussion</b>	<b>Date of activity</b>
Press advertisements for public meetings	To invite stakeholders to public meetings	September 2011
Public meetings: Palma, Pemba and Maputo	To present the proposed EIA process and project to the public and to allow the public to identify issues of concern	27- 30 September 2011
Written comments received	Written comments received during the scoping process	September- October 2011
Update the Stakeholder Database	Registration of new interested and affected parties (I&APs)	October 2011
Submission of Final EPDA Report and EIA ToR to MICOA	For MICOA's decision	21 November 2011

#### **3.4.4** *EPDA Report*

The results of the baseline data review and the public participation activities were compiled into a Final EPDA Report prepared in accordance with the requirements of Decree no. 56/2010. This Final EPDA Report was made available to registered I&APs and to MICOA as defined in the applicable law for review for a period of 20 working days.

#### **3.4.5** *Authority Review of the EPDA Report*

MICOA formed a technical review committee to undertake a review of the Final EPDA Report which included key stakeholders from government at national and provincial levels and various institutions. The committee reviewed the report and the Final EPDA Report was granted approval by MICOA on 3 January 2012. A copy of the approval letter (reference 001/GM/MICOA/12) is included in *Annex B*.

### **3.5** *PHASE 3: IMPACT ASSESSMENT*

#### **3.5.1** *Specialist Studies*

The environmental and socioeconomic sensitivities and issues identified during the scoping phase were used to develop the Terms of Reference (ToR) for the specialist studies to be undertaken during the Impact Assessment phase of the EIA. The outcomes of these studies formed the basis for the baseline description and impact assessment of the potential impacts on the affected environment.

The objectives of the specialist studies were to:

- describe the existing environmental and socio-economic conditions;

- identify those resources or receptors in areas potentially affected by the Project;
- understand stakeholder concerns, perceptions and expectations regarding the proposed Project;
- assess the impact on the environment using predefined criteria; and
- develop mitigation measures for potential negative impacts.

The specialist studies undertaken as part of the EIA process are listed in *Table 3.2*.

**Table 3.2** *Specialist Studies*

<b>Specialist Study</b>	<b>Key Specialist</b>	<b>Organisation</b>
Air quality	Chris Hazell- Marshall Yves Verlinden	ERM
Noise	Rod Linnett Jamie Hogg Steve Mitchell Marilena de Stefano Justin Kmelisch	ERM
Climate change	Simon Clark Lisa Constable David Bonellie	ERM
Landscape and visual	Eimear O'Connor John Flannery	ERM
Soils, landuse, land capability	Hendrik Smith Louw Potgieter	Digby Wells Environmental
Groundwater	Hugo Marais Heinrich Schreuder Hanco Roux Andreas Stoll	ERM
Surface water - hydrology	Gary Morgan	ERM
Waste	Peter Braithwaite Keith Grant	ERM
Surface water ecology/ wetlands	Kathy Taggart Andrew Cauldwell Amanda Austin Chris Renshaw Crystal Rowe Fred de Villiers	Natural Scientific Services CC
Terrestrial mammals	Samuel Laurence	Enviro-Insight
Reptiles and amphibians	Luke Verburgt	Enviro-Insight
Avifauna (terrestrial, marine)	Lucas Niemand	Enviro-Insight
Terrestrial flora/ habitats	Ben Orban	Enviro-Insight

<b>Specialist Study</b>	<b>Key Specialist</b>	<b>Organisation</b>
Marine ecology	Robin Carter Nina Steffani Andrea Pulfrich Henry Gilham Erich Koch	Lwandle Technologies (Pty) Ltd
Fish	Emidio Andre	Impacto
Marine mammals/ coastal habitats	Adriano Macia	Impacto
Marine modelling	Steven Luger Rhydar Harris	Prestedge Retief Dresner Wijnberg
Socioeconomic studies	Bento Salema Joyce Malalane Nilza Mazivila	Impacto
Tourism	Bento Salema	Impacto
Archaeology and cultural heritage	Leonardo Adamowicz	Impacto
Marine traffic	Eugenio Muianga	Impacto
Fisheries	Atanasio Brito	Impacto

As part of the ToR, a number of the specialists undertook field studies to gather data to further assist in defining the baseline so as to inform impact assessments. The following table indicates the field work schedule which was planned to incorporate wet season and dry seasons where applicable.

