



## ESHIA Executive Summary and Update



Moçambique Área 1, Lda (AMA1)

Rev 0  
May 2019



	<b>Mozambique LNG</b> <b>ESHIA Executive Summary and Update</b>		
	<b>Document No. MZ-000-AM1-HS-RPT-00002</b>		
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## PREFACE

This Environmental, Social and Health Impact Assessment (ESHIA) Executive Summary and Update provides an overview of the various environmental, social, and health studies that comprise the ESHIA for the Mozambique Liquefied Natural Gas Project (the Project). It summarises the various reports that were submitted in support of attaining environmental licenses, the various environmental and social support studies, and the Environmental and Social Management Plan (ESMP) for the Project. The Environmental Impact Assessment Report (EIA) for the Project (referred to as the “LNG Project EIA”) was undertaken between 2011 and 2013, with the Final LNG Project EIA Report being submitted to government for approval in February 2014. Since then, the project description has been further refined, and other studies (including additional environmental assessments and management plans) were undertaken that update and augment the LNG Project EIA. In particular, focus has been on ensuring that the range of studies, from the LNG Project EIA onwards, demonstrates alignment with the International Finance Corporation (IFC) Performance Standards (IFC PS) on Environmental and Social Sustainability (updated in 2012) and Environmental, Health and Safety (EHS) Guidelines (2007).

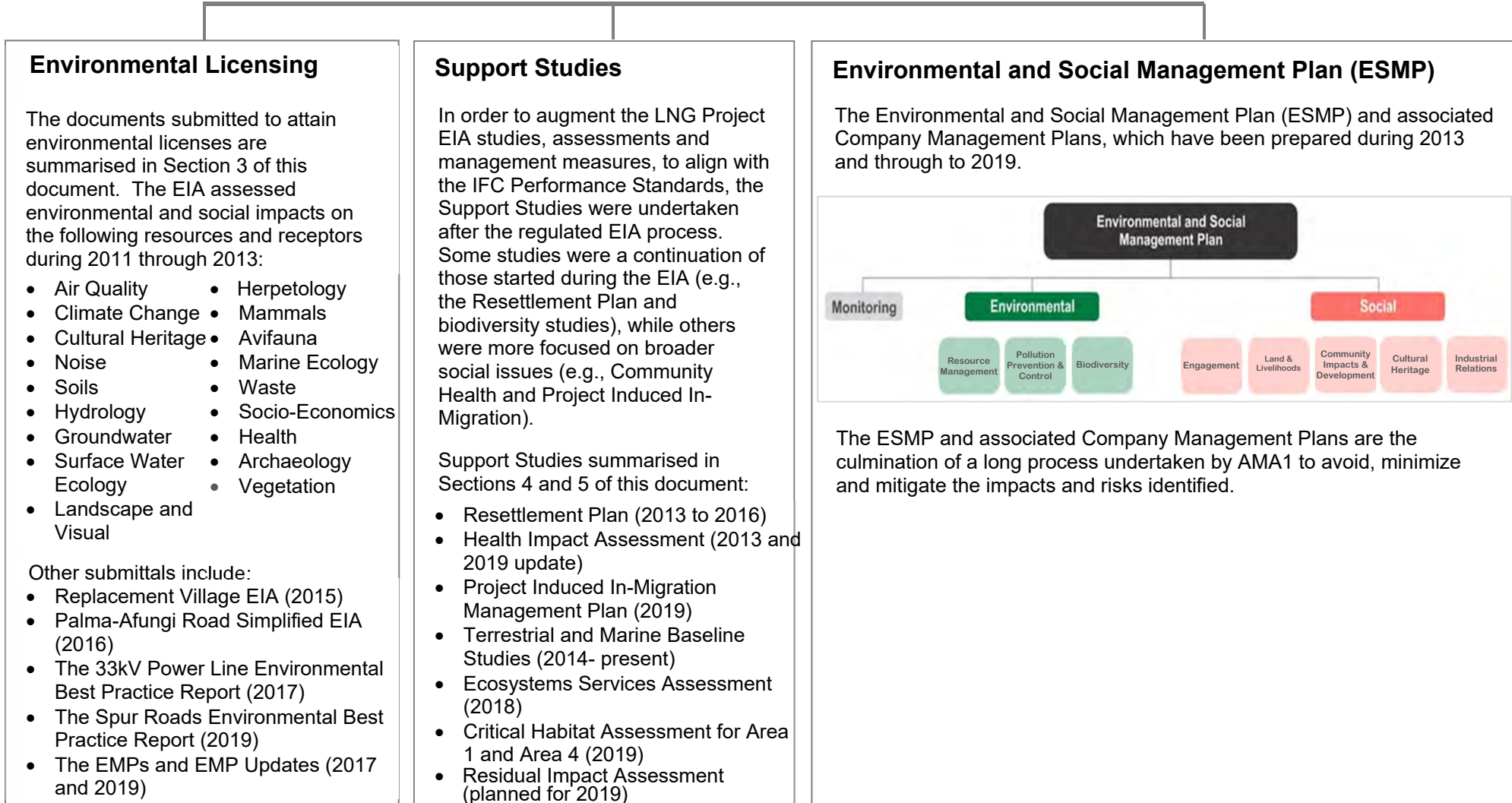
AMA1 has identified potential lenders and has had the Project reviewed by the lenders’ Independent Environmental and Social Consultants (IESC). This ESHIA Executive Summary has been developed to support the IESC due diligence of the Project’s readiness and to address some of the requests for clarification that have been raised by the IESC. Further, this ESHIA Executive Summary provides stakeholders (public, government agencies, lenders’ stakeholders, etc.) with a summary of all the documents, initiatives, policies, plans, and procedures that together comprise the ESHIA. Stakeholders can review this document to get an overview of the ESHIA without having to read a multitude of documents.

This Executive Summary is based on the documents listed in Section 10.0. There are three main components of the ESHIA – refer to the figure overleaf.

In consolidating and updating relevant information this document provides stakeholders with an understanding of how AMA1 evaluated the potential environmental and social risks associated with the Project and the measures to avoid, minimise and mitigate those impacts and risks.



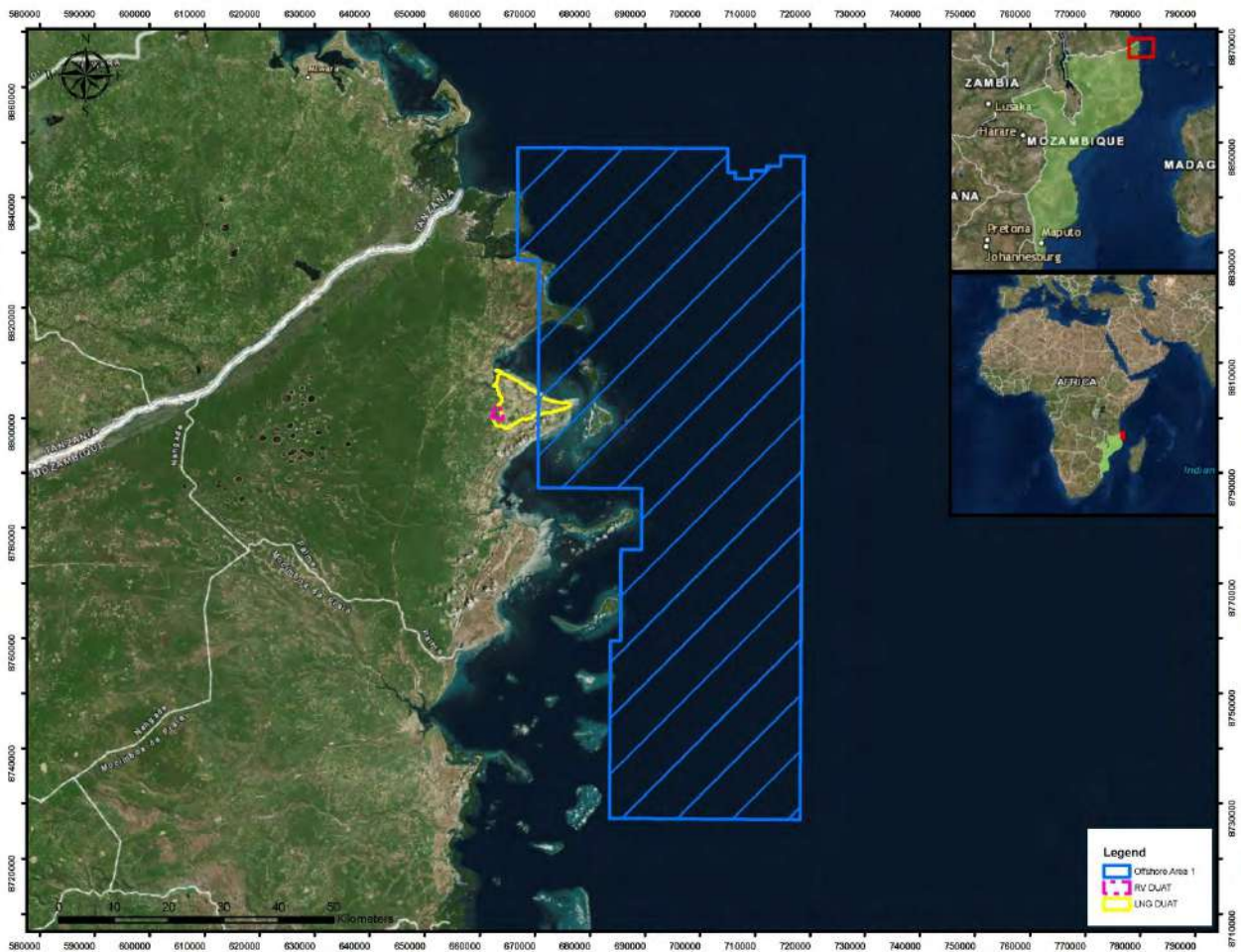
## ESHIA (Environmental, Social & Health Impact Assessment)





## 1.0 INTRODUCTION

Anadarko Moçambique Área 1, Limitada (AMA1) is developing a Liquefied Natural Gas (LNG) Project (the Project) associated with Area 1 Offshore of the Rovuma Basin (Area 1) in northern Mozambique. The Project is designed to gather natural gas from the offshore block<sup>1</sup>, process the gas in an onshore LNG Facility at the Afungi Peninsula of Cabo Delgado Province, and export the liquefied natural gas to international markets. Figure 1.1 shows the location of the Area 1 offshore block.





**Figure 1.1 - Project Location showing Area 1 (blue hatched area) and the DUAT areas**

The operator of Area 4 Offshore of the Rovuma Basin (Area 4), Mozambique Rovuma Venture S.p.A (MRV)<sup>2</sup> is similarly developing an onshore LNG facility associated with Area 4. Area 1 and Area 4 are positioned adjacent to one another and a number of gas reservoirs or gas fields (including both standalone reservoirs and straddling reservoirs) have been discovered

<sup>1</sup> The Area 1 concessionaires are AMA1 (26.5%), ONGC Videsh Ltd. (OVL) (10%), Mitsui E&P (20%), ENH (15%), BPRL (10%), Videocon (10%) and PTTEP (8.5%).

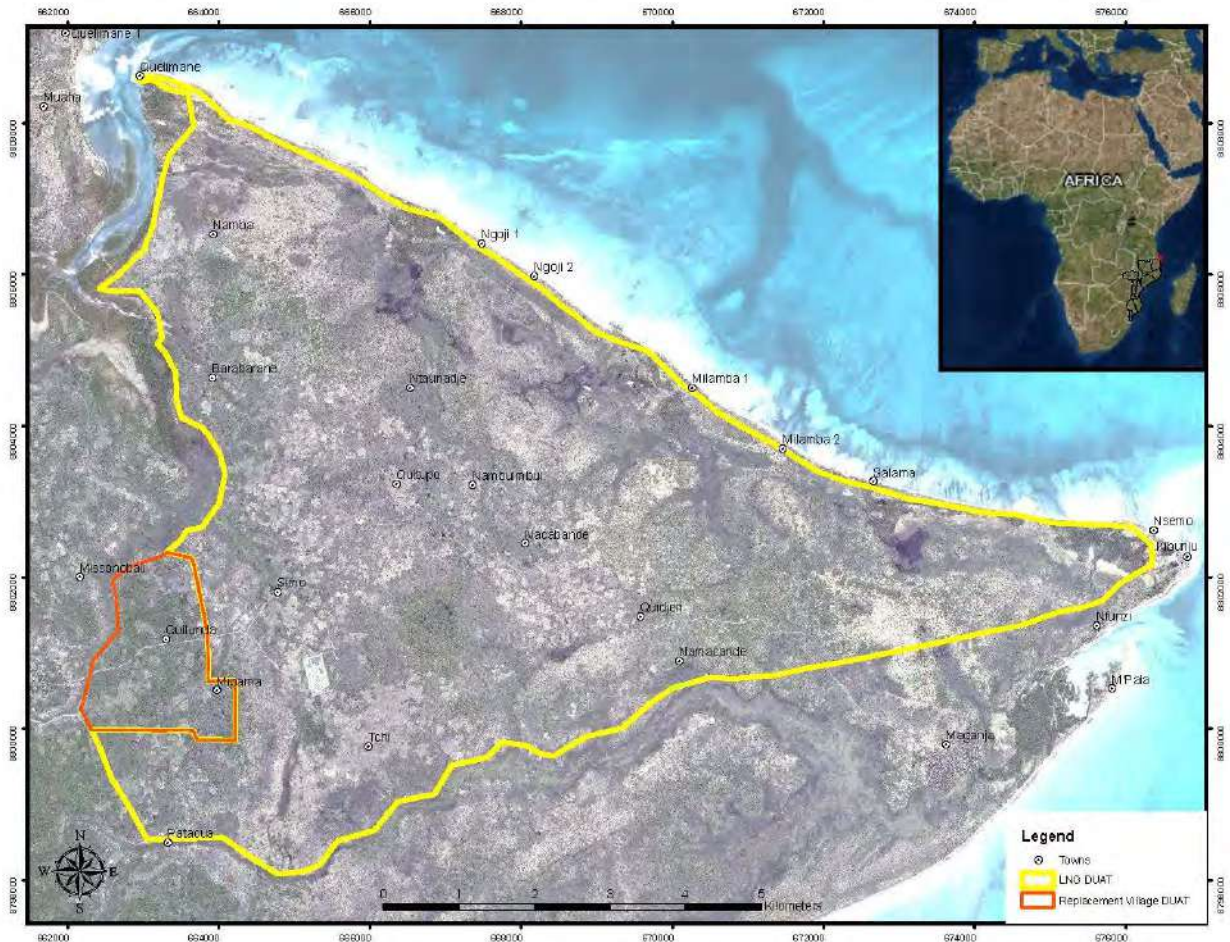
<sup>2</sup> MRV comprises Eni and ExxonMobil.

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within each of the areas. Both Area 1 and Area 4 projects will separately construct and operate their own respective offshore and onshore (up to 3 trains and about 15 MTPA each) facilities. In parallel, they will jointly design, construct and use certain onshore shared facilities in the area of the DUAT (e.g., airport, roads, fences, etc.) and nearshore common facilities (i.e. LNG Marine Terminal and Material Offloading Facility).

The site of the onshore facilities was selected after a comprehensive site selection process (see Section 3.1.1). Empresa Nacional de Hidrocarbonetos (ENH) acquired the Right to Use and Benefit from Land (known as a DUAT) from the Ministry of Agriculture in 2012, in accordance with the Land Legislation. The DUAT was then transferred to the Mozambican company, Rovuma Basin LNG Land, Lda. ('RBLL') incorporated by AMA1, MRV and ENH. The initially provided DUAT was approximately 7,000ha on Afungi Peninsula, but was later modified to accommodate a new DUAT for the Replacement Village (see Section 3.2).

The LNG DUAT and Replacement Village DUAT are shown in Figure 1.2. The area of the LNG DUAT is consistent with the Government of Mozambique's vision for an LNG Park (which may include other operators and other trains on the site). The onshore LNG facility, comprising the LNG trains, the common infrastructures, marine facilities, LNG storage tanks, etc. will be located within the LNG DUAT.



**Figure 1.2 – LNG DUAT and Replacement Village DUAT Areas**

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This document presents a consolidation and update of all the environmental and social studies and assessments that together comprise the Environmental, Social and Health Impact Assessment (ESHIA) developed for the Area 1 Mozambique LNG Project, hereafter referred to as the 'Project', which includes facilities for the exclusive use of Area 1 (known as Exclusive Facilities) and the facilities that Area 1 will share with Area 4 (known as Shared Facilities).

### **1.1 History of Exploration and Development in Mozambique**



Exploration for hydrocarbons (oil and gas) in Mozambique started in 1904 and international oil and gas companies carried out extensive onshore exploration, but limited offshore exploration from 1948. Hydrocarbon exploration in Cabo Delgado Province in northern Mozambique, and specifically in the Mocímboa da Praia and Palma districts, began in the 1980s with French and American companies, with the results being subsequently analysed by Artumas. In 2007, Artumas and AMA1 merged their interests and conducted seismic acquisition and exploratory drilling in 2008 to certify whether or not hydrocarbons exist in commercially viable quantities in the Rovuma Basin Onshore Block. Natural gas was discovered in an onshore well that was drilled in Mocímboa da Praia (MOC-1).

In the offshore Rovuma Basin, exploration activities have been carried out by a number of operators, namely AMA1 (Area 1), MRV (Area 4), Statoil (Area 2 and Area 5) and Petronas Carigali Mozambique Rovuma Basin Limited (PCMRB) (Area 3 and Area 6). Significant commercial quantities of gas have been discovered in Area 1 and Area 4, leading to AMA1 and MRV conceiving their development projects.

### **1.2 Overview of the Project**

The Project entails the following key components:

- Offshore gas wells and subsea gathering systems;
- Offshore gas subsea transmission pipeline system linking the offshore gas fields to the onshore LNG Facility;
- Temporary Beach Landing (TBL) and Materials Offloading Facility (MOF);
- LNG marine terminal and export facilities (jetty and berths);
- Onshore LNG facilities including gas reception, treatment, dehydration, condensate stabilisation and LNG process facilities;
- Gas turbines for power generation and associated power distribution within the Project facilities;
- Temporary and permanent worker accommodations and associated facilities;
- An approximately 1.6 km airstrip and an expansion up to approximately 2.3 km airstrip and associated facilities; and
- Associated infrastructure including roads, water treatment, wastewater treatment and waste management infrastructure, storage facilities, office buildings, etc.

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### 1.3 Benefits of the Project

The strategy, policies and practices of the Ministry of Mineral Resources (now called the Ministry of Mineral Resources and Energy) have the following goals:



- To ensure the sustainable exploration and development of mineral resources;
- The industrial development of the country and the local utilisation of its mineral resources;
- To add value to mineral resources through in-country processing;
- To promote partnerships, including the participation of Mozambican private enterprises in the sector;
- The periodic update of the legal and fiscal framework to maintain investment attractiveness in Mozambique; and
- The training and institutional strengthening.

The natural gas discoveries made to date are among the world's most significant discoveries in the last 20 years. The purpose of AMA1's Project is to advance the sustainable exploration, development and production of these resources in Mozambique through the extraction, processing and export of the significant natural gas resources discovered in the offshore Area 1, Rovuma Basin. The Project represents an economic opportunity that could be transformational for the economy of Mozambique by allowing the country to become one of the world's leading LNG exporting countries, potentially generating:

- Substantial tax and profit-sharing revenues for Mozambique, contributing substantially to the country's Gross National Product (GNP);
- Significant foreign exchange income from external markets and gas supplies for industrial and domestic development in Mozambique;
- Infrastructure and quality-of-life improvements for Mozambique's people;
- The possibility for long-term technology and knowledge transfer, bringing economic development and improving the quality of life for its inhabitants;
- Direct and indirect employment opportunities for Mozambicans; and
- Significant, long-term foreign direct investment.

### 1.4 The ESHIA

From the commencement of the project planning in 2011, AMA1 has sought to align the various assessments, studies and plans with the Equator Principles and International Finance Corporation Performance Standards on Environmental and Social (E&S) Sustainability (IFC PS). The regulatory driven Environmental Impact Assessment Report (EIA) for the Liquefied Natural Gas Project in Cabo Delgado (referred to as the "LNG Project EIA") commenced in 2011 and was completed by December, 2013. The Final LNG Project EIA Report was submitted to the then MICOA in February 2014, and was approved in June of the same year. Where possible and practical the regulatory EIA was aligned with the 2012 IFC PS on E&S Sustainability and the 2013 Equator Principles.

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AMA1 has identified potential lenders and the Project has been subject to an environmental and social due diligence by the lenders' Independent Environmental and Social Consultants (IESC). This ESHIA Executive Summary has been developed to support the IESC due diligence of the Project's environmental and social readiness. Further, this ESHIA Executive Summary provides stakeholders (public, government agencies, lenders' stakeholders, etc.) with a summary of the documents, initiatives, policies, plans, and procedures that together comprise the ESHIA. Stakeholders can review this document to get an overview of the ESHIA without having to read a multitude of documents.



There are three main components of the ESHIA:

- I. **Environmental Licensing**, which is summarized in Section 3.0, comprising:
  - a. The LNG Project EIA and associated specialist studies (2014);
  - b. The Replacement Village EIA and EMP (2015);
  - c. The Palma-Afungi Road Simplified Environmental Assessment (2016);
  - d. The 33 kV Power line Environmental Best Practice Report (2017);
  - e. The LNG Project EIA Environmental Management Plans (EMPs) (2017);
  - f. The Spur Roads Environmental Best Practice Report (2019); and
  - g. The EMP Updates and associated Supplementary Information Reports with specialist input (2019).
- II. **Support studies**, summarized in Sections 4.0 and 5.0, include:
  - a. Resettlement Plan (2016);
  - b. Project Induced In-Migration Plan (2019);
  - c. Health Impact Assessment (2019);
  - d. Ecology and Biodiversity Studies:
    - i. Terrestrial and Marine Baseline Studies (2014 – present);
    - ii. Ecosystems Services Assessment (2018);
    - iii. Critical Habitat Assessment for Area 1 and Area 4 (2019); and
    - iv. Biodiversity Residual Impact Assessment (to be completed).

In order to augment the LNG Project EIA studies, assessments and management measures, to align with the IFC Performance Standards, the Support Studies were undertaken after the regulated EIA process. Some studies were a continuation of those started during the LNG Project EIA (e.g., the biodiversity studies), while others addressed broader social issues (e.g., Community Health and PIIM).

- III. The **Environmental and Social Management Plan (ESMP)** and associated Company Plans (see Figure 1.3 and Section 7.0).

The ESMP and associated environmental and social Company Plans are the culmination of a long process undertaken by AMA1 to avoid, minimise and mitigate the impacts and risks identified to date. These plans will be implemented during

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construction phase of the Project, and will be reviewed and updated prior to the operational phase.

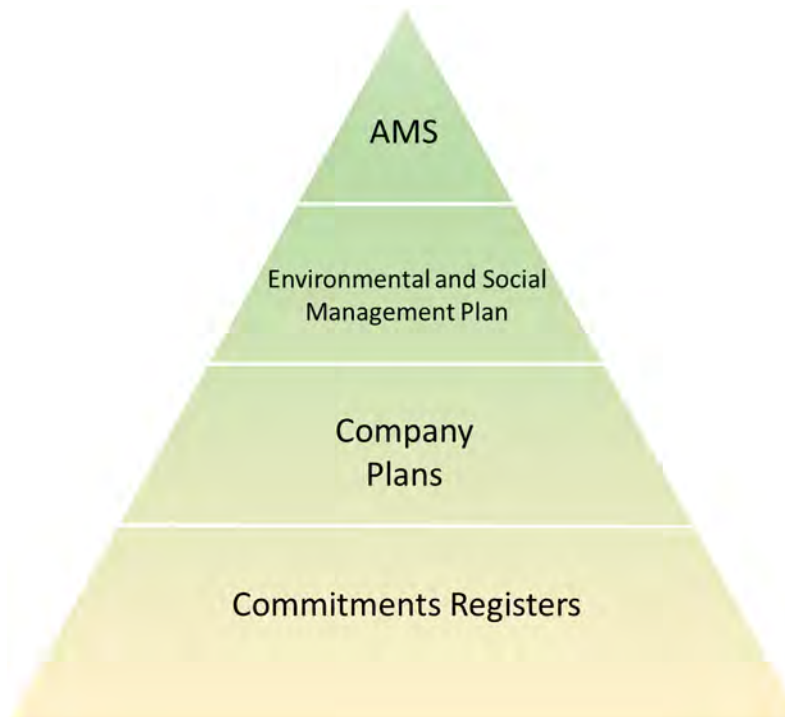


**Figure 1.3 – ESMP and Management Plans**

### 1.5 Anadarko Management System (AMS)

The various management measures developed will be implemented during construction and operations within the context of the Anadarko Management System (AMS). Figure 1.4 provides the framework within which the Project will address the identified impacts and risks. Section 7.0 of this document describes the ESMP associated Company Plans and commitments registers in more detail. Section 7.0 also describes management of contractors within the context of the ESMP.

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**Figure 1.4 – Anadarko Management System and Framework for Managing E&S impacts and risks**

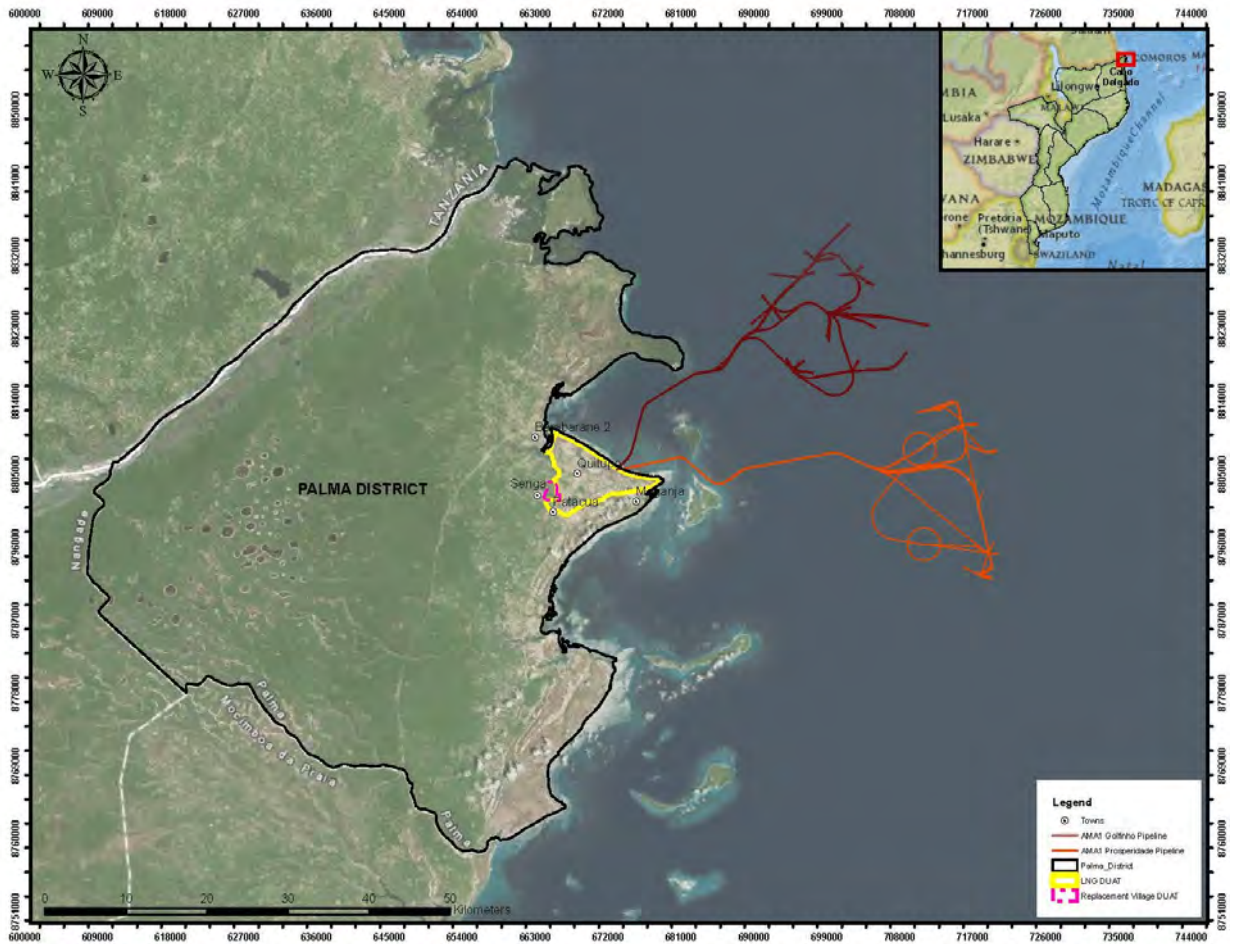
## 2.0 PROJECT DESCRIPTION

This section summarises the three main components of the Project:

- The Offshore Project in Area 1 includes production wells, development of gas reserves, and an offshore pipeline system to transport the natural gas from offshore gas fields to the onshore facilities.
- The Onshore Project includes the LNG facilities and other infrastructures (e.g. worker facilities, construction areas, access roads, and an airport).
- The Near Shore Project components include the marine infrastructure within Palma Bay. This is comprised of logistic, support and export facilities (e.g., shipping channels, MOF, and LNG Export Jetty).

Figure 2.1 shows the location of the Project.

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**Figure 2.1 – Project Locality<sup>3</sup>**

The sections below represent the current Project description based on current engineering and design. It differs from the Project description in the LNG Project EIA. The manner in which the Project changes were addressed is described in Section 3.6.



**2.1 Alternatives**

Site selection, pipeline routing and layout alternatives have been evaluated throughout the ESHIA process, with the environment and social team working closely with, or in cooperation with the engineering / facilities team.<sup>4</sup> In all cases, alternatives were evaluated based on environmental and social risks and impacts, technical feasibility and

<sup>3</sup> The Prosperidade field (in the southern portion of Area 1) will be developed some time in the future but is not part of the current Plan of Development.

<sup>4</sup> Technology and process alternatives were still being evaluated as part of the FEED process which had not concluded at the time of writing the LNG Project EIA. However, environmental and social considerations to avoid, minimise and mitigate impacts were integrated into the FEED process by means of dedicated environmental and social interfaces with the FEED contractors. A register of environmental and social mitigations (from the EIA) was provided to FEED contractors to integrate into their design and construction plans.



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financial feasibility criteria. A key focus of the alternatives analysis was to avoid, minimise and mitigate potential environmental and social impacts.

Seven locations along Mozambique’s coast were initially evaluated for the location of the LNG Facility. After screening out four alternatives, three were investigated in more detail. After various site visits and assessments, two locations (namely the Cabo Delgado Peninsula and the Afungi Peninsula) were selected for further investigation. Three sites within the Cabo Delgado location and two sites within the Afungi location were investigated in detail. Based on a range of environmental (e.g., sensitive habitats and fauna), social (e.g., number of people and area of cultivated land), and technical criteria (e.g., gas pipeline access to the site), the team selected a site on the northern side of the Afungi Peninsula. Pipeline routes in the bay and the layout of the various onshore components were all investigated and optimum layouts were selected to minimise potential environmental and social impacts. The selected site and layouts are described in more detail in the following sections.

## **2.2 Offshore Project Component**



The subsea gas fields are located approximately 50 km offshore in the northern and eastern parts of Area 1. In excess of 65 trillion cubic feet (TCF) of recoverable natural gas has been identified in Area 1.

The Offshore Project entails the development of the Golfinho field (northern portion of Area 1) initially. At some point in the future, the Prosperidade field (in the southern portion of Area 1) will also be developed. Current Front End Engineering and Design (FEED) is focused on the Golfinho field. Development and production at Golfinho field will yield approximately 15 trillion standard cubic feet from up to 55 wells. Transport of natural gas will occur via subsea pipelines which are routed in a corridor to the onshore LNG facilities.

### **2.2.1 Offshore Drilling Campaign**

Wells will be drilled and completed at a rate of approximately one well every 50 days. A dynamically positioned (DP) Mobile Offshore Drilling Unit (MODU) is proposed to conduct the drilling of the wells. The MODU will flare gas on average for 1.5 days per well. In addition, produced water and completion brines will need to be discharged overboard from the MODU during drilling. During drilling, water-based muds (WBM) will be used for the top section of the well (100 m below the mud line) and low toxicity synthetic fluid (also called Non Aqueous Drilling Fluid, NADF) will be used for the remainder of the well. No oil based mud will be used during drilling. Treated cuttings discharged into the sea will have a maximum oil concentration (by weight of dry cuttings) of 6.9% or less. This is aligned with US Environment Protection Agency requirements in the Gulf of Mexico.

Support vessels will supply the MODU from Pemba and / or Afungi. Helicopters will transport crew and supplies from Afungi to the MODU. Any minor maintenance of the drilling unit will be undertaken in sheltered water in Palma Bay or Pemba Bay.

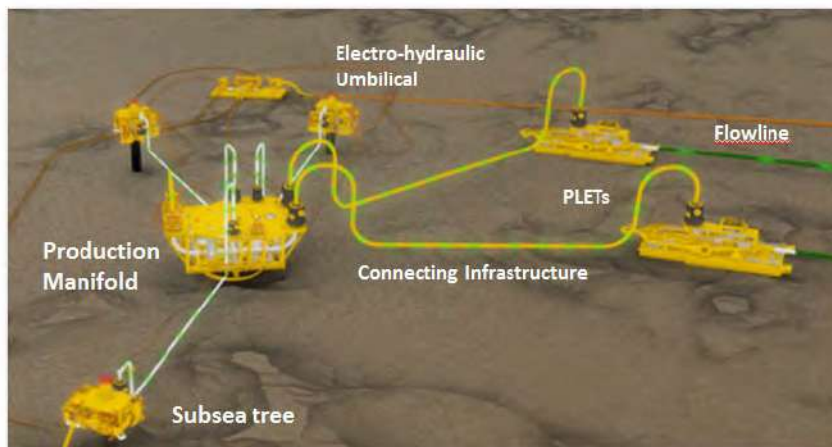
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**Figure 2.2 – Example of DP Drill Ship**

**2.2.2 Subsea Production Overview**

Natural gas from the production wells flows through the subsea production system and connecting infrastructure to a manifold that combines flow from other wells and directs the gas into the pipelines to the shore. To avoid the risk of interrupted gas flow due to hydrate formation, a monoethylene glycol (MEG) injection and recovery system is required. MEG is used to inhibit the formation of hydrates by altering the freezing point of the water found in the raw natural gas.



**Figure 2.3 – Indicative Layout of Subsea Production System**

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### **2.2.3 Construction of the Subsea Production System**

A workforce of approximately 1,400 construction staff and technicians is needed for construction. The work force will be accommodated onshore, on the offshore vessels and on a floatel, which will accommodate 300 to 400 people. The timeframe for this phase is up to approximately 4 to 5 years and during this time, up to 40 construction vessels may be present in the field at peak. A temporary exclusion zone of approximately 1,000m is required on both sides of the pipeline corridor. All Project vessels will follow the International Convention for the Protection of Pollution from Ships (MARPOL 73/78) regulations.

The installation of subsea pipelines and umbilical will be laid in a predetermined corridor (see the Golfinho pipeline corridor in Figure 2.1). The pipeline ends at the LNG Facility and umbilicals cease at the onshore control centre. The pipelines will be installed via a purpose-built, dynamically positioned (DP) lay barge. For installation in Palma Bay, approximately 6.4 million m<sup>3</sup> material (excluding backfill) is expected to be dredged for the Golfinho pipeline corridor. For the majority of the dredging, a trailing suction hopper dredger will be used. These vessels can hold their own loads by using pumps with pipes that drag along the seabed while in operation. A cutter suction dredger will be used to dredge the reef crossing around Cabo Delgado peninsula. Close to shore, an excavator (on land initially and then on a pontoon) will be used to dredge material.



### **2.2.4 Commissioning/Operation of the Subsea Production System and Pipeline**

Commissioning efforts include a variety of conformity checks and tests (including hydrostatic testing, a.k.a. hydrotesting) to verify that all components will perform effectively during operation. The plan for the disposal of hydrotest is based on if there are any residual chemicals in the water. Hydrotest will be re-used to test onshore facilities to the extent possible. If this is not possible, the hydrotest water used in the Subsea Production System will be discharged only after treatment in compliance with the IFC standards.

There will be no loss of injection chemicals from the umbilicals or MEG pipelines to the marine environment during normal production operations, however, during commissioning and dewatering of the MEG pipeline approximately 20 bbl glycol will need be discharged subsea in the gas field at a depth of approximately 1,000 m.

### **2.2.5 Potential Future Offshore Expansion**

There is a possibility of the need for expansion of the Subsea Production System based on future exploration activities, global demand for LNG, and potential cooperation with other oil and gas operators. If expansion of the production capacity of the onshore LNG Facility occurs, this expansion may require the Subsea Production System to expand to support this increased capacity. If there are additional pipelines needed to accommodate future expansion, the onshore control system will need to be upgraded because the delivery will exceed 6 BCF/day. The earliest approximate expansion date will occur 10 years after the start of production and will follow regulated processes to permit expansion activities.

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### 2.3 Onshore Project Component

The Onshore Project is designed to receive, treat, and convert natural gas from the Subsea Production System into a liquid. Two LNG trains will be constructed initially and additional trains are planned for future phases. Space for up to 14 trains has been allocated to include the potential for future growth (in line with the vision of an LNG Park by the Government of Mozambique). The total area of the LNG DUAT is approximately 6,625 ha. In addition 332.2 ha has been allocated for the Replacement Village, outside of the LNG DUAT, and 4,407 ha has been allocated by the District Administrator for replacement agricultural land. With the exception of the Replacement Village, replacement agricultural land, and associated infrastructure (e.g., community roads and Palma- Afungi road), Project infrastructure will be located within the EIA Revised Project Footprint Area. The Project components are shown in Figure 2.4.