**Table 3.3** *Specialists Fieldwork*

<b>Specialist Study</b>	<b>Dates of Fieldwork</b>
Air quality	20 - 27 February 2012 10 - 12 April 2012
Noise	20 - 27 February 2012
Climate change	Study based on existing data and interaction with Technical Team
Landscape and visual	26 - 31 January 2012
Soils, landuse, land capability	9- 22 December 2011
Groundwater	07- 14 February 2012 20 August- 17 September 2012 12 - 21 December 2012
Surface water - hydrology	14-18 May 2012
Waste	Study based on existing data and interaction with Technical Team

Specialist Study	Dates of Fieldwork
Surface water ecology/ wetlands	12 – 16 October 2011 21 February – 1 March 2012 21-26 June 2012
Terrestrial ecology including : <ul style="list-style-type: none"> <li>o Terrestrial mammals</li> <li>o Reptiles and amphibians</li> <li>o Avifauna (terrestrial, marine)</li> <li>o Terrestrial flora/ habitats</li> </ul>	08 – 20 December 2011 27 March - 06 April 2012
Marine ecology including: <ul style="list-style-type: none"> <li>o Fish</li> <li>o marine mammals</li> <li>o coastal habitats</li> </ul>	05 -19 November 2011 19 March – 02 April 2012 04 – 21 June 2012
Marine modelling	Study based on existing data and interaction with Technical Team
Socioeconomic studies including tourism and fisheries	29 November – 06 December 2011 11 - 19 January 2012
Archaeology and cultural heritage	20 October – 01 November 2011
Marine traffic	Study based on existing data and interaction with Technical Team

The results of the specialist reports have been integrated into the baseline, impact assessment chapters and ESMP in this EIA Report, see *Chapters 6 to 17*. The methodologies for the various specialist studies undertaken are summarised below and detailed in *Annex C*.

### 3.5.2 *Impact Assessment Methodology*

During scoping, a preliminary analysis was undertaken of the ways in which the Project may interact (positively and negatively) with environmental and socioeconomic resources or receptors. The impacts that were identified as potentially significant during the scoping process provided focus for the specialist studies for the detailed EIA. Each of the potential impacts identified is assessed using the following methodology.

The assessment of impacts is an iterative process considering four questions:

1. **Prediction:** What will happen to the environmental resources or human receptors as a consequence of the Project?
2. **Evaluation:** Does this impact matter? How important or significant is it?
3. **Mitigation:** If it is significant can anything be done about it to avoid, reduce or manage the impacts?
4. **Residual Impact:** Is the impact after mitigation still significant?

Where significant residual impacts remain, further options for mitigation may be considered and impacts re-assessed until they are as low as reasonably practicable (ALARP) for the Project and would be deemed to be within acceptable levels.

The methodology used for assessing impacts is detailed in *Section 3.6*.

### **3.5.3 EIA Report and ESMP**

The results of the specialist studies have been integrated into this EIA Report and have provided input to the development of the Environmental and Social Management Plan (ESMP).

The EIA report provides an assessment of the impacts associated with the proposed Project and makes recommendations for the mitigation of adverse impacts and the enhancement of positive impacts. The ESMP is presented in *Annex D*, is in a tabular format and contains clear, practical management measures to be implemented during the construction, operation and decommissioning of the Project. Should the environmental licence be issued, the ESMP will form part of conditions of the license to ensure that the Project is conducted and managed in an environmentally and socially responsible manner.

### **3.5.4 Public Participation during the Impact Assessment Phase**

The Draft EIA Report and ESMP were made available for public comment between 23 August and 27 September 2013. At the request of MICOA, the commenting period was extended by approximately one month to 31 October 2013. This request was to provide all stakeholders with additional time to effectively review the Draft EIA Report given the documents size and complexity.

Public meetings were held in Palma, Pemba and Maputo between 09 and 12 September 2013 to present the findings of the Impact Assessment Phase and to elicit comment on the Draft EIA Report and ESMP. During the meeting held in Palma on 11 September 2013, it was requested that the EIA Team facilitate further meetings in Palma District at a community level. Three additional public meetings were held in Maganja, Quitupo and Senga with community representatives between 16 and 18 October 2013.

A summary of the activities undertaken during and after the IA Phase is presented in *Table 3.4*. The stakeholder consultation process undertaken during the Impact Assessment Phase is further described in the PPR in *Annex A*.