#### 2.3.1 LNG Facility

LNG is produced by cooling natural gas below its condensing temperature (-163 C) and storing it near atmospheric pressure. Once liquefied, the gas volume is 1/600<sup>th</sup> of its volume in gaseous form thus making it more economical to transport and store. The raw gas collected from subsea gas pipelines undergoes pre-treatment to remove acid gas, heavier carbons, water, and mercury (equipment to remove mercury will be included as a precautionary measure). The gas stream is routed to a liquefaction unit to undergo various stages of chilling resulting in the stream being cooled and liquefied provided by the refrigeration cycle. The preferred liquefaction technology (i.e. Air Products and Chemicals Incorporated process, which is a propane, pre-cooled, mixed-refrigerant process known as AP-C3MR) has a nameplate capacity of 6.44 MTPA per train. Taking into account downtime, the actual annual capacity will be around 5.99 MTPA per train. The product will be higher pressure LNG that is then transferred to storage tanks prior to export. A flare system is required in the event of an emergency to provide over pressure protection of the equipment and piping, depressurisation capabilities for offshore gas and routine maintenance, and direct all flammable/toxic gas releases to a safe and environmentally suitable disposal route.

Current assessments of the gas composition indicate that approximately 6,000 to 15,000 barrels per day (bpd) of condensate per LNG Train is likely to be derived as a by-product of gas processing. Gas and liquids entering the facility from the gas pipelines are received in the inlet slug catchers and separated into individual streams. The liquid (condensate) is mixed with other liquid hydrocarbons collected from latter stages of the LNG liquefaction process. The condensate then undergoes further processing prior to storage in dedicated condensate storage tanks. Preliminary planning is for two condensate storage tanks, each with a 375,000 bbl capacity. Condensate will ultimately be offloaded to marine tankers for export.



# Mozambique LNG

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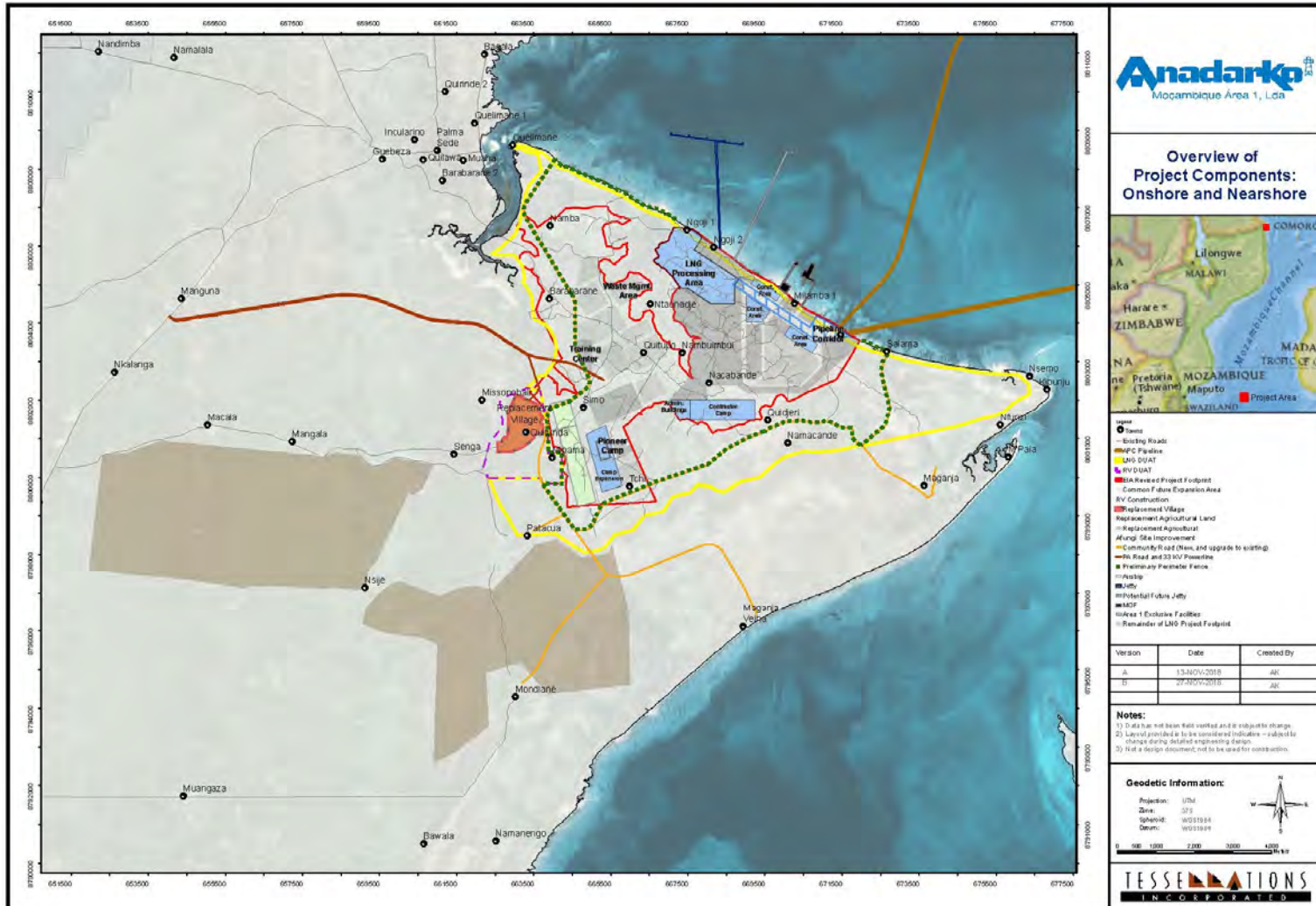




Figure 2.4 – Onshore Project Components

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### 2.3.2 Supporting Onshore Components

Onshore components associated with the LNG facility within the LNG DUAT comprise:

- Temporary and permanent accommodation facilities; temporary and permanent utilities including:
  - fuel gas system;
  - power generation and distribution;
  - water desalination plant;
  - water wells and water treatment;
  - sewage treatment facilities;
  - a waste management facility (including incinerators, landfill cells for non-hazardous waste, and leachate treatment); and
  - communication infrastructure.
- Buildings to accommodate: administration, recreation, training facilities, health facilities, control rooms, warehouses, maintenance shop, and security;
- Infrastructure to support logistics including roads and airstrip;
- Storage facilities including refrigerants, water, and fuel.

#### 2.3.2.1 Replacement Village



In order to develop the LNG facility and associated infrastructure, households from the village of Quitupo and some of its production zones (agricultural areas) (e.g. Simo, Milamba and Ngodji) need to be physically resettled to a safe and secure area. The RV will be constructed in the southwest corner of the LNG DUAT area, around Quitunda, to house these resettled communities. The Replacement Village will include housing, government and community facilities (such as a police station, administration centre, a primary school, places of worship, etc.), and associated infrastructure and utilities.

#### 2.3.2.2 Replacement Agricultural Land

The Resettlement Plan commits the Project to providing physically and economically displaced household with replacement agricultural land. The two areas identified for replacement agricultural land are outside of the LNG DUAT as shown in Figure 2.4 above. The land was surveyed to identify suitable areas for agriculture as well as areas that comprised ecologically sensitive and important habitats. As a result of the ecological surveys, approximately 1,135 ha of the replacement agricultural land has been identified as sensitive and will not be allocated as replacement land, reducing the area of land to be used for agriculture to 3,272 ha.

#### 2.3.2.3 Access Roads

An existing laterite road, the Afungi road, currently connects Afungi with the R762 National Highway. This road currently constitutes the only viable access into the Project area for construction traffic. However, as traffic volumes increase

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considerably before and during construction a new access road, designed to carry heavy loads is required. The Palma-Afungi Road (Figure 2.4) will allow for safe and efficient road transport using large heavy vehicles loaded with construction materials. The Palma-Afungi Road runs from the R762 (approximately 10 km south of Palma town), to the Project site. The road will be approximately 12 km in length, and falls for the most part outside of the LNG DUAT, with the last 2 km of the eastern extent of the road within the LNG DUAT.

In addition to the Palma-Afungi Road, there is a need for new community roads to link settlements to the north-south and east-west, as well as to replacement agricultural areas and fisheries areas. These roads will accommodate bicycles, motorcycles and public transport, and are referred to as ‘Community Roads’ (Figure 2.4). The purpose of the Community Roads is primarily to provide access from the Replacement Village to beach areas, to the replacement agricultural land, and to other areas outside of the Project site.

### **2.3.3 Construction of the Onshore Project**

The EPC Contractor is accountable for the final design of the LNG Facility (Onshore and Near Shore Projects) and supporting infrastructure. The contractor will ensure compliance with all applicable Mozambican safety and environmental regulations, standards, and permit conditions, and with AMA1 policies to comply with all legal requirements during the Construction Phase of the Project. All contractors and subcontractors are required to comply with all measures outlined in the ESMP.

### **2.3.4 Construction Phase**

Construction will last 65 to 70 months (i.e., between 5-6 years) and will include earthworks; piling; concrete foundations; borrow pits, welding; installation of pipe racks, tanks, piping, power and control systems; construction of the waste management facility, training centre, airstrip; all roads; erection of permanent buildings; and utilities and services. In addition, a domestic gas pipeline will be constructed within the EIA Revised Project Footprint Area. Other portions of the LNG Facility will be constructed off site at various locations and transported to site.



This phase requires an approximate workforce of 12,000 to 13,000 at peak. Workers who live in surrounding communities will be bussed in daily. Approximately 20 percent of the workforce needed for the construction of the first LNG Train would be Mozambican nationals.

### **2.3.5 Commissioning of the Onshore Project**

The commissioning period takes approximately six to eight months with a start-up period in the final two months of commissioning. Flaring (discharge of burned gas) will occur during start up. Some venting (discharge of unburned gas) may occur. During integrity testing, hydrotest water will be discharged into the bay. Where possible, pneumatic testing will be used.

### **2.3.6 Operation of the Onshore Project**

The LNG Facility has an approximate 30-year service life span. Operations will comply with applicable Mozambican regulations and relevant IFC Environmental, Health and Safety Guidelines. Activities associated with the Project include the following:

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- Operation and maintenance of the LNG processing equipment and supporting facilities (power, water and waste management);
- Operation and maintenance of the permanent operations camp;
- Operation and maintenance of logistics facilities (to and from the Project site via land, sea, and air); and
- Site security.

The LNG Facility will be operational 24 hours a day. The typical operation staff will be approximately 700 personnel, but additional staff will be needed for shut-downs and maintenance. Shutdowns will occur every few years and maintenance will occur once every two to three years. Minor shutdowns may occur more often and require 50-100 additional personnel. Between 500 to 1,000 additional personnel would be needed during a major shutdown.

### **2.3.7 Future Expansion of the Onshore Project**

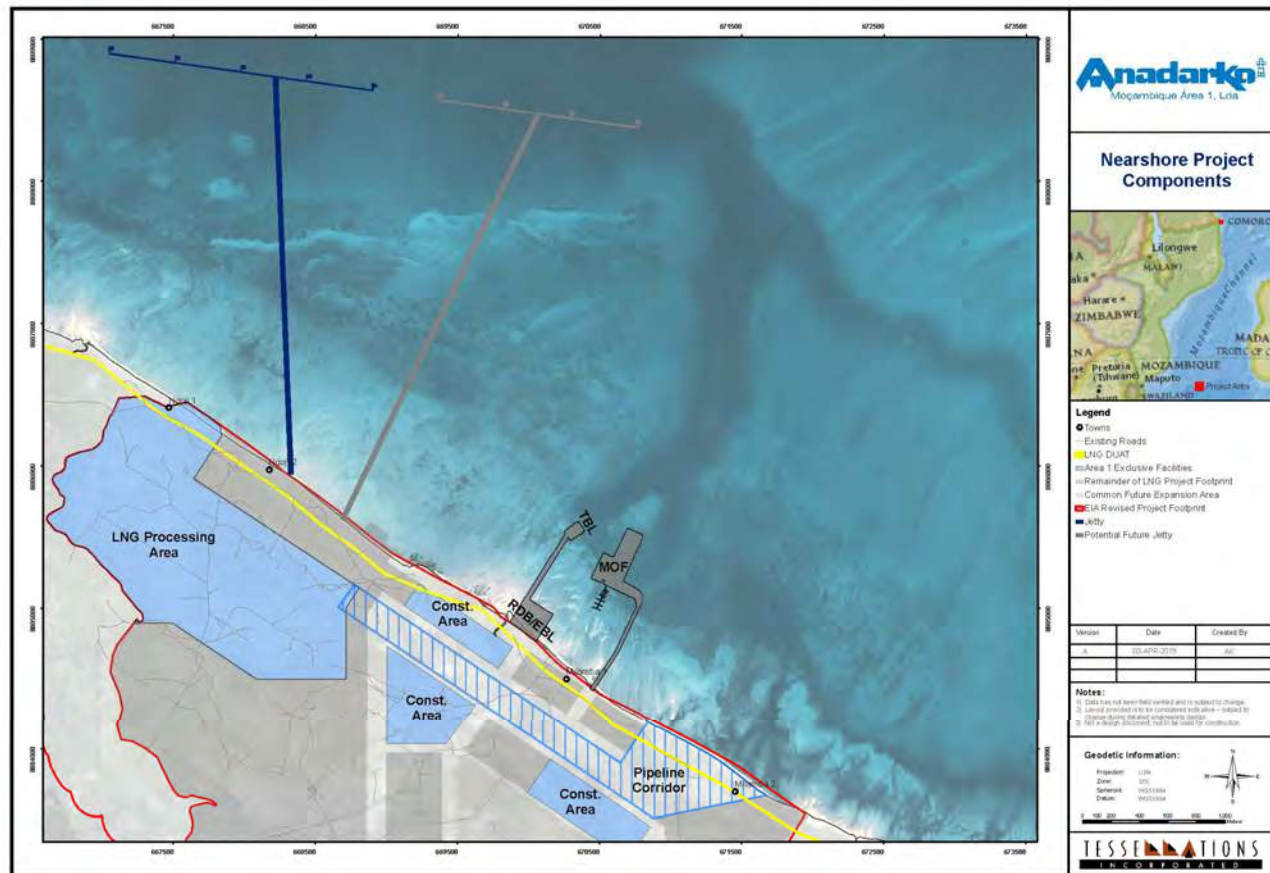
The Project will invest in other infrastructures including pipelines and additional space for future growth and without needing to shut down any current operations. The timeline will be determined on supply and demand of natural gas and will meet regulatory requirements.

## **2.4 Near Shore Project Components**

The Near Shore Project includes the interconnection of the marine facilities and Onshore components of the overall Project. The design includes the marine facilities associated with the LNG Facility and the supporting infrastructures needed to maintain effective operations. Near Shore components (Figure 2.5) include:

- Temporary Beach Landing (TBL) constructed in stages starting with a Rapid Deployment Beach Landing and followed by an Early Beach Landing;
- Materials Offloading Facility (MOF)
- LNG Export Jetty;
- Mooring dolphins;
- Navigation channel;
- Navigation aids; and
- LNG loading facilities.





**Figure 2.5 – Near Shore Project Components**



The Near shore Project components will serve as the focal point for the development of all phases of the Project starting from construction to the exportation of LNG to the global market. During construction, a safety exclusion zone of 500 m will be established. During the Operational Phase, a permanent safety zone of up to 1500 m will be established around the MOF and LNG Export Jetty.

The TBL serves as a temporary structure and, if needed, a permanent structure upon completion of the Construction Phase. If not needed, the TBL will be decommissioned and removed at construction end. The MOF serves as a supporting structure during the Construction Phase to transport heavy equipment onsite.

#### **2.4.1 Construction of Near Shore Project**

The associated activities involved with construction include dredging, construction of the TBL, MOF, and construction of the LNG Export Jetty and berths. These facilities will be shared with Area 4, but constructed by Area 1.

The first phase of construction will entail a Rapid Deployment Beach Landing, as it can quickly allow equipment and material to come ashore via groundable barges or

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similar. Thereafter it will morph into an Early Beach Landing, which will have a quay or bulkhead for small barges, or similar, to moor. The Early Beach Landing will be used while the TBL is being constructed. The TBL (comprising two lift on/ lift off berths and two roll on/ roll off berths) will remain in place through construction until the MOF is in place. The TBL (located to the west of the MOF) is anticipated to be approximately 230 m wide and extend approximately 845m from the shoreline.

The MOF structure is anticipated to be approximately 415 m wide and extend to approximately 1,000 m from the shoreline. The TBL and MOF are anticipated to stand approximately 5-6 m above lowest astronomical tide (LAT)<sup>5</sup>.

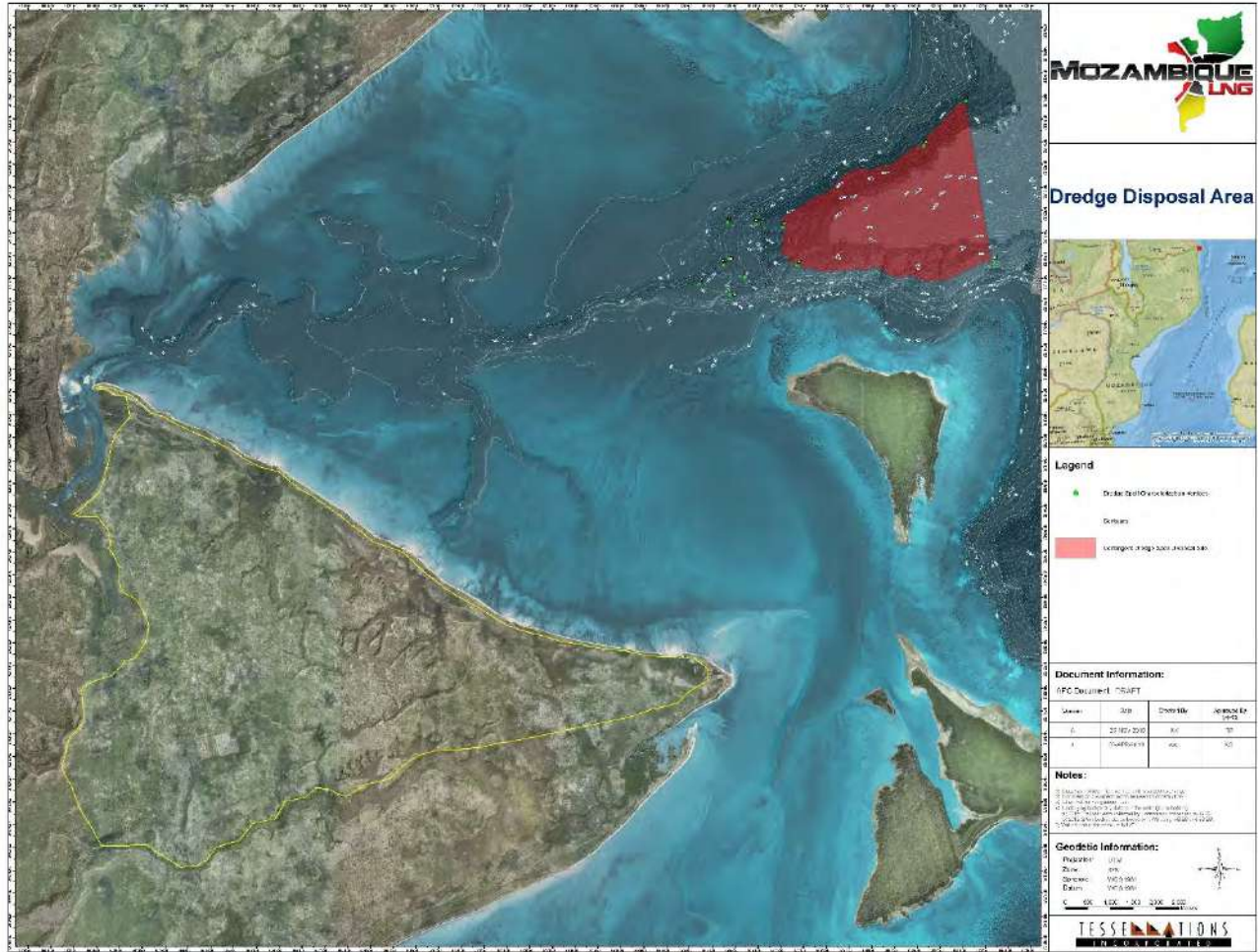
The Early Beach Landing, TBL and MOF will require piling. The EBL will have up to 655 sheet piles and four cylindrical piles. The TBL will have up to 2,070 sheet piles and 10 or 12 cylindrical piles. The MOF will have a combi-wall system of piles comprising 450 king piles and approximately 800 sheet piles. All the MOF piles will be driven onshore (on reclaimed areas). For the EBL and TBL most of the piles will be driven in the intertidal zone.

The Jetty will comprise of four dedicated LNG berths and one multipurpose berth for condensate loading and potential future LNG loading. The berths will be connected to the onshore facilities by an approximately 3.5 km access trestle. It is anticipated that the trestle will be approximately 9 m above LAT and have a total width of approximately 33 m to accommodate a roadway and pipe rack, separated by concrete barriers. The LNG berth is comprises a loading platform and several dolphin berthing systems<sup>6</sup>. The jetty will have approximately 1,400 cylindrical piles, most of which will be driven in the nearshore.

Dredging will be down to -10.5 m LAT at selected areas for the TBL and MOF. For the Jetty, dredging will be down to -14 to 15 m LAT. Dredging will also be required for the main access channel to the Jetty, an anchorage area, and the approach channel to the MOF. Total dredge volumes for the Near Shore facilities is conservatively estimated at 12.2 million m<sup>3</sup>. Studies are underway to investigate reducing depths and/ or widths of channels, thereby reducing dredge volumes. Dredged material will be disposed within the dredge disposal area shown in Figure 2.6. Prior to disposal, the site will be surveyed and any environmental sensitivities (such as coral) will be identified. Subsequent disposal will be planned to avoid environmentally sensitive area to the extent practicable.

<sup>5</sup> The Lowest Astronomical Tide (LAT) is an internationally standardised reference size for measuring the depth of water and to define the coastal line in sea charts. It is the lowest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions.

<sup>6</sup> A dolphin is an isolated man-made marine structure for berthing and mooring of vessels; they are used where piers or quays for docking vessels are not appropriate, and thus enable the reduction of the length of the pier.





**Figure 2.6 – Offshore Dredge Disposal Site**

**2.4.1.1 Fibre Optics Cable**

AMA1 and Area 4 are investigating the option of providing internet services to the site via a marine fibre optics cable. The cable will make landfall at one or two points (depending on whether redundancy will be built in) along the shore. The alignment and shore landing of the potential fibre optics cable are still being investigated, however it is anticipated that the cable will come onshore somewhere on the western portion of the LNG DUAT. The possible back-up, redundant cable would come ashore somewhere on the eastern portion of the LNG DUAT.

**2.4.2 Future Expansion**

Future expansion of the offshore and onshore facilities may be needed, based on future exploration activities, global demand for LNG and potential cooperation with other oil and gas operators within the region.

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### **2.4.3 Commissioning of the Near Shore Project Facilities**

The commissioning activities will be similar to that of the Offshore and Onshore Project components. During this phase, the piping system will be commissioned simultaneously with the LNG Facility and will undergo hydrostatic, integrity, and systems control testing. The boil off gas-system will be tested as well along with the venting and flaring components to ensure safe conditions are in place while the LNG Facility is fully operational.

### **2.4.4 Operation of the Near Shore Project Facilities**

The MOF used to unload equipment associated with the activities of the LNG Facility. Tugs and support vessels assist the LNG Carriers via the following operations:

- Providing potential escort services for the LNG Carriers as they transit to the facilities;
- Providing assistance to the LNG Carriers during berthing and unberthing operations at the LNG Export Jetty; and
- Providing firefighting, rescue services, and spill response as required.

Patrol boats enforce the moving exclusion zone around LNG Carriers while they are under pilot control.

Once at the LNG Export Jetty berthing area, the terminal systems will load LNG Carriers at approximately 12,000 m<sup>3</sup> per hour.

## **2.5 Associated Facilities**

Associated facilities are 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. The following potential associated facilities have been identified at the time of writing (April 2019):



- Upgrade of the Mocímboa da Praia (MDP) Airport;
- Upgrade and expansion of Pemba Port.
- Quarries (or quarry) outside the DUAT area

### **2.5.1 Upgrading Port of Pemba**

The upgrade of Pemba Port is to be undertaken by the Government of Mozambique to support industrial development (including exploration and production projects) in Northern Mozambique. The Project may use the upgraded facilities to support drilling activities. In addition the port may be used to support subsea construction. However, the Project is still viable without the upgrade. Any impacts and mitigation measures associated with these upgrades will be addressed by the Government of Mozambique in accordance with the relevant environmental regulations.

### **2.5.2 Upgrading MDP Airport**

Aerportos de Moçambique plans on upgrading the MDP airport. The upgrade entails, resurfacing the airstrip with asphalt, and improving the fencing and runway signage to improve safety during aviation operations. The operational aspects of the airport will continue to be managed by the Government of Mozambique. AMA1

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supported the planned upgrades by providing runway lights and precision approach path indicator lights. The Project is still viable without the upgrade occurring.

### **2.5.3 New or Expanded Quarries**

The location of these quarry site(s) have not yet been confirmed but the EPC Contractor is investigating a quarry in near the town of Mueda in Cabo Delgado Province (150 to 200 km southwest of the Project site). At this stage, it is possible that new sites would be required or that existing sites would be upgraded to provide the Project's needs. For new quarries, being operated by the EPC Contractor, the ESMP and Company Management Plans would be implemented to mitigate potential environmental or social impacts. For existing quarries that are expanded to provide material for the Project, the Project will conduct a due diligence to assess any environmental or social risks and impacts. Where possible the Project will leverage its commercial relationship with the third party to operate their facilities consistent with the ESMP. Where practicable, the Project will support or supplement the actions of the third party operators in managing environmental or social impacts. To date, the Replacement Village and Palma-Afungi Road contractors have identified a quarry in the vicinity of the Cabo Delgado Peninsula. AMA1 has reviewed the operator of the Quionga quarry's EMP and have requested updates to meet appropriate environmental and social requirements to align with the Project's commitments and with Good International Industry Practice.



## **3.0 ENVIRONMENTAL LICENSING**

The following sections summarise the various submissions to acquire environmental licenses for the Project. Section 3.1 summarise the LNG Project EIA. Since the time of writing the document, Project details were updated. These Project description updates, together with updated impact assessments and/ or mitigations are summarised in Section 3.6.

### **3.1 The LNG Project EIA (2011 to 2014)**

An Environmental Impact Assessment (EIA; ref.: EA-MZ-SR0100-ERM-U17-00001-00) was undertaken for AMA1 and MRV for onshore and offshore LNG facilities and associated infrastructure associated with both Area 1 and Area 4 Projects. AMA1 initially led the EIA process for the Project (i.e. the LNG Project EIA) since April 2011, with MRV joining as a joint proponent in 2013. The LNG Project EIA was submitted to the Ministry for the Coordination of Environmental Affairs (MICOA), which is now called the Ministry of Land, Environment and Rural Development (MITADER), in February 2014.

The LNG Project EIA was compiled to comply with the Mozambican EIA regulations, mainly Decree No. 56/2010, of 22 November, which approves the Environmental Regulations for Petroleum Operations and Decree No. 45/2004, of 29 September (as amended by and Decree No. 42/2008 of 4 November), which amends some articles of Decree No. 45/2004). The LNG Project EIA also complied with the Environmental Regulations for Petroleum Operations is set out in Decree No. 56/2010 of 22 November. In December 2013, the EIA regulations were updated. The LNG EIA was approved in June, 2014 and a condition of approval was that the environmental license would only be issued once the Resettlement Plan was approved (see Section 4.2). As far as was reasonably practicable, the LNG EIA also aligned itself with the IFC EHS Guidelines (2007).

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The purpose of the LNG Project EIA was to predict the significance of the Project's impacts on the baseline physical, biological, and socio-economic environment; and to identify measures needed to minimise negative impacts and maximise the positive impacts. This information was used to assist the Government of Mozambique in their decision-making process. Figure 3.1 illustrates the EIA process followed.

The various consultation meetings (during the Scoping Phase, Impact Assessment Phase and at several stages in the Resettlement Planning process) are described in Section 8.0 of this document.



**Figure 3.1 – EIA Process Flow**

### 3.1.1 Site Selection



As a part of the initial Project planning in 2011, a high-level analysis of baseline sensitivities was conducted to identify an appropriate location for the onshore facilities and near shore infrastructure. These analyses were performed to highlight key baseline sensitivities, red flags, or harmful flaws from a socio-economic and biophysical viewpoint of potentially suitable sites for the onshore LNG facility along the northern coast of the Cabo Delgado Province.

Site visits were conducted in May, June, and August of 2011 by environmental and social specialists, and the Engineering Team to gather environmental and social data of alternative sites and evaluate the suitability of the site alternatives from a technical perspective. These investigations formed the baseline for the site selection process (also described in Section 3.1.1 of this document and in detail in Chapter 5 of the LNG Project EIA). The EIA Team, along with environmental and social specialists, evaluated the sensitivities and constraints of the sites under consideration. This process included assessing the technical, environmental, health, and social impacts associated with using each alternative for development of an onshore LNG facility. With the available information, it was concluded that the Afungi site was the preferred alternative for assessment in the LNG Project EIA.

### 3.1.2 Prediction, Evaluation and Mitigating Impacts

#### 3.1.2.1 Predicting and Evaluating Impacts

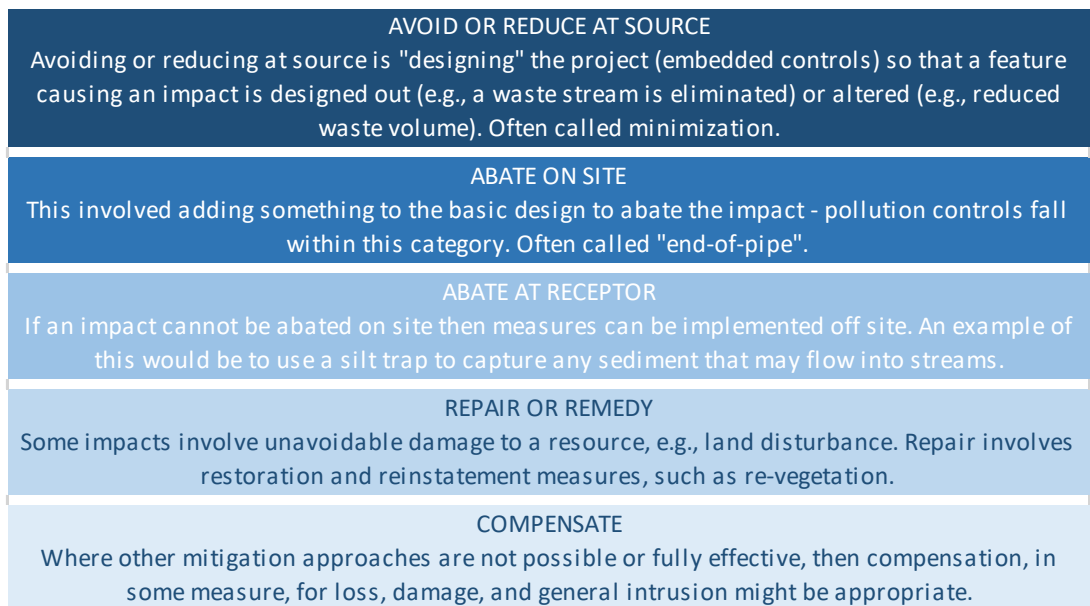
Impacts were identified by the EIA Team with inputs from stakeholders (e.g., local communities, government departments, and local communities).

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An impact refers to a change in a resource or receptor that is created by the development of the Project or a Project-related activity. Environmental impacts include physical aspects such as changes in air quality and biological factors. Socio-economic impacts refer to effects of the Project on people and their livelihoods. The categories of significance used in the LNG Project EIA ranged from Negligible to Major.

### 3.1.2.2 Mitigating Impacts



The Project aimed to avoid impacts to the best extent practical. If impacts could not be avoided, they were mitigated or optimised using measures that would provide for the least negative impact or most positive impact possible. In cases where these first two strategies were not possible, the Project aimed to remediate impacts where possible and investigate options for compensation or offsets where necessary or required. Figure 3.2 illustrates the “Mitigation Hierarchy for Planned Project Activities”.



**Figure 3.2 – Mitigation Hierarchy**

### 3.1.3 Summary Offshore Environmental Impacts

The offshore project location is in deep waters up to 2,300 m. This area supports a large number of marine mammals, as well as numerous fish species, turtles, and sea birds. Reef structures have also been observed in the deep water environment. Project activities that could potentially impact this baseline include well drilling and the discharge of treated drill cuttings and residual muds, disposal of dredged material, and installation of subsea infrastructures.

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**Table 3-1: Summary of Offshore Impacts**

Project Impacts	Impact Significance Level Pre-Mitigation	Impact Significance Level Post-Mitigation
Discharge of drill cuttings	MINOR	<b>NEGLIGIBLE to MINOR</b>
Discharge of residual muds	MINOR	<b>NEGLIGIBLE</b>
Discharge of hydrotest water	NEGLIGIBLE	-
Increased traffic	NEGLIGIBLE TO MODERATE	<b>NEGLIGIBLE</b>
Habitat modification	MODERATE	<b>NEGLIGIBLE</b>

**Impacts of discharged drill cuttings:** Dispersion modelling indicates that the effects to offshore benthic flora and fauna (physical inundation) will be of MINOR significance before and after mitigation. The drilling of offshore production wells has the potential to impact water quality and marine ecology. With mitigation measures in place, the impact significance would be reduced to *NEGLIGIBLE to MINOR* significance.

Deepwater reef structures and organisms may be subject to more severe impacts. Reef structure growth is a slow process, so any significant impact may prolong their recovery time. Due to this, the impact significance would be MODERATE before mitigation. Most reef communities in this area are comprised of scattered rock and sediment with low numbers of marine life. With mitigation measures in place, this impact significance would be reduced to *MINOR*.



**Impacts of discharged residual muds:** Impacts from this activity on marine organisms are expected to be of MINOR significance because the muds from the drill cuttings after treatment are of low toxicity levels. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE*.

**Impacts of discharged hydrotest water:** Impacts from this activity on marine ecology/processes are expected to be of *NEGLIGIBLE* significance because the hydrotest water will be discharged in a phased approach and at pressures that will allow for the water quality effects to happen in close proximity of the release points.

**Impacts of increased traffic:** Impacts from this activity (e.g. vessel and helicopter noise, lighting, and movements) on offshore marine ecology, except marine mammals, are expected to be of *NEGLIGIBLE* significance. Vessel collisions may have a greater impact on whales due to their conservational importance and will be of MODERATE significance. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE*.

**Impacts of habitat modification:** Impacts from this activity (subsea infrastructure being built on the seabed) will result in changes to the composition of the seabed and affect the diversity and structure of the benthic marine community. These impacts will be of MODERATE significance, especially at deep water reef structures. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE* as the location of the subsea structures will avoid sensitive marine areas to the extent practical.



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### 3.1.4 Summary of Near Shore Environmental Impacts

The near shore location in Palma Bay has a variety of different benthic habitats and supports sea grass beds and associated organisms close to shore. Coral reefs are also located throughout the bay and around the islands of Tecomaji and Rongui. Project activities that could affect this baseline include dredging, installation of pipelines, and the construction of the jetties and Multi-Purpose Dock.



**Table 3-2: Summary of Near Shore Impacts**

Impact	Impact Significance Level Pre-Mitigation	Impact Significance Level Post-Mitigation
Dredging	MAJOR	MINOR TO MAJOR
Modification of the beach	MODERATE	MINOR
Increased noise	MODERATE	MINOR
Alien invasive species	MODERATE	MODERATE
Discharge into the bay	NEGLIGIBLE to MINOR	NEGLIGIBLE
Waste discharges	MODERATE	NEGLIGIBLE
Loss of estuary/mangroves	MODERATE	MODERATE
Security exclusion zones	MINOR	MINOR

**Impacts of dredging:** Impacts from this activity (e.g., increased turbidity, cutting a trench, deposition of fine sediment, and modifications of the seabed) on marine life including seagrass, coral, and associated marine communities are expected to be of MAJOR significance. With mitigation measures in place, including changing the activity technique, avoiding highly sensitive areas, and reducing turbidity, the significance of the proposed activities will be largely reduced. The deposition of fine sediment will remain as a MAJOR significance because resuspension of particles will be unavoidable. Dredged material deposited in a dredge placement area (Afungi Canyon in Palma Bay) will result in negative impacts by covering the benthos and will be at a MODERATE significance. With mitigation measures in place, this impact significance would be reduced to MINOR as the benthos will recover within 1 to 3 years after cessation of dredging.

**Impacts of beach modification:** Impacts from this activity (e.g. installation of infrastructures on the intertidal beaches and extending into the shallow subtidal zone) will result in a loss of parts of the sand beach, subtidal zones, and seagrass meadows. The establishment of hard substrate communities in the intertidal zone along with the corals, sponges, and other associated organisms will take place. Colonisation of invasive species may also be of concern. These impacts are expected to be of MODERATE significance. With mitigation measures in place, including design modification, the impact significance of the proposed activities will be reduced to MINOR.

**Impacts of increased noise:** Impacts from this activity (e.g. pile driving in Palma Bay) on fish, whales, dolphins, and turtles are expected to be of MODERATE significance. With mitigation measures in place, this impact significance would be reduced to MINOR should a 'soft start' method be utilised prior to the commencing of construction activities.

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**Impacts of alien invasive species:** Impacts from this activity (transferring of invasive species into Palma Bay via ballast water) on the biodiversity and marine ecology of the area are expected to be of MODERATE significance. With control measures and processing techniques in place as sanctioned by the International Maritime Organisation (IMO), this impact significance would be further reduced. Due to the possibility that invasive organisms may become established, the significance of this impact would remain as *MODERATE*.