**Table 3.4** *Summary of Public Participation Process (PPP) during EIA Phase*

<b>Activity</b>	<b>Purpose</b>	<b>Date of activity</b>
Focus Group Meetings: Provincial Government (Pemba), Tourism Operators (Pemba) and Central Government (Maputo)	To present the EIA progress to the key groups of stakeholders to allow them to identify issues of concern	30 January – 01 February 2012
Distribution of draft EIA Report for public review	Provide information on the EIA process, the proposed development and dates of public meetings	27 August 2013
Distribution of invitations to public meetings - Maputo, Pemba and Palma	To invite stakeholders to public meetings	27 August 2013
Press advertisements for public meetings -- Maputo, Pemba and Palma	To invite stakeholders to public meetings	27 August 2013
Public meetings: Palma, Pemba and Maputo	To present the findings of the EIA process to the public and to allow the public to raise concerns / queries	09 – 12 September 2013
Focus Group Meeting: Tourism Operators and Fisheries (Pemba)	To present the findings of the EIA process particularly, potential impacts to tourism operators and fisheries, to allow these key stakeholders opportunity to voice concerns / comments	10 September 2013
Distribution of invitations to public meetings - Maganja, Quitopo and Senga	To invite stakeholders to public meetings	02 October 2013
Press advertisements for public meetings -- Maganja, Quitopo and Senga	To invite stakeholders to public meetings	02 - 16 October 2013
Public meetings: Maganja, Quitopo and Senga	To present the findings of the EIA process to the public and to allow the communities to voice concerns / issues	16 – 18 October 2013
Written comments received	Written comments received	27 August – 31 October 2013
Submission of Final EIA Report (including ESMP) to MICOA	For MICOA's decision	February 2014

At a high level, key issues raised to date by stakeholders relate to:

- Land acquisition (process followed and communication).

- Displacement (physical and economic).
- Job creation and training for local communities.
- Economic benefits and community development.
- Impacts on livelihoods (tourism, fishing and agriculture).
- Impacts on biodiversity and ecosystems (marine and terrestrial).
- Impacts on health, safety and security.
- Implementation of mitigation and management measures (effectiveness of mitigation or capacity of authorities to monitor).

All comments received (verbal and written) have been consolidated into the PPR which is appended to the EIA Report in *Annex A*. Similarly, copies of all relevant documentation such as meeting minutes, attendance registers, advertisements and letters of invitation are included in the PPR.

## 3.6 *EIA METHODOLOGY*

### 3.6.1 *Overview*

The purpose of impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and natural resources according to a defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any potential adverse environmental effects and to report the significance of the residual impacts that remain following mitigation.

The adequate assessment and evaluation of the potential impacts and benefits associated with the Project necessitates the development of a scientific methodology that will reduce the subjectivity involved in making such evaluations. A clearly defined methodology is used in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this, the Project must be considered in the context of the area and the people that will be affected.

Nonetheless, an impact assessment is based on the professional judgment and experience of various specialists and EIA practitioners. The evaluation of significance is thus contingent upon subject matter expertise, professional judgement and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to the receiving environment.

### 3.6.2 *Impact Prediction*

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the Project component or by the execution of a Project related activity. There are a number of ways that impacts may be described and quantified, including:

- Nature of impact: positive or negative.
- Type of impact: direct, indirect or cumulative.
- Duration of impact: temporary, short-term, Medium-term, long-term or permanent.
- Scale of impact: On-Site, Local, regional, national, international/transboundary.

The types of impacts and terminology used in the assessment are outlined in Table 3.5.

**Table 3.5** *Defining the Nature of the Impact*

Term	Definition
<b>Nature of Impact</b>	
<b>Positive</b>	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
<b>Negative</b>	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
<b>Type of Impact</b>	
<b>Direct impact</b>	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (eg between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
<b>Indirect impact</b>	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (eg in-migration for employment placing a demand on resources). Indirect impacts can also referred to as induced or secondary impacts.
<b>Cumulative impact</b>	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

The EIA will consider routine and non-routine events that may lead to potential impacts. ‘Non-routine’ events generally relate to accidents or unplanned events (such as oil/fuel spills, emergency flaring or venting of gas, etc.) that may result in adverse impacts. In these cases the probability of the event occurring needs to be considered.

### 3.6.3 *Assessing Significance*

For the purposes of this EIA, the following definition has been adopted: ‘An impact is significant if, in isolation or in combination with other impacts, it should be taken into account in the decision-making process’.

It is generally accepted that significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. It is widely accepted that Impact Magnitude (or Severity) is a function of the extent, duration and intensity of the impact.

The criteria used to determine significance are summarised in *Table 3.6* <sup>(1)</sup>. The prediction takes account of mitigation measures that are already an integral part of design.