**Impacts of discharges into the bay:** Impacts from this activity (e.g. discharges from the water treatment plants from the LNG Facility) on near shore water quality and marine organisms in Palma Bay are expected to be of NEGLIGIBLE to MINOR significance. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE*.

**Impacts of waste charges:** Impacts from this activity (e.g. discharges of solid and liquid waste from marine vessels) on marine organisms in Palma Bay are expected to be of MODERATE significance. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE*.

**Impacts of estuary loss and its mangroves:** Impacts from this activity (Project construction activities) resulting in the loss of the estuary and associated mangroves to the east of the Project site are expected to be of MODERATE significance on marine ecology. The impact significance will remain *MODERATE* due to the loss of the multi-species mangrove stand.



**Impacts of the security exclusion zones:** Impacts from this activity (establishment of security exclusion zones) around the LNG Facility and Near Shore construction are expected to be of MINOR significance. This activity will disrupt the fishing efforts and locally increase pressure on the community outside the exclusions zones. No mitigation measures were identified in the LNG Project EIA. Thus the impact significance will remain *MINOR*.

### 3.1.5 Summary of Onshore Environmental Impacts

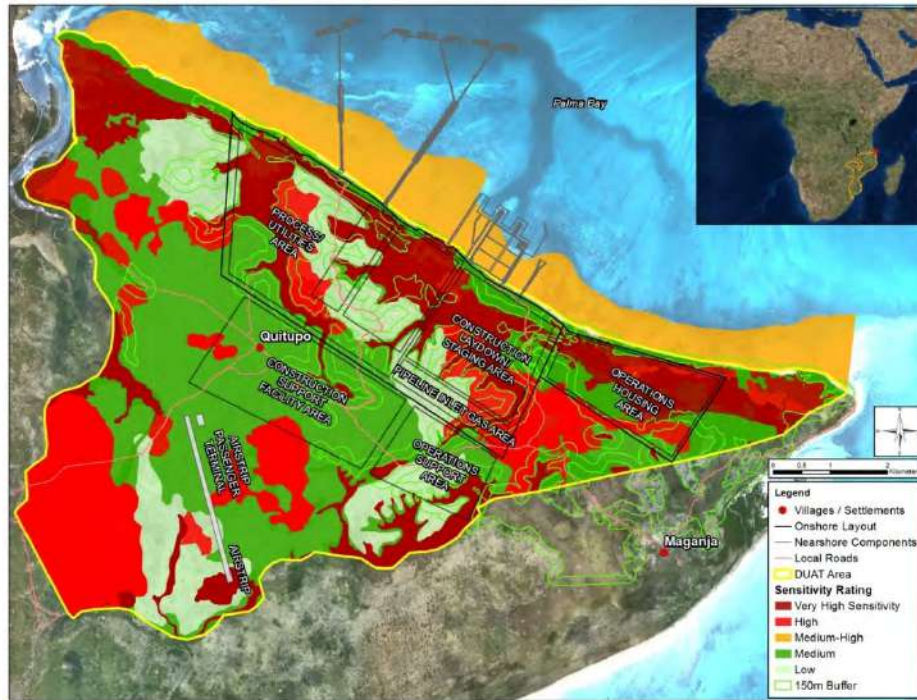
The onshore project area includes three main habitat types: marshlands, wetlands and woodlands. They support important animal and plant life within the Afungi Project Site. The project activities that could impact the baseline include the clearing of vegetation, infilling of estuaries and other site prepping activities during the Construction Phase, as well as accidental spills, runoff and sedimentation during the operation phase.

Based on the findings of the baselines studies undertaken during the LNG Project EIA, it became prudent to revise the footprint of the Onshore Project location due to the identification of mapped sensitive habitats for a variety of species. With interactions between the EIA and project team, methods were identified to reduce negative environmental impacts to the extent practical while still allowing for the necessary plant / construction area to be delineated. This mitigation effort enabled avoidance of some impacts while minimising others to as low as reasonably practicable (ALARP).

The impact on high to very high ecologically sensitive areas was reduced by 645 ha in the revised Project layout (refer to Figure 3.3 and Figure 3.4). The environmentally



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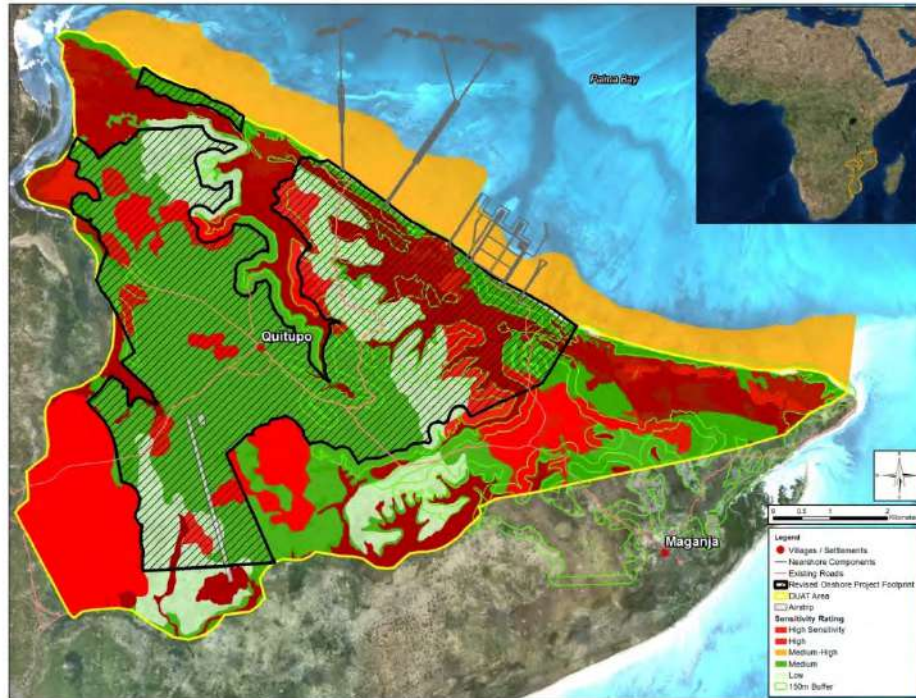
sensitive<sup>7</sup> areas were based on fieldwork in the DUAT area. Hence the sensitivities are not contextualised within the region. Post-EIA regional studies are described in Section 5.0 and the sensitivity mapping has been updated to provide the regional context.



**Figure 3.3 – Environmentally Sensitive Areas of the DUAT**

<sup>7</sup> Social sensitivities were not considered at this stage as the initial intention was for communities within the DUAT area to be resettled to outside the DUAT.

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**Figure 3.4 – Revised Onshore Project Footprint Area to minimise impact on Sensitive Areas**

**Table 3-3: Summary of Onshore Impacts**

Impact	Impact Significance Level Pre-Mitigation	Impact Significance Level Post-Mitigation
Air Emissions During Operations:		
Two-Train LNG Facility	MINOR	<b>NEGLIGIBLE</b>
Six-Train LNG Facility	MODERATE	<b>MODERATE</b>
Emissions of Greenhouse Gases	MAJOR	<b>MAJOR</b>
Noise Generation	MINOR	<b>NEGLIGIBLE</b>
Visual Landscape:		
Construction Phase	MODERATE to MAJOR	<b>MINOR</b>
Operation Phase	MAJOR	<b>MODERATE</b>
Clearing of Soil	MODERATE	<b>NEGLIGIBLE to MINOR</b>
Groundwater Use	NEGLIGIBLE	<b>NEGLIGIBLE</b>
Construction in Marine Sensitive Habitats	MAJOR	<b>MODERATE</b>
Clearing of Site:		
Vegetation	MODERATE	<b>MINOR</b>
Reptiles and Amphibians	MODERATE to MAJOR	<b>MINOR to MODERATE</b>
Birds	MODERATE to MAJOR	<b>MINOR to MODERATE</b>
Mammals	MAJOR	<b>MINOR to MODERATE</b>

**Impacts of air emissions:** Impacts from this activity (operation phase of the LNG Facility) on human and ecological receptors outside of the Project site are expected

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to be of NEGLIGIBLE significance with SO<sub>2</sub> levels increasing the impact significance to MINOR. With mitigation measures in place, this impact significance would be reduced to *NEGLIGIBLE*. If the expansion of the LNG Facility from two trains to six trains occurs, the significance will be raised to *MODERATE*.

**Impacts of emissions of greenhouse gases (GHG):** Impacts from this activity (construction and operation phases of the LNG Facility) could result in the Project accounting for nearly 10 percent of Mozambique’s national annual GHG emissions. . These impacts are expected to be of MAJOR significance. With good practices in place, this impact significance will remain at *MAJOR*.

**Impacts of noise generation:** Impacts from this activity (construction and operation phases of the LNG Facility) are expected to be of NEGLIGIBLE to MINOR significance. With noise levels required to remain in compliance with Mozambican and IFC noise limit/standards, this impact significance will remain at *NEGLIGIBLE to MINOR*.

**Impacts to the visual landscape:** Impacts from this activity (movement of vessels and highly visible equipment) on the visual landscape of the Palma Bay Seascape will have an impact of MODERATE to MAJOR significance during the Construction Phase. This impact will increase to MAJOR during the operation phase with the introduction of long term presence of the LNG and associated facilities. Locations further from the Project site will have impacts of *MINOR* significance during the Construction Phase and *MODERATE* significance during the operation phase of the LNG Facility.



**Impacts of soil clearing:** Impacts from this activity (clearing of the LNG Facility area during construction) causing soil compaction, topsoil loss, soil erosion, and alteration of natural drainage are expected to be of MODERATE significance. With mitigation measures in place, this impact significance will be reduced to *NEGLIGIBLE to MINOR*.

**Impacts of groundwater use:** Impacts from this activity (groundwater abstraction from the production well supply wells) causing lowering of groundwater levels in and around abstraction boreholes are expected to be of NEGLIGIBLE significance to the surrounding community water supply and environmental receptors utilising surface water. This impact significance will remain at *NEGLIGIBLE*.

**Impacts on surface water ecology:** Impacts from this activity (Construction Phase of the LNG Facility) causing loss of wetland and estuarine habitats are expected to be of MAJOR significance to the ecological functions of the environment. With mitigation measures in place, including the revision of the Project footprint to avoid highly sensitive area to the extent practical, will reduce the impact significance to *MODERATE*.

**Impacts of site clearing:**

**On vegetation:** Impacts from site clearing activities on vegetation, causing fragmentation and removal/disturbance of some sensitive vegetation units, are expected to result in an impact of MODERATE significance. With mitigation measures in place, including the revision of the Project footprint, the impact significance will be reduced to *MINOR*.

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**On reptiles and amphibians:** Impacts associated with site clearing activities on reptiles and amphibians will include the following: loss of habitat due to infilling of wetland areas, increased mortality, and reduced breeding success. These impacts are expected to be of MODERATE to MINOR significance. With mitigation measures in place, including the revision of the Project footprint, the impact significance will be reduced to *MINOR*.

**On birds:** Impacts from site clearing activities on birds, causing loss of estuarine salt marshes, freshwater wetlands, large forests and inter-tidal zone habitats, are expected to result in an impact of MODERATE to MAJOR significance. The introduction of feral animals due to the population influx may also result in a reduction of the habitat quality. With mitigation measures in place, including the revision of the Project footprint, the impact significance will be reduced to *MINOR to MODERATE*.



**On mammals:** Impacts from site clearing activities on mammals, including the loss/fragmentation of habitat and the loss of the ability to escape construction equipment, are expected to result in an impact of MAJOR significance. The influx of people into the Project area will also result in indirect impacts to the mammals and their habitat. With mitigation measures in place, including the revision of the Project footprint, the impact significance will be reduced to *MODERATE*.

### 3.1.6 Summary of Social Impacts

The Project site is located within Palma District. Most people over the age of 15 in the district have received no formal education and illiteracy is high in the area. Formal employment is scarce and almost non-existent within the private sector. The majority of the population in the Project site are therefore highly dependent on natural resources such as fishing and small scale agricultural activities. There are very few health care facilities in Palma District yet communities are regularly at risk of health problems arising from water and sanitation. The communities largely use natural water sources, such as open wells and streams. The sanitation in the area is poor with few formal toilets; this puts the water sources at risk with potential for out breaks of diarrhoea and cholera. The main Project activities that could change socio-economic conditions include the removal of access to land on the Afungi Peninsula, removal of access to parts of Palma Bay, an increasing in-migrant population within the Project area, training and employment of local people and use of local goods and services.

**Table 3-4: Summary of Key Social Impacts**

Impact	Impact Significance Level Pre-Mitigation	Impact Significance Level Post-Mitigation
Tourism	MAJOR	MODERATE
In-migration	MAJOR	MODERATE
Community health	MAJOR	MODERATE to MAJOR
Local, regional, and national economy	MINOR (positive) to MAJOR (positive)	MINOR (positive) to MAJOR (positive)
Increase in marine vessel movement	NEGLIGIBLE to MODERATE	NEGLIGIBLE to MINOR
Archaeology:		
Onshore	MODERATE	NEGLIGIBLE to MINOR
Offshore	MINOR	NEGLIGIBLE to MINOR

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**Impacts on tourism:** Impacts from visual and noise activities associated with Project construction and operations are expected to be of MAJOR significance on tourism. These impacts include disruption and loss of attraction to tourism destinations on the islands of Tecomaji, Rongui, and Queramimbi. With mitigation measures in place, such as revising the Project design to minimise visual intrusion, the impact significance will be reduced to *MINOR*.

**Impacts of in-migration:** Impacts from Project-associated in-migration on the socio-economic environment on the local communities are expected to be of MAJOR significance. These include indirect negative environmental, social, and economic impacts on local receptors such as social services, infrastructures, utilities, cultural life, and livelihoods. With mitigation measures in place, including coordination with relevant authorities, the impact significance will be reduced to *MODERATE*. See Section 4.4 of this document for an update on PIIM.



**Impacts on community health:** Impacts from the Project workforce and in-migration on community health are expected to be of MAJOR significance. These include communicable diseases, increased demand on health infrastructure, food and nutrition related issues, and community accidents. With mitigation measures in place, the impact significance will be reduced to *MODERATE*, but some impacts (e.g. increase in sexually-transmitted diseases) will remain as MAJOR. Positive impacts are expected to be of *MODERATE to MAJOR* significance with the implementation of enhancement measures promoting community health benefits. See Section 4.3 of this document for an update on community health impacts.

**Impacts on local, regional, and national economy:** Impacts from Project activities are expected to be of *MINOR positive to MAJOR positive* on the surrounding economies. These include income growth (increased employment rate and procurement), capacity development, and increased government revenue. With mitigation measures in place, including enhancing the economic benefits, the impact significance will remain at *MINOR positive to MAJOR positive*. A potential negative impact of unmet community expectations will be of *MODERATE* significance and remain as such throughout the Project life.

**Impacts from increased marine vessel movement:** Impacts from Project activities on international maritime traffic and national regional cabotage are expected to be of *NEGLIGIBLE to MODERATE* significance with the presence of Project vessels and exclusion zones. With mitigation measures in place, the impact significance will be reduced to *NEGLIGIBLE to MINOR*. Commercial fishing impacts during the Construction Phase of the Project are also expected to be of *NEGLIGIBLE to MINOR* significance and are primarily located offshore. With mitigation measures in place, the impact significance will be reduced to *NEGLIGIBLE*.

**Impacts on archaeology:**

**Onshore:** Impacts to onshore archaeology and cultural heritage are expected to be of *MODERATE* significance during Project activities (e.g. site clearing and Construction Phase). With mitigation measures in place, the impact significance will be reduced to *MINOR* and will remain *NEGLIGIBLE* during the operation phase.

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**Offshore:** Impacts to offshore archaeology and cultural heritage are expected to be of MINOR significance during the construction and operation phases of the Project. With mitigation measures in place, the impact significance will be reduced to *NEGLIGIBLE*.

### 3.1.7 **Unplanned Events**

An unplanned event is understood as ‘a reasonably foreseeable event’ that is not planned to occur during the life of the Project but has a possibility to occur due to Project activities. Consideration of unplanned events in the LNG Project EIA focused primarily on the risks of large volume spills of chemicals or hydrocarbons and the failure of subsea infrastructures (e.g., pipeline failure). Though these are not likely, if a spill was to occur, it could have adverse impacts of *MAJOR* significance on environmentally sensitive areas as well as local fisheries and tourism.

The Project’s safety studies, Emergency Response Plan and Oil Spill Contingency Plan reduce the likelihood of adverse impacts and provide response strategies to minimise any negative impacts from the occurrence of an unplanned event.

### 3.1.8 **Cumulative Impacts**

Future developments may occur together with the Project which may cumulatively affect the environment. These include the establishment of an Industrial Zone (IDZ) by the Government of Mozambique (potentially incorporating the Project site) as well as future phases of exploration and development of hydrocarbon resources by AMA1, MRV, and others. The cumulative impacts that may occur include economic development of the Cabo Delgado Province and the country as well changes to habitats and ecosystems as the relatively undeveloped region is transformed. Both biophysical resources and socio-economic receptors in this region may experience positive impacts as a result of the establishment of the IDZ, provided it is managed properly. Spatial planning by the Government of Mozambique will also be of importance to promote sustainable development in the region. Cumulative impacts are further elaborated on in Section 6.0.

### 3.1.9 **Environmental and Social Management Plan in the LNG Project EIA**



A number of measures to manage residual impacts of the Project are included in the initial ESMP included within the LNG EIA. Specific management plans were developed according to the requirements of Mozambican law and good international industry practice. . They include the following:

- Environmental Education and Training
- Tabular ESMP
- Waste Management Plan
- Decommissioning and Rehabilitation Plan
- Emergency Response Plan
- Initial Resettlement Plan

### 3.1.10 **LNG EIA Approval**

MITADER issued a letter (dated 16 June 2014, Ref 62/GM/MICOA/189/14) to AMA1 and copied to MRV, indicating that they approved the LNG Project EIA Report as it



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addressed the various requirements in the relevant regulations and responded to issues raised by public and other stakeholders. A condition of the approval was that the environmental license would only be issued once the Resettlement Plan was approved (see Section 3.6 for detail on the final environmental licensing approach). The EIA Approval Letter also provided recommended mitigation and management measures beyond those detailed in the LNG Project EIA chapters and the appended Tabulated ESMP (Annex D of the LNG Project EIA Report).

In August 2014, a meeting was held with MITADER (by then MICOA) to seek clarification on some of the recommendations (i.e. suggested mitigation or management measures) outlined in the EIA Approval Letter. A subsequent meeting was held with MITADER (previously MICOA) in May 2015. Following these discussions, on 08 June 2015, MITADER issued a letter to AMA1 and MRV that provided clarification on the above-mentioned recommendations and confirmed revised text to supersede the specific conditions for which clarity was sought in the EIA Approval Letter. This letter forms an addendum to the EIA Approval Letter.

### **3.2 Replacement Village EIA (2015)**

The Replacement Village (RV) EIA forms an addendum to the LNG Project EIA. Locating the RV within the DUAT area is a recent consideration determined following consultations with communities and other stakeholders. It was decided after the LNG Project EIA was completed and, therefore, not considered in that EIA. The social impacts and mitigation measures are addressed in the RP. The location of the RV was selected after a comprehensive site selection and consultation process was undertaken that took into account community wishes, ecological sensitivities and distance from the Project. This section summarises the RV EIA which considers the environmental impacts and mitigation measures. The RV EIA updated impacts in the LNG Project EIA to take into account the inclusion of the RV. The following impacts and mitigation measures are included in the RV EIA. Operational Phase mitigations are expected to be implemented by the District Authority as they will take over operation of the RV.



#### **3.2.1 Air Quality**

The Replacement Village will have an electricity supply and some people will elect to pay for electricity thereby reducing emissions from burning firewood and/or charcoal. Households waste and waste arising from the government and community facilities will be collected transferred to a municipal landfill. As such, burning of waste in pits, as is common practice in the rural areas of Mozambique, is not expected, and may actually result in a slight improvement in the air quality. Residual impacts during construction and operations are expected to be negligible. The inclusion of the RV does not materially alter the air quality impact assessment in the LNG Project EIA.

The air quality mitigation measures in the LNG Project EIA apply to the RV construction activities. Workers will be trained accordingly.

#### **3.2.2 Solid and Liquid Waste**

The construction contractors will be responsible for ensuring that solid and liquid waste generated will be managed in accordance with the Waste Management Plan (WMP) which forms *Annex E* of the LNG Project EIA as well as other applicable legal and regulatory requirements. During the Operational Phase, households waste and

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waste arising from the government and community facilities will be collected and segregated at an allocated space in the Replacement Village to be transferred to a municipal landfill. The residual impacts are predicted to be negligible during construction and minor during operations. The inclusion of the RV does not materially alter the waste impact assessment in the LNG Project EIA.

During construction the Contractor will align with the Company WMP. During operations, the District Authority is expected to follow the relevant waste management decrees.

### 3.2.3 Soils and Erosion

The RV footprint will be approximately 133 ha. The area will be cleared of vegetation, exposing soil to wind and water erosion, and construction activity will compact soil. Once appropriate mitigation is applied, the residual impact is expected to be minor during construction. The inclusion of the RV does not materially alter the soils impact assessment in the LNG Project EIA.

During construction the Contractor will align with the Company Soil Erosion, Reinstatement and Landscaping Plan and will comply with the soil and erosion mitigation measures in the LNG Project EIA. During operations, it is recommended that the District Authority monitor and remediate any erosion where required.



### 3.2.4 Groundwater

Water demand for the Construction and Operational Phases of the RV will be supplied by groundwater. The estimated water demand during the Construction and Operational Phases is approximately 550 m<sup>3</sup>/day and 335 m<sup>3</sup>/day, respectively). The groundwater use for the RV construction and operation will add to the groundwater use by the LNG facility and associated infrastructure.

A groundwater modelling study (AECOM, 2018<sup>8</sup>) has estimated the peak cumulative demand for Area 1 and Area 4 Exclusive Facilities and Shared facilities (including the RV and airstrip) to be approximately 5,000 m<sup>3</sup>/d. The revised modelling shows that despite predicted drawdowns of potentially 30-60 m in some boreholes, modelled groundwater levels are not drawn down below 3 m above sea level (ASL) at the wetland locations where tidal influences are expected; hence, saline intrusion is not predicted to occur. The model also demonstrates that in all scenarios, groundwater supply to the RV is not affected by Project use. Accordingly the residual impact is expected to be negligible. The inclusion of the RV does not materially alter the groundwater impact assessment in the LNG Project EIA.

Mitigation includes (i) monitoring the dynamic groundwater level to maintain a level of  $\geq 3$  m ASL at the groundwater interface at tidally influenced estuaries or wetlands; (ii) collect groundwater data and adjust pumping rates if required; and (iii) encouraging the community to capture and use rainwater where practical. It is also recommended that at the end of Year 2 of the Project, the groundwater model should be validated using actual monitoring data from the construction phase of the Project and if necessary re-calibrated.

<sup>8</sup> AECOM. 2018. AMA1 Updated Groundwater Model. Water Sustainability Study. Draft Report. Prepared for Anadarko Moçambique Área 1, Lda. 26 November 2018.

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### 3.2.5 Surface Water Ecology

#### 3.2.5.1 Surface Water Quality

Site clearance and construction activities associated with the RV will not disturb any major stream or wetland. They will, however, occur close to a seasonal wetland and drainage channel that drains into the estuary immediately north west of the DUAT. During the Construction Phase there may be erosion and sedimentation of this drainage channel, resulting in sedimentation and increased turbidity of the wetland system, reducing light penetration and water quality. During the Operational Phase, there may be runoff of oils and fuels from vehicle or motorbikes from roads into the wetland system, resulting in a deterioration of water quality in the wetland system. The overall riparian habitat integrity is largely modified as it has used by the local communities for growing crops. Most of the upper zone of the wetland system has been transformed for cultivation. This is evidenced by high percentage of pollutant-tolerant diatoms and low number of sensitive macro-invertebrate taxa at the wetland sample site. With mitigation measures in place, the residual impacts during construction and operation are negligible and minor, respectively. The inclusion of the RV does not materially alter the surface water quality impact assessment in the LNG Project EIA.



Mitigation will be aligned with the Company Wastewater Management Plan.

#### 3.2.5.2 Surface Water Hydrology

A change in the quantity of water within the wetland system and in the flow regime of the wetland could fragment the systems, disrupt seasonality and functionality, alter the aquatic and riparian habitat and influence species diversity, composition, distributions and abundances. Most of the wetlands within the Afungi Peninsula have small localised catchments, and hydrology of these systems could be affected by the following construction and operational activities:

- Removal of natural vegetation;
- Hardening of surfaces;
- Construction and operation of roads;
- Stormwater run-off; and
- Use of groundwater and potential lowering of the groundwater table.

The combined result is expected to be felt in the dry season only as the rainy season will maintain high flows in the wetland system. During the dry season, the wetland system may receive less groundwater recharge. Thus, flows in the dry season may be less than normal. During construction and operations the residual impact is expected to be minor. The inclusion of the RV does not materially alter the surface water hydrology impact assessment in the LNG Project EIA.

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### 3.2.6 Vegetation

#### 3.2.6.1 Site Clearance and Loss of Habitat

According to the Regional Onshore Ecology Baseline Report (EA-MZ-SR0100-RRG-U17-00013-00), the RV is located in the “secondary woodland and shifting agriculture” regional habitat, which covers a large area inland and up and down the coast. The LNG Project EIA considered the RV site as having a high sensitivity relative to other vegetation units within the DUAT area. However, the subsequent regional baseline shows that the habitat is well represented in the region. The habitat is characterised by secondary growth associated with agricultural and high prevalence of alien/invasive plant species. The area is considered to be semi-transformed and, therefore, of low sensitivity in the region. At the time of writing the RV EIA, the habitat was not considered to be Critical Habitat in terms of IFC PS6<sup>9</sup>. The site clearance activities for the RV will result in the direct loss of approximately 133 ha of vegetation. Some impacts will also occur from having a large number of people concentrated in the RV as they may use vegetation around the RV for fuel, building materials for informal structures, etc. The residual impact is minor in significance. The main change to the LNG Project EIA is that the vegetation units and habitats are now considered within the context of the region and as such, the sensitivity of some habitats have been reassessed to be lower than originally thought in the LNG Project EIA.

The mitigation measures in the LNG Project EIA related to minimise the impact of site clearance will be implemented. Areas will be re-vegetated in accordance with the Company Soil Erosion, Reinstatement and Landscaping Plan.

#### 3.2.6.2 Alien Invasive Vegetation

Disturbance of soil and/or the removal of established vegetation will increase the opportunity for invasive plants to germinate and establish. Mitigation measures will likely reduce the intensity and likelihood of establishing or spreading alien/invasive species. The residual impact significance is predicted to be negligible. The inclusion of the RV does not materially alter the alien plant invasive impact assessment in the LNG Project EIA.



The primary mitigation measure during construction and operations is to have trained personnel monitor for the spread of invasive plants and eradicate them to prevent their spread. The mitigation measures related to alien invasive plants in the LNG Project EIA will be implemented.

### 3.2.7 Herpetofauna, Avifauna and Mammals

#### 3.2.7.1 Site Clearance and Loss of Habitat

According to the LNG Project EIA, the RV site ranged from medium to high sensitivity for herpetofauna, birds and mammals (relative to other habitats within the DUAT). However, the subsequent to the Regional Onshore Ecology Baseline Report (EA-MZ-SR0100-RRG-U17-00013-00) indicate that the RV footprint is

<sup>9</sup> In early 2019, a detailed vegetation survey was undertaken across the DUAT, including the RV DUAT. Some areas of intact and degraded *Berlinia orientalis* forest/thicket patches were identified in the RV DUAT area, potentially containing CH-qualifying biodiversity. See Section 5.2.1. Direct and indirect impacts to Critical Habitat will be addressed in the Residual Impact Assessment and Project’s Biodiversity Action Plan. See Section 5.2.1.

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considered low sensitivity habitat for herpetofauna, birds and mammals. The 133 ha RV represents an incremental increase to the footprint area for the LNG Project. With the implementation of appropriate mitigation, a residual impact of negligible to minor is expected.

The mitigation measures related to site clearance in the LNG Project EIA will be implemented.

### 3.2.7.2 Mortality, Displacement and Disturbance

Mortality, displacement and disturbance are expected to occur during the Construction and Operational Phases of the Project. The Operational Phase is longer in duration; however, fewer impacts are expected during this phase as the vast majority of the resident herpetofauna, birds and mammals are expected to have been displaced by this stage. Some mortality may result from villagers hunting/ trapping for food. During site clearance and construction, some fauna may be injured or killed. Cleared areas and linear infrastructure also fragment habitats and create barriers to the natural movement of some types of fauna. Disturbances to birds during construction activities are likely to result from high ambient noise levels during construction. With mitigation the residual impact during construction and operation is minor and negligible to minor respectively. The inclusion of the RV does not materially alter the mortality, displacement and disturbance impact assessment in the LNG Project EIA.

The LNG Project EIA mitigation measures will be implemented.

### 3.3 Palma-Afungi Road Simplified Environmental Assessment (2016)



The proposed Palma-Afungi Road (shown in Figure 2.4) is approximately 12 km long and connects the Project site to the R762. This road will be the primary access route to the Project site. The Palma-Afungi Road was classified as a Category B project by MITADER and therefore required a Simplified Environmental Assessment to be conducted.

During the construction phase, negative and positive impacts were identified, related to the clearing of vegetation and the disturbance of the fauna, the loss of agricultural plots, food crops and fruit trees and/or their commercial value, and the loss of graves caused by the construction of the road. The significance of the negative impacts ranges from insignificant to moderate, and will vary from *INSIGNIFICANT to LOW* after implementation of the recommended mitigation measures. Positive impacts include job creation and increasing income of local households. The significance of the positive impacts, varied from *LOW to MODERATE*.

The Project will not directly affect the community infrastructure, graves, cemeteries or sacred places, or sites of historical or archaeological interest, and does not require physical resettlement.

In the operational phase, the significance of the negative impacts varies from low to high, but will vary from *INSIGNIFICANT to MODERATE* after implementation of the recommended mitigation measures.

The applicable mitigation measures listed in the Palma-Afungi Road EMP will be applied. The Environmental License was issued in December 2016.

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### **3.4 33 kV Power Line Environmental Best Practice Report (2017)**

The power line is intended to connect the Replacement Village to the national grid. For the most part, it is aligned parallel to the P-A road. MITADER classified the power line as a Category C and an environmental best practice report was required to be submitted to MITADER. The Best Practice Report outlined potential environmental and social impacts and mitigation measures aligned with those described in the LNG Project EIA and Resettlement Plan.

The Environmental License was issued in February 2017.

### **3.5 Spur Roads Environmental Best Practice Report (2019)**

The Spur roads are two 5 km long roads intended to improve access to Mondlane and Maganja-a-Velha villages from the closest community roads at the boundary of the LNG DUAT. MITADER classified the power line as a Category C and an environmental best practice report was required to be submitted to MITADER. The Best Practice Report outlined potential environmental and social impacts and mitigation measures aligned with those described in the LNG Project EIA and Resettlement Plan.

The Spur Roads Environmental Best Practice Report was approved by MITADER in March 2019 and the issuance of the Environmental License is pending.

### **3.6 EMPs (2017) and EMP Updates (2019)**



The Project described in the LNG Project EIA included Area 1 and Area 4 exclusive facilities as well as shared facilities between Area 1 and Area 4. Given that there would be more than one operator<sup>10</sup> for the various Project facilities a single Environmental License could not be issued based on the LNG Project EIA. Area 1 and Area 4 developed a licensing strategy to account for five discrete operators. By means of a letter dated of 24 November 2016 (Ref. No: 2285/MITADER/ DINAB/ GDN/183/16) MITADER agreed to the issuance of the five ELs on the condition that separate Environmental Management Plans (EMPs) would be developed and submitted for each discrete Project component.

Five separate EMPs were submitted to MITADER for the various Area 1 and Area 4 project components addressed in the Project LNG EIA. No new information was presented and the impact assessments and mitigations remained largely unchanged from the LNG Project EIA. Five separate environmental licenses were issued by MITADER for the following Project components in February 2018:

- Materials Offloading Facility (MOF);
- Liquefied Natural Gas Marine Terminal (LNGMT);
- Area 1 Exclusive Facilities;
- Area 4 Exclusive Facilities; and
- Area 1 and Area 4 Shared Facilities.

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<sup>10</sup> There would be an Area 1 and Area 4 operating company, respectively for Area 1 and Area 4 exclusive facilities. In addition there would be joint Area 1/ Area 4 entities created solely to operate shared facilities such as the Jetty and MOF.

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The LNG Project EIA acknowledged that, as is normal for a major capital project of this scale, further engineering and design work would be undertaken and committed to implementing a MOC Procedure to deal with such changes. This commitment is also aligned with the requirements of Article 30 of Decree No. 56/2010, 22 November, which states “any expansion or amendment of the terms of the Petroleum Operations which was not foreseen in the EIS or the SES shall be communicated in writing to the Ministry which oversees the Environmental sector”.

To meet the commitment made to MITADER in the LNG Project EIA, an internal MOC Procedure was developed to identify and evaluate the environmental implications of any changes arising from the design optimisation process, which then informed the updating of the five separate EMPs for the various Area 1 and Area 4 Project components.

The process was developed so that it would capture any significant changes from the LNG Project EIA and 2017 EMPs in a consistent and systematic way. The procedure was as follows:

- A. All changes to the design were identified and documented.
- B. Each of the changes was then reviewed and evaluated using the same process of evaluation as presented in the LNG Project EIA to decide if the change was material to the EIA findings and the mitigation commitments contained in the EIA and EMP.
- C. Based on the above analysis, a decision was made as to whether:
  - I. The EIA and 2017 EMPs adequately address the potential impacts of the change and no further amendments are envisaged for the EMP Update; or
  - II. There was a need for additional technical assessment and/or review and update of the mitigation and management measures set out in the 2017 EMPs.



To better understand potential impacts of some design changes it was necessary to undertake additional technical assessment for example on marine, air emissions, groundwater, waste, and dredging. Effluent and dredging assessments were based on preliminary models and assessments and further detailed modelling and assessment is underway on effluent and dredging sediment dispersion to confirm preliminary results and any further mitigation required.

The five updated EMPs, together with Supplementary Information Reports which provided updated impacts assessments and/ or mitigations associated with these changes were submitted to MITADER in February 2019 for consideration and decision-making. Approval of the updated EMPs is pending at the time of writing (April 2019).

### 3.6.1 Key Project Changes

The EMP Updates addressed Project changes from the base case described in the LNG Project EIA and 2017 EMPs. The EMP Updates were submitted to MITADER together with Supplementary Information Reports. Where required specialist input (marine, dredging, noise, air, groundwater) was used to inform the assessments and mitigations. The following is a list of the key Project changes that were considered:

- Introduction of the Golfinho Pipeline;
- Updated design of the MOF and introduction of the TBL;



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- Updated dredging volumes, revised turbidity thresholds, and a new dredge disposal site;
- Updated dredging sediment modelling (Area 1 model and Area 1/ Area 4 cumulative model is underway);
- Updated noise thresholds for the construction phase;
- Updated noise modelling for the airstrip new location;
- Updated air emissions (and associated Area 1 air model and Area1/ Area 4 cumulative model);
- Updated groundwater demand (and associated Area 1 groundwater model and Area1/ Area 4 cumulative model);
- Updated effluent discharges (the associated Area 1 effluent discharge model and Area1/ Area 4 cumulative model is underway);
- Updated details on pile driving. Underwater noise modelling (currently underway) is being conducted to determine potential impacts on sensitive species (marine mammals, fish, marine turtles) as a result of piling; and
- More detail on how waste will be managed in a common Waste Management Facility (which would include a waste storage and segregation area, incinerators, landfill cells for non-hazardous waste, leachate management and treatment, and gas monitoring).

### **3.6.2 Updated Project Impacts**



The majority of impacts in Section 3.1 related to the Project changes remains as assessed in the LNG Project EIA (i.e. significance before and after mitigation remains as previously assessed) and are not repeated in this section. Below is a summary of those impacts where the significance of the impact has changed due to the proposed Project changes.