**Table 3.6**      *Significance Criteria*

<b>Impact magnitude – the degree of change brought about in the environment</b>	
<b>Extent</b>	<b>On-site</b> – impacts that are limited to the direct area of disturbance and immediate surrounds.
	<b>Local</b> – impacts that affect an area in a radius of up to 10km around the site.
	<b>Regional</b> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.
	<b>National</b> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.
	<b>Transboundary/International</b> – impacts that affect internationally important resources such as areas protected by international conventions.
<b>Duration</b>	<b>Temporary</b> – impacts are predicted to be of short duration and intermittent/occasional (typically less than 1 year).
	<b>Short-term</b> – impacts that are predicted to last between 1 and 5 years.
	<b>Medium-term</b> – impacts that are predicted to last between 5 and 10 years.
	<b>Long-term</b> – impacts that will last longer than 10 years and cease when the Project stops operating.
	<b>Permanent</b> – impacts that cause a permanent change in the affected receptor or resource (eg removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
<b>Intensity</b> <sup>(2)</sup>	BIOPHYSICAL ENVIRONMENT: <i>Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie habitats, species or communities).</i>
	<b>Negligible</b> – the impact on the environment is not detectable.
	<b>Low</b> – the impact affects the environment in such a way that natural functions and processes are not materially affected.
	<b>Medium</b> – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.
	<b>High</b> – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.
	<i>Where appropriate, national and/or international standards are to be used as a measure intensity of the impact.</i>
	SOCIO-ECONOMIC ENVIRONMENT: <i>Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.</i>
	<b>Negligible</b> – there is no perceptible change to people’s livelihood

(1) In some cases, specialists have slightly modified the means of assessing significance based on what is most appropriate to their subject matter. Where this is the case it has been clearly outlined.

(2) The frequency of the activity causing the impact also has a bearing on the intensity of the impact, ie the more frequent the activity, the higher the intensity.

**Low** - people/communities are able to adapt with relative ease and maintain pre-impact livelihoods.  
**Medium** - people/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.  
**High** - Those affected people/communities will not be able to adapt to changes and continue to maintain-pre impact livelihoods.

Impact likelihood – the likelihood that an impact will occur	
Unlikely	The impact is unlikely but may occur at some time during normal operating conditions.
Likely	The impact is likely to occur at some time during normal operating conditions.
Definite	The impact will occur at some time during normal operating conditions.

Once a rating is determined for magnitude and likelihood, the risk matrix in Table 3.7 can be used to determine the impact significance for positive or negative impacts.

Table 3.7 Impact Significance

SIGNIFICANCE RATING				
	LIKELIHOOD	Unlikely	Likely	Definite
MAGNITUDE	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

Table 3.8 outlines the various definitions for significance of an impact and is based on the significance rating matrix.

Table 3.8 Significance Definitions

Significance Definitions	
<b>Negligible significance</b>	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
<b>Minor significance</b>	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value/vulnerability/importance.
<b>Moderate significance</b>	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that “moderate” impacts <i>have</i> to be reduced to ‘minor’ impacts, but that moderate impacts are being managed effectively and efficiently.
<b>Major significance</b>	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for

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some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (ie ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

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Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as *low, medium* or *high*.

#### 3.6.4

#### *Mitigation*

An impact assessment is designed to ensure that decisions on projects are made in full knowledge of their likely impacts on the environment and society. A vital step within the process is the identification of measures that will be taken by a project to mitigate its impacts.

In some instances, mitigation can be incorporated into the Project design (*built-in mitigation*) in order to avoid or reduce the negative impacts or enhance the positive impacts. The ongoing EIA process has therefore involved identifying where significant impacts could occur and then working with the Engineering Team to identify and develop technically and cost-effective means of mitigating those impacts to levels that are deemed acceptable. A description of these mitigation measures is included within the ESMP.

Where a significant impact is identified, a hierarchy of options for mitigation is typically explored as outlined in *Box 3.1*.