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**Table 3-5: Summary of impacts where the significance of the impact (as assessed in the LNG Project EIA) has changed due to proposed project changes**

	Impact	Original EIA Assessment		Revised Assessment		
		Without Mitigation	Residual Impact (with Mitigation)	Without Mitigation	Residual Impact (with Mitigation)	
1	Impacts of turbidity generated from the cutting of a trench through coral reef and rock on near marine ecology	MAJOR	<b>MINOR</b>	MAJOR	<b>MODERATE</b>	
2	Impact of dredging induced seabed modification on near shore marine ecology	Golfinho pipeline was not included in the LNG Project EIA		Seagrass and coral reefs: MAJOR  Pockmarks: MODERATE	<b>MINOR</b>	
3	Impact of disposal of dredged material at the offshore site (as identified in the LNG Project EIA vs the new site identified in the EMP Update).	MODERATE	<b>MINOR</b>	MINOR	<b>MINOR</b>	
4	Impact of noise as a result of the relocated airstrip (2 <sup>nd</sup> phase of airstrip)	MINOR	<b>NEGLIGIBLE</b>	MINOR to MODERATE	<b>MINOR</b>	
5	Impact of establishment and utilisation of ship anchoring areas on near shore marine ecology	N/A- Anchoring was not included in the LNG Project EIA		MODERATE	<b>NEGLIGIBLE</b>	
6	Impact of desalination and treated sewage discharges during operation on near shore water quality and marine ecology	NEGLIGIBLE	<b>NEGLIGIBLE</b>	MODERATE	<b>NEGLIGIBLE</b>	
7	Cumulative operational phase air quality impacts to human receptors	NO <sub>2</sub>	MINOR (max 1-hr)	NEGLIGIBLE	MODERATE (onshore) to MAJOR (offshore) (max 1-hr)  NEGLIGIBLE (1-year)	<b>MODERATE (onshore) to MAJOR (offshore) (max 1-hr)</b>  <b>NEGLIGIBLE (1-year)</b>

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8		SO <sub>2</sub>	MINOR (max 24-hr)	NEGLIGIBLE	NEGLIGIBLE (onshore) to MAJOR (offshore) (max 24-hr)	<b>NEGLIGIBLE (onshore) to MAJOR (offshore) (max 24-hr)</b>
					MODERATE (max 10-min)	<b>MODERATE (max 10-min)</b>
					NEGLIGIBLE (max 1-hr and 1- year	<b>NEGLIGIBLE (max 1-hr and 1-year</b>
9		Benzene	N/A- not included in the LNG Project EIA		MINOR	<b>MINOR</b>
10		Toluene	N/A- not included in the LNG Project EIA		NEGLIGIBLE	<b>NEGLIGIBLE</b>

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#### 4.0 ADDITIONAL SOCIAL AND HEALTH ASSESSMENTS

Additional social and health assessments were conducted providing outputs to further the development of management Plans such as the Community Health Management Plan (CHMP) and the Project Induced In-migration Management (PIIM) Plan. The following section highlight key takeaways from the following additional social and health assessments and reports conducted:

- Resettlement Plan;
- Health Impact Assessment; and
- Project Induced In-Migration Management Plan.

##### 4.1 Areas of Influence

The Area of Direct Influence (ADI) is defined as Palma District and the DUAT area and surrounds (including Senga and Maganja). Communities in the DUAT may be affected through physical resettlement. Some communities outside the DUAT may be impacted by loss of access to natural resources within the DUAT and Palma Bay (through land take and exclusion zones), and through additional pressure on social services (e.g. health care) and resources (e.g., water) through influx of people to the area.

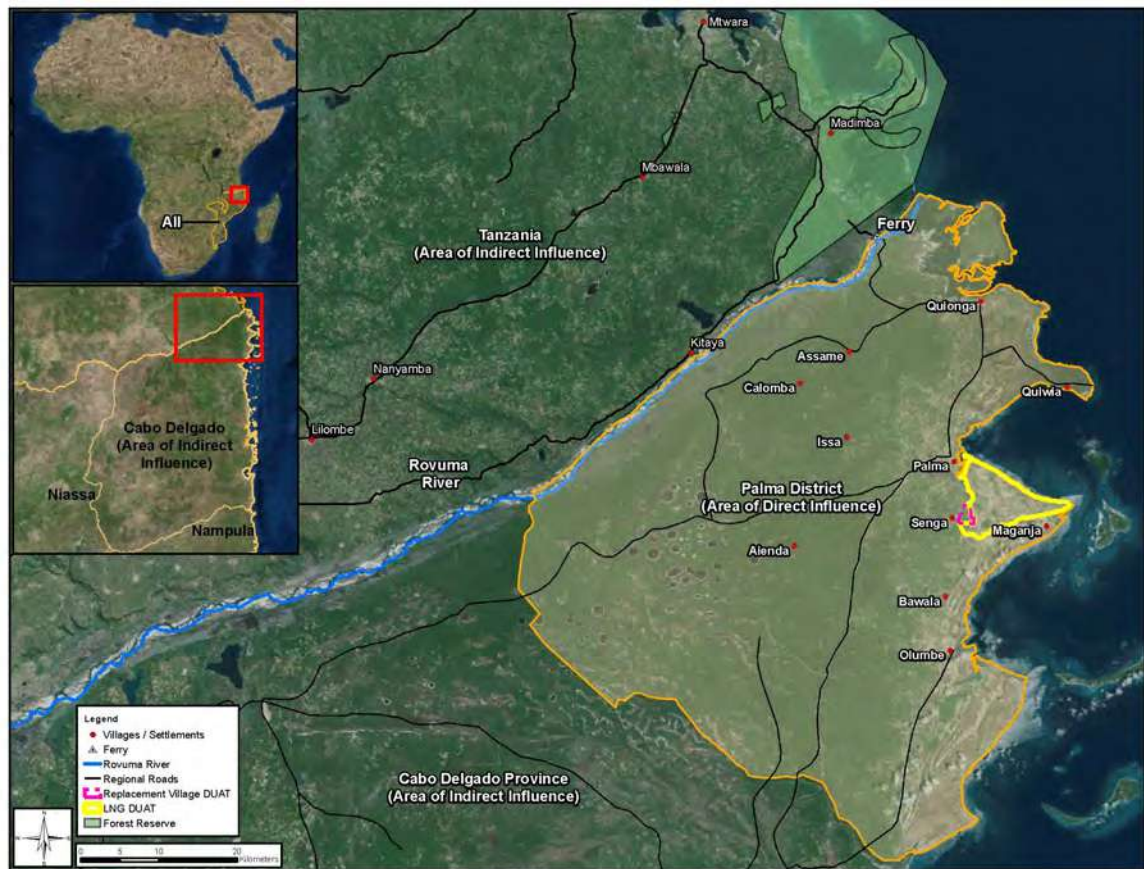




Figure 4.1 – Social ADI and AI

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The Area of Indirect Influence (All) is primarily defined as Cabo Delgado Province as this is where probably most economic benefits will be experienced and where much of the workforce may originate. Southern Tanzania has been included in the All regarding indirect impacts related to PIIM.

#### 4.2 Resettlement Plan

The Resettlement Plan (RP) (EA-MZ-SR0504-APC-U13-00002-00) defines a framework for consultation and participation of affected and host communities, all levels of government and civil society that will be ongoing throughout resettlement implementation, monitoring and evaluation. The following sections provide an overview of the RP.

As prescribed by Resettlement Decree N° 31/2012, an approved full RP is required as a precursor to issuing an EL for the Project. This decree was enacted a year into the EIA process and the Project had to adjust its resettlement planning accordingly. The RP describes the policies, principles, procedures, roles and responsibilities for managing the impacts associated with physical displacement (loss of dwellings) and/ or economic displacement (full or partial loss of productive assets, income sources or other means of livelihood) caused by the construction and operation of the LNG Facility and export terminal. The RP was prepared in accordance with Mozambican legislation and International Finance Corporation (IFC) Performance Standard (PS) 5: Land Acquisition and Involuntary Resettlement (January 2012).

The RP was prepared from 2013 to 2016 in close consultation and with the full participation of stakeholders including affected communities and the Government of Mozambique (GoM) as well as civil society organisations that have played an active role in Project resettlement planning. Chapter 9 of the RP and Section 8.3.2 of this document provide further details of consultation. The RP was also submitted to peer technical review by an independent specialist during drafting in 2015. The RP was well regarded by the independent review. It was determined to be comprehensive and met Good International Industry Practice.



The RP comprises a 3 phase resettlement, with asset verification compensation and relocation of physically displaced households occurring in line with the construction of the replacement village and the Project requirements for land.

##### 4.2.1 Magnitude of Resettlement

The magnitude of the overall Project (AMA1 and MRV developments combined), across the diverse grouping of stakeholders can be summarised as follows:

**Table 4.1 – Magnitude of Resettlement**

Impact	Magnitude
Project land requirements	6,625 ha
Number of physically displaced households	556
Number of economically displaced households (terrestrial)	952
Replacement agricultural land areas	3,612 ha
Number of fishers and intertidal collectors to be relocated	243

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Impact	Magnitude
Number of fishers and intertidal collectors impacted by construction	1,508
Number of fishers and intertidal collectors impacted by operations	3,266

Note: Number of fishers and intertidal collectors impacted is dependent on final definition of the Marine Exclusion Zone. Numbers presented in table are based on maximum MEZ of 1,500m.

#### 4.2.2 Replacement Agricultural Land



On 18 December 2014 the Project requested support from the District Administrator (DA) in identifying potentially suitable areas of replacement agricultural land. In response, the District Government undertook a preliminary reconnaissance assessment with the assistance of the Project in June 2015. Their preliminary assessment identified potential areas in Senga-Mondlane lying to the west of the DUAT, which had not been used for some years (i.e., fallow lands), and where the soils would be suitable for cultivation.

Soil studies indicate that some parts of the Senga-Mondlane Land Parcel has poor quality soil. Given the likelihood that additional land would be required as a result of poor quality soil at Senga-Mondlane the government identified another parcel referred to as the Senga-Macala parcel. A total of 4,445 ha has been identified of which 9% was assessed as unsuitable for agriculture based on soil studies conducted. Table 4.2 provides a list of the soils identified in the replacement agricultural land areas as well as their relative agricultural potential.

**Table 4.2 – Soil Types within the Identified Replacement Agricultural Land Areas**

FAO Classification	South African Classification	Relative Agricultural Potential <sup>11</sup>	Area
Albisols	Constantia (Variant)	4	1,832
Ferric Acrisols	Clovelly	4.5	594
Arenosols	Fernwood	2.5	403
Ferralsols	Griffin	5	211
Acrisols	Hutton	5	204
Plinthic Arenosols	Longlands	3	819
Gleysols	Katspruit	1.5	5
Planosols	Kroonstad	2	6
Wetlands & rivers	-	-	372
Total			4,446

<sup>11</sup> 1 = low, 3 = medium, 5 = high

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Environmentally and culturally sensitive areas within the Land Parcels have been identified. The land use plan for the land takes cognisance of the sensitive areas and avoids wetlands, streams and cultural heritage sites. Where possible the sensitive habitats have been avoided.

#### **4.2.3 Potential Conflicts between Displaced and Host Households**



The resettlement process involves relocation of Quitupo village and settlements in related production zones to a single settlement (the resettlement village in Quitunda) located in Senga territory. In addition replacement agricultural land is being made available in Mondlane, Senga and Macala. This may lead to increased competition for agricultural land and natural resources. It could also lead to disagreements about land boundaries, leadership validity and the sharing of social infrastructure and services. General resentment could also arise due to disparities in the quality of housing and infrastructures in the replacement village compared to adjacent villages. All these factors have the potential to lead to social and cultural conflicts. In order to manage the risk of conflict, the Project will undertake or otherwise facilitate (where mitigation is the responsibility of the GoM) the following:

- Establishment of a Community Grievance Mechanism (see Chapter 10 of the Resettlement Plan);
- Through the Community Development Fund, make funds available for affected and host communities to undertake infrastructure improvements and other beneficial programmes (refer to Section 5.3 of the Resettlement Plan); and
- Negotiation (by the Government) of an intercommunity agreement between Senga and Quitupo that stipulates:
  - Establishment of a regular forum for harmonizing relations and addressing concerns between the four communities – Quitupo, Maganja, Senga and Mondlane.
  - The rules for accessing agricultural and foraging land, and the use of social infrastructure and services;
  - Land boundaries; and
  - Leadership structure and responsibilities.

Because of the potential conflicts that could arise between the displaced and host communities, and to minimise this risk, specific issues will be carefully managed during the planning and implementation phases of resettlement.

#### **4.2.4 Project Physical and Economic Displacement Impacts**



The population that will be affected by the Project consists of a diverse group of stakeholders, including households who are reliant (to varying degrees) on a combination of subsistence agriculture, fishing, inter-tidal gathering and small trading.

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Early Project activities have provided some cash income earning opportunities for Afungi communities and increased cash circulation in the local economy.

As part of Project land acquisition and restrictions on access to natural resources, individuals, households and small businesses will likely face physical and economic displacement impacts. These impacts are:

- Loss of use of land;
  - Permanent loss of use of land as result of Project development;
  - Temporary loss of use of land;
- Loss of dwellings;
- Loss of ancillary structures;
- Loss of trees and crops (specifically annual and perennial crops as well as fruit trees);
- Loss of access to marine resources;
  - Sea based displacement impacts;
  - Loss of access to intertidal and shallow subtidal fishing grounds;
  - Loss of access to traditional marine fishing grounds;
- Impacts on communal resources, facilities and infrastructure;
  - Loss of community facilities and infrastructure;
  - Loss of access to communal natural resources;
  - Severance of community tracks and paths;
- Impact on small businesses;
- Impacts on cultural heritage (relocation of cemeteries and graves, loss of religious buildings, loss of sacred sites, loss of intangible cultural resources);
- Other impacts on host and displaced communities;
  - Managing relations between hosts and resettled communities;
  - Increased pressure on forest resources in host and displaced communities;
  - Increased pressure on other agricultural land in other areas;
  - Increased fishing and intertidal pressure on marine resources in other areas; and
  - Risks from Project-induced in-migration.

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Left: Fishing vessels in Palma Bay, Right: Rice field in wetland

#### 4.2.5 Livelihood Restoration Plan (LRP)

To provide Project affected people with the opportunity to improve or at a minimum restore their livelihoods and income levels the Resettlement Livelihood Restoration Plan (LRP) (Chapter 8 of the RP) is proposed as a form of mitigation.

The objectives of the LRP are to:

- To restore food security to at least pre-project levels and to assist households to meet their own food requirements;
- To diversify household income sources and introduce new cash generating opportunities;
- To extend livelihood opportunities to both men and women;
- To ensure that vulnerable and disadvantaged households are given opportunities to participate and benefit from livelihood programmes; and
- To improve households' livelihood resilience and capacity to absorb or respond to shocks.

The LRP will focus initially on three objective areas which include agriculture and foraging, fisheries and alternative, non-land based livelihoods as well as capacity building.



##### 4.2.5.1 Agricultural Livelihood Restoration Plan (ALRP)

In line with the overall LRP strategy, the Agricultural Livelihood Restoration Plan (ALRP) seeks to ensure that all displaced households have the opportunity to achieve sustainable levels of food security within 18 months of being physically relocated. This goal will be achieved through providing access to replacement agricultural land, improving primary production and also assisting affected households to make better use of primary production. It is important to note that the ALRP includes common resources such as forest products but excludes fisheries.

##### 4.2.5.2 Fisheries Livelihood Restoration Plan (FLRP)

The goal of the FLRP is to give persons who derive benefits from fishing and marine resources and who are economically displaced by the Project, the



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opportunity to improve or restore their livelihoods and income levels. This goal will be achieved through provision of access to equipment, diversified fisheries, mariculture (seaweed and sea cucumber), improved coastal fisheries infrastructure and installation of Fish Aggregating Devices (FADs).



*Catch of the day for sale in Palma*



#### **4.2.5.3 Diversified Livelihoods Plan**

The Diversified Livelihoods Plan has the goal of diversifying household livelihoods in order to improve resilience to natural and economic shocks and reduce direct dependence on land and sea resources. Constituent programmes such as adult literacy, household financial training, microfinance and savings groups, small business training, replacement house maintenance, facilitation of ID documents, among others) are geared toward providing households with the opportunity to diversify their livelihood activities while building their capacity to improve their livelihoods and manage their finances. In addition, project derived employment with Area 1 and/or Area 4 is included.

#### **4.2.6 Gender Considerations in the RP**

At the household level, patriarchal (male-led) structures prevail, typically expressed as a male head of household and, when in polygamous relationships, maintaining several households. These multiple households may be located on the same plot, in the same village or in different villages. Only when women are widowed do they head households, however, this leadership role is relinquished if the woman remarries. Machambas are inherited or developed by a woman or her husband, and it is through either of them that access to land for farming is secured.

In most parts of Afungi, Islamic influence prescribes that upon marriage a woman should move to her husband's village or residence and uses his property. However,

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many Mwani from the south and Makonde from the hinterland are matrilineal. In these cases Islamic men marry and move to their wives' families where they secure use and ownership rights for machambas. In cases where the influence of Islam is stronger than that of a matriline, a woman of a Mwani or Makonde lineage, may go to live in her husband's home. This latter situation is becoming more common.

Polygamous men divide their land between their various wives, who each farm individually. The wives also live in separate households, sometimes even outside the husband's community. A woman might have land or trees of her own through inheritance. Both men and women contribute to the subsistence of the household through agriculture, fisheries or trade related activities. The barring of women from fishing vessels is based on the traditional belief and prevailing perception of women's weakness (i.e. that they are not physically able to participate in fishing from boats). This belief is strongly held by both women and men in Afungi.

Women generally provide their cash income to their husbands, who decide how the money will be spent. Husbands generally decide what portion of the agricultural yield is to be used by the family and what portion is sold for cash income.



The following measures have been put in place to ensure that women's rights are protected during the resettlement process:

- DUATs for replacement house plots are registered in the name of both spouses.
- In polygamous marriages, both wives receive a replacement house if they are to be physically relocated.
- Male heads of households are encouraged to bring their wives with them to sign their household agreement and proof of payment.
- When households chose to divide cash compensation into more than one bank account, the process is facilitated by the banking service provided with whom the Project has a Memorandum of Understanding.
- Encouraging the participation of women in livelihood restoration programs.

#### **4.2.7 Monitoring and Evaluation**

As part of the Resettlement Implementation Action Plan, resettlement monitoring will verify that:

- Actions and commitments described in the RP are implemented fully;
- Eligible affected people and entities receive their compensation entitlements in full and within agreed timeframes;
- Resettlement programmes remain aligned with national legislation and lender requirements and that, where non-compliances are identified, timely and effective corrective actions are undertaken;
- Resettlement activities are effective in achieving outcomes consistent with those defined in the RP (i.e. sustainably improving affected peoples' living standards and income levels and resettled households' integration into new socio-economic networks);
- Vulnerable households receive additional support as defined in the RP;

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- Complaints logged by Project affected people and their hosts are followed up and that, where necessary, appropriate corrective actions are implemented; and
- Regular progress reporting occurs to keep the Project Management team, Government, Project affected people and other interested stakeholders appropriately informed about resettlement progress and issues.

#### **4.2.8 Resettlement Implementation**

Chapter 12 of the RP lays out the institutional roles and responsibilities for RP implementation, the schedule with timeline for implementing the tasks necessary to execute the RP and the Project’s commitment to fully cover all costs required for resettlement implementation (including a location factor).



### **4.3 Health Impact Assessment**

Community health impacts are assessed in Section 13.5 of the LNG Project EIA. The EIA assessment and mitigation was based on a Rapid Health Impact Assessment, which was subsequently used to develop a more comprehensive Community Health Impact Assessment (HIA). The Community HIA report (MZ-000-AM1-HS-ASM-00001) was developed to ensure compliance with Good International Industry Practice as well as IFC PS4, Community Health Safety and Security. Furthermore, in 2018/2019 Area 1 and Area 4 jointly updated the HIA conducted in 2013 to include the Area 4 Project and extend the HIA geographical scope to consider the wider region (broader in Palma District, Mocimboa da Praia, Pemba town, Mueda and transport corridors between these locations)..

Based on the Regional HIA, a health management and monitoring plan will be jointly developed by Area 1 and 4. As the potential direct and indirect impacts are likely to be relatively homogenous, it was prudent to consider the impacts of both Projects collectively, recognising that the additive / cumulative nature of both Projects may add to the significance of impacts, based purely on scale.



*First aid training*

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#### 4.3.1 Health Impact Assessment Activities

The different activities that were conducted to support final modelling of impacts in the HIA included:

- A scoping study (May 2012) to understand existing health needs and vulnerabilities, potential health impact areas of concern related to development of the Project and analysis of gaps in data to inform impacts. Scoping included:
  - A desk top literature review of standard source and peer reviewed literature;
  - Review of existing Project documentation and preliminary designs; and
  - Participatory data collection in the study area involving key informants from the health sector, non-governmental organisations, other stakeholders; and
  - Consideration of different structures within the Project Affected Communities (PACs).
- Community based participatory data collection (qualitative) such as the use of 35 Focus Groups to gather opinions and perceptions of the community;
- Questionnaires at public health facilities or from community health agents to collect specific comments/concerns from affected parties between September 2012 and April 2013; and
- A baseline health survey (April 2013) to support the closure of data gaps identified at scoping and to enhance the evidence base for the modelling of impacts and monitoring of mitigation and management measures.



The 2018 HIA update included:

- Desktop activities:
  - Update literature review initially performed in 2012/2013 for the Scoping Study and initial HIA undertaken as part of the LNG Project EIA;
  - Review of updated planned Project FEED and activities for both Projects; and
  - Consideration of information from specialist biophysical and social studies conducted for the LNG Project EIA.
- Field activities:
  - A qualitative participatory data collection, in the form of key informant interviews with provincial and district health officials, was conducted in March 2018.

#### 4.3.2 Summary of Health Impacts

Potential health impacts and key management measures have been divided into three Project phases, namely:

- I. The early works phase, including Afungi Site Improvement (ASI) activities and the resettlement process;

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- II. The main construction phase, including onshore and nearshore construction of the LNG plant/s and associated facilities (excluding offshore construction) such as camps, roads, etc.; and
- III. The operations phase.

A summary of key potential impacts for the early works phase is presented below.

The proposed impacts and recommended mitigation measures for the construction and operational phases has the potential change to such an extent during construction and will be reassessed near the end of construction before final impacts are outlined for the operations phase. Further, it must be noted that certain impacts are not static or confined to a particular Project phase. Some impacts may occur in all Project phases, others may shift as the Project progresses, and some may be restricted to certain periods.

#### 4.3.2.1 Key Health Impacts and Mitigations: Early Works Phase

##### *Project induced Influx and unplanned settlements/ 'urbanisation'*



In the early works phase, several potential very high and high negative impacts are noted, including:

- Risks for an increased transmission of communicable diseases (including HIV and other sexually transmitted infections (STIs), tuberculosis, malaria, water/sanitation related conditions and diseases with outbreak potential);
- Accidents and injuries from road traffic accidents;
- A broad range of impacts related to influx of people; and
- Impacts related to environmental determinants.

With mitigation, the risk for transmission of STIs remains high, with most other high risks reduced to a *MEDIUM* negative significance. The benefits of economic development will start to be realised, but with limited opportunity to enhance these in the early works phase. The main impact areas are identified below along with specific impacts and proposed mitigation measures.

The development of the Project has the potential to generate influx and place pressure on settlements and urbanisation. While a separate Project Induced In-Migration Study has been undertaken (see Section 4.4), specific health impacts were identified as part of the HIA:

- Increased potential for communicable disease transmission through:
  - Movement of people with introduction of disease /increased incidence of disease;
  - Inability to plan/provide basic services (housing, water sanitation etc.);
  - Increase of casual sex relationships and increase of Sexually Transmitted Infections (STIs), including HIV/AIDS; and

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- Overcrowding and environmental degradation may increase transmission of vector related disease.
- Increased utilisation of basic and health services;
- Minimal institutional capacity of local health authorities to manage and plan; for larger scale influx and associated impacts; and
- Change in social dynamics in the study area.

The proposed mitigation measures for the above impacts include the development of influx management and labour recruitment plans; supporting capacity building for town planning for Project induced influx; developing project policies and programmes around TB and HIV; development of effective contractor management programmes on accommodation and recruitment; development of malaria control programmes; supporting the planning for basic services programmes in the area in order to receive influx and resettlement/host communities; developing and designing appropriate site based medical systems; and supporting local authorities in planning for development in the area.

#### *Environmental Changes*

Early works will initiate before resettlement of communities so they will likely be exposed to diverse environmental hazards and pollutants that can include but are not limited to: air borne pollutants (dust, diesel particulate matter); noise and vibration from machinery; pollution of surface water sources and visual intrusions. The disturbance of macro habitats will also increase the available breeding sites for mosquitos that may increase risk for disease transmission. Proposed mitigation measures include following recommendations from the LNG Project EIA, implementation of a grievance process that the Project can follow up on as well as effective stakeholder engagement and communication; avoiding the creation of standing water bodies; and supporting vector control activities (i.e. insecticide treated bed nets in at risk communities).



#### *Altered Accessibility*

The Project may reduce access to health services (in addition to increasing time to reach health services), land (limiting access to arable lands/crops and/or displacing crops or land for cultivation/grazing) and markets (where goods are bought and sold as well as “production zones” along the coast dues to development of near shore infrastructure).

To mitigate these potential impacts key recommended measures include working with district health department and local health facilities to develop systems that support access to facilities by communities; clearly defining and compensating for lost arable land and crops; and supporting access to markets and creating alternative access to fishing areas.

#### *Accidents and Injuries*

There will be increased movement of Project related equipment which may increase risk for accidents and injuries in the PACs. Mitigation measures include developing information, education and communication (IEC) programmes in the

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local communities promoting road safety, and implementing AMA1 and Contractors' health and safety management plans.

**4.3.2.2 Key Health Impacts and Mitigation Measures: Construction and Operations**  
*Project Induced influx and unplanned settlements/ 'urbanisation'*



Similar to the early work stage, there is an increased potential for communicable disease transmission but with greater intensity. Other impacts include increased utilisation of health services as well as increased stress on limited basic services, also with greater intensity. Increased disposable income and potentially an increase in transactional sex could place women and young girls in a vulnerable position. Inflation of housing and food prices can further stress vulnerable populations. Lastly there could be an erosion of traditional values and social harmony giving rise to social ills such as crime, domestic violence, ethnic conflict and commercial sex work and substance abuse.

Key recommended mitigation measures include:

- Extending and enhancing programmes initiated at Early Works to address the increased risks of communicable disease transmission;
- Evaluate opportunities for health systems and support development of a five year district health strategy;
- Avoiding recruitment of local medical staff to work on Project medical services and work with government to attract medical staff to work in public health facilities in study area;
- Supporting the development of strategic health programmes as part of the Projects Regional Development Initiative;
- Enhancing strategic plans with national and local authorities to proactively plan for basic services;
- IEC campaigns to for local workforce on financial management;
- Supporting PACs and vulnerable groups on gender issues, local development programmes and health issues;
- Strict contractor management;
- Inflation management and monitoring programmes; and
- Evaluating opportunities to maintain local cultures and norms, especially with vulnerable groups.

*Environmental Changes*

Although environmental health exposures due to proximity of Project activities will be reduced after resettlement there is still the risk of air and water quality impacts in addition to noise and vibration impacts. Key mitigation measures include recommended management measure from the LNG Project EIA; developing integrated malaria control programmes as part of the Resettlement

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Plan and developing effective larval source manage programmes to prevent introduction of infected mosquitoes.

#### *Resettlement*

The impacts will include improved basic services (housing, water, sanitation and health care) if carefully planned and executed (on resettled and host communities); disrupted social networks and traditional values and loss of arable land or access to traditional fishing areas. Recommended mitigation measures are described in the Resettlement Plan.

#### *Altered Accessibility*

There will likely be improved access to communities in certain areas due to the construction of a new bypass and improved roads.

#### *Accidents and Injuries and Urbanised Lifestyle*

Potential impacts of these project stages will include increased road traffic (through improved roads) and development of an 'urbanised society' including negatives changes in lifestyle practices (smoking, alcohol consumption, poor diet etc.) which may give rise to increased chronic diseases and cancers. To mitigate these impacts IEC programmes should be implemented and wellness programmes may be initiated in the workplace for prevention of chronic diseases.

Further, mitigation measures should be supported by the following key principles:



- Any interventions should be aligned with national strategies and programmes where possible;
- Interventions should be planned with enhancement and sustainability measures in mind;
- Where possible, health system strengthening (HSS) interventions as opposed to localised, unsustainable, once-off initiatives should be implemented;
- Effective and on-going communication with PACs should be maintained throughout the Project life cycle stages;
- Information, education and communication interventions are essential components on not only health but general Project interventions;
- Contractor management and compliance should be enforced from the outset, including adherence to certain requirements in the contracting phase; and
- Display cultural sensitivity with all stakeholders in all Project interactions.

#### *Opportunities*

The Project has the potential to support numerous extended health and social benefits such as:

- Improved access to services and economic opportunities through improved roads and communication networks;



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- Improved services and local development initiatives:
- Improved local economy and creation of job opportunities in the formal and informal sector;
- Resettled communities will benefit from improved housing and basic services, as long as effectively planned and implemented;
- Development of the area will assist to create potential partnerships with stakeholders (government, non-governmental organisations (NGOs), etc.) to strengthen health systems and other social services.

#### **4.3.3 Community Health and Management and Monitoring Plan (CHMMP)**



The priority impacts and recommendations contained in the Health Impact Assessment are being transferred into a framework Community Health Management and Monitoring Plan (CHMMP), the final output of the HIA. This framework will be used as the building block to guide the development of detailed community health interventions, including details on actions to be taken, implementation, the proposed location, duration, any potential partner(s), and monitoring/evaluation criteria.



*Communal water supply*

#### **4.4 Project Induced In-Migration (PIIM) Management Plan**

Sections 12.11.5, 12.12.5, 12.13.5 and 13.4 of the LNG EIA address the impacts of PIIM on environmental resources and social receptors. The LNG EIA proposes a detailed PIIM study to further evaluate potential impacts and develop appropriate mitigation. The PIIM Management Plan (MZ-000-AM1-SP-PLN-00001) was produced after the LNG EIA and

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assesses the environmental and social impacts and risks and develops specific mitigation measures.

The PIIM Management Plan (PIIM MP) is applicable to the early works namely, the RV and ASI construction phases and applies through the LNG construction period. The PIIM MP distinguishes between the areas inside and outside the land assigned to the Project (i.e., LNG DUAT). Specifically, the PIIM MP addresses potential in-migration into the geographical area outside of the LNG DUAT. The Project has developed an Encroachment Management Plan<sup>12</sup> that seeks to address to un-authorized occupation or use of land within the LNG DUAT.

The purpose of the PIIM MP is to establish a framework for development planning and change management that increases the likelihood of positive outcomes associated with Project development and planned and spontaneous induced development (e.g., industrialization) while simultaneously avoiding, minimizing and/or mitigating the potential negative impacts often associated with PIIM.

The overall objectives of the plan are:



- to pro-actively promote awareness and understanding of Project development, planned and induced development pathways and project-induced in-migration;
- to promote a multi-stakeholder forum (bringing together government, private sector, development assistance, civil society and communities) to serve as a focal point for participation coordination and collaboration in development planning and avoidance, minimization and/or mitigation of potential negative impacts associated with PIIM;
- to build the preparedness of stakeholders (government, private sector, development assistance, civil society and communities) to coordinate and collaborate efforts that simultaneously address development and project-induced in-migration; and
- to promote design, planning and delivery of programs that address development and/or project-induced in-migration.

#### **4.4.1 Assessment of PIIM**

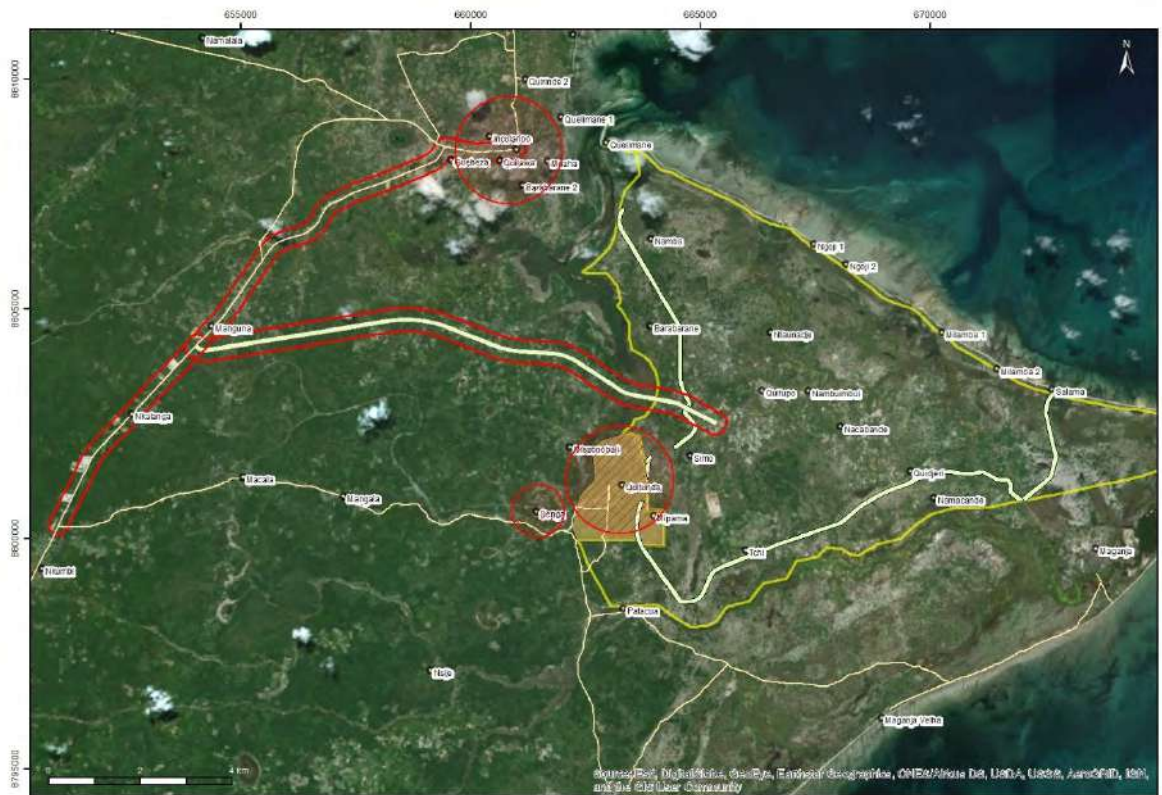
Assessment of potential PIIM has identified four sources of in-migrants, specifically: (i) the rest of Mozambique; (ii) Cabo Delgado Province; (iii) the rural hinterland of Palma District; and (iv) Southern Tanzania (and other proximate countries i.e., Zimbabwe, Malawi). In turn three pathways for in-migration were identified including: (i) the R762 connecting Palma to Mocimboa de Praia (and beyond) in Cabo Delgado Province and Mozambique; (ii) from the hinterland of Palma District; (iii) road access connecting Palma through Quionga to Namiranga (on the Tanzanian border) from which one can enter Southern Tanzania and travel to Mtwara. In addition, it is noted that both historically and currently dhows and other ships continue to ply the coastline facilitating transport along the coast of Mozambique as well as with Tanzania.

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<sup>12</sup> The Encroachment Management Plan is already being implemented as a coordinated effort between the Project, Government and specific communities and community leadership structures as part of Resettlement management measures.

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Areas to which migrants are likely to be drawn (PIIM hotspots) were defined in line with the following criteria: (i) road access; (ii) proximity to the Project area and (iii) availability of infrastructures (primarily accommodation), services and utilities. Based on these criteria PIIM hotspots have been identified as follows: (i) Palma Town; (ii) the R762 highway connecting Mocoimba de Praia to Palma and specifically the section between the roadheads of side-roads leading to the Afungi Pensinula and Palma Town; (iv) the Palma-Afungi Highway and (iv) the Afungi Peninsula, primarily the Resettlement Village and Senga. Figure 4.2 illustrates the anticipated PIIM hotspots.





**Figure 4.2 – Anticipated PIIM Hotspots (outlined in red)**

The Project has identified Palma Sede as the primary hotspot in the district. Further road-side development along the R762 between Palma and the road-head of the Palma-Afungi Highway and on the Palma-Afungi Highway itself serves as possible ‘growth corridors’ with development of settlement, commercial activity and/or light industry. Within the Afungi Peninsula, Quitunda (the Resettlement Village) and nearby Senga Village are identified as likely PIIM hotspots.

**4.4.2 Strategy and Approach to Managing PIIM**

The Project PIIM Management strategy is defined by the potential socio-economic development of Palma District, the proximity of Palma Town to the Afungi Peninsula,

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the probable concentration of PIIM in Palma Town, the likelihood of roadside development and the potential impacts and risks of PIIM. Based on the preceding the strategy is primarily focused on development planning for Palma Town and Palma District as the basis for development and management of the influx footprint. Potential PIIM impacts and risks will be managed pro-actively by promoting community capacity to manage change and community health. On the Afungi Peninsula, the large Project footprint together with simultaneous implementation of resettlement and Project construction activities may limit short-term in-migration until such time the resettlement village is complete. PIIM management interventions also include specific measures implemented by existing functional areas activities.



The strategy also recognizes that multiple stakeholders' primary interest will lie in promoting the sustainable development of Palma and Palma District as a whole and thus seeks to leverage this interest to characterize PIIM as a potential threat to sustainable development. Implicit in this approach is that while PIIM is a project-induced phenomenon its expression represents a more active threat to sustainable development of Palma Town and the R762 corridor than to the communities on the Afungi Peninsula, the Project and the Project's immediate social license to operate.

Based on the preceding, development processes that lead to strategic development plans, diversified growth and multiple nodes of development of the district coupled with a more focused approach to urban planning in Palma (including assessment of infrastructure, services and utilities) will simultaneously address key concerns with the PIIM physical and social footprint and PIIM impacts and risks.

#### **4.4.3 Principles for Managing PIIM**

The key principles for managing PIIM adopted in the PIIM MP are:

- Recognised relationship between broader socio-economic development and management of Project Induced In-migration;
- Recognition of the complementary nature of development programming and PIIM management, implies recognition of the roles of and responsibilities of multiple stakeholders including Government, development partners, private sector and communities for planning and management of development and PIIM;
- Effective design, planning and delivery of development and PIIM management will be facilitated by the establishment of a Multi-Stakeholder Development Forum, first in Palma District and later on potentially at provincial level
- PIIM management will pro-actively address the three thematic areas
  - inflow
  - footprint
  - negative Impacts
- PIIM management focus will be determined by pathways for in-migration; recognised hotspots; and, an understanding of development opportunity and PIIM impact and risks.
- In addition to specific focal areas, the potential PIIM impact and risks will be integrated across relevant functions.



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#### 4.4.4 PIIM Management Measures

The PIIM Management Plan identifies nine (9) areas of interventions as follows: (i) Multi-Stakeholder Framework; (ii) Managing Inflow of In-migrants; (iii) Spatial Planning; (iv) Urban Planning – Infrastructure, Services and Utilities; (v) Community Strengthening