THE MITIGATION HIERARCHY FOR PLANNED PROJECT ACTIVITIES
<p><i>Avoid at Source; Reduce at Source</i></p> <p>Avoiding or reducing at source is essentially 'designing' the project so that a feature causing an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimization.</p>
<p><i>Abate on Site</i></p> <p>This involves adding something to the basic design to abate the impact - pollution controls fall within this category. Often called 'end-of-pipe'.</p>
<p><i>Abate at Receptor</i></p> <p>If an impact cannot be abated on-site then measures can be implemented off-site - an example of this would be to use the stand-by vessel to help control the level of interference with fishing activity.</p>
<p><i>Repair or Remedy</i></p> <p>Some impacts involve unavoidable damage to a resource, eg land disturbance. Repair essentially involves restoration and reinstatement type measures, such as base camp closure.</p>
<p><i>Compensate in Kind</i></p> <p>Where other mitigation approaches are not possible or fully effective, then compensation, in some measure, for loss, damage, and general intrusion might be appropriate.</p>

## 3.6.5

*Assessing Residual Impacts*

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

The degree of significance attributed to residual impacts is related to the weight the EIA Team considers should be given to them in making decisions on the Project and developing conditions. The ESMP addresses mitigation and management of residual impacts.

Any residual **major impacts**, whether positive or negative, are considered to warrant substantial weight) when compared with other environmental, social or economic costs and benefits) for those making decisions on the Project. Conditions will be expected to be imposed to ensure residual negative impacts are strictly controlled and monitored and residual positive impacts are fully delivered.

Residual **moderate impacts** are considered to be of lesser importance to making decisions, but still warrant careful attention to conditions regarding mitigation and monitoring, to ensure best available techniques are used to keep adverse impacts within levels deemed to be acceptable and to ensure beneficial impacts are delivered.

**Minor impacts** are brought to the attention of decision-makers but are identified as warranting little if any weight in the decision. Mitigation will be achieved using normal good practice and monitoring will be expected to be carried out to confirm that impacts do not exceed predicted levels.

### 3.6.6 *Cumulative Impacts*

Cumulative impacts occur when a Project activity acts together with other activities (other projects) to impact on the same environmental or social resources or receptor. Cumulative impacts have been defined as “*the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted* <sup>(1)</sup>”. By definition, the impact assessments in this EIA Report consider the cumulative impacts of past and present projects in that all impacts are assessed against the present day baseline. The present day baseline includes impacts of past and present projects that have shifted the original natural conditions to the present day conditions. Thus, the cumulative impacts section considers potential reasonably defined developments that could act together with the proposed Project to impact on common receptors.

The following ‘reasonably defined’ activities have been identified:

- establishment of an Industrial Development Zone (IDZ) by the Government of Mozambique in the vicinity of, or incorporating, the Afungi Project Site; and
- future phases of exploration and development of hydrocarbon resources by AMA1, eni and others.

## 3.7 *MANAGEMENT AND MONITORING*

A wide range of different measures to mitigate impacts have been identified in the EIA Report and the Project is committed to their implementation, success

(1) As defined by IFC Performance Standard 1, January 2012.

and continuous improvement (see *Chapter 17*). These measures are set out in the Project Description and other chapters of the report and, to assist the reader, they have been brought together in the ESMP (*Annex D*) which describes how the mitigation commitments will be delivered, together with the role of monitoring, inspection, audit and reporting. In line with Mozambican legislative requirements, additional details in the form of outline topic-specific plans (eg for waste management see *Annex E*) are provided for issues of critical importance.

### **3.8** *DEALING WITH AND MANAGING GAPS AND UNCERTAINTY*

#### **3.8.1** *General Considerations for an Evolving Project*

Through the course of the EIA process, the EIA Team interacted with the Engineering Team so that environmental and social considerations were factored into Project design. However, as with most complex projects, the refinement of the Project design is an ongoing and sometimes lengthy process. Thus there is a need for a mechanism to ensure that the final design does not result in impacts that have not been adequately addressed in the EIA. Thus, in order to compensate for potential late design changes, the EIA Team has been conservative wherever appropriate and has generally considered the ‘worst case scenario’ in assessing impacts and developing mitigation measures. The approach has been to take a conservative view of the likely residual impacts, to identify standards of performance which the Project will meet where firm predictions cannot be made and to propose monitoring measures to confirm predictions and to identify whether additional or amended mitigation is required.

Should the Project design change substantially after submission of the EIA Report such that there are resultant significant impacts that have not been considered in this report, the Project commits to updating this EIA through an addendum.

#### **3.8.2** *Managing Uncertainty*

The accuracy of predictions depends on the assessment method, degree of understanding of the environmental and social context and the level of Project detail available. In this regard, all assumptions and any resulting uncertainties have been made explicit in this EIA Report. In all instances, the significance criteria have been applied conservatively so as to develop appropriate mitigation measures that address any uncertainties. The success of mitigation will be monitored and modified as part of the Project’s ESMP. Where necessary, corrective actions will be implemented to achieve desired mitigation outcomes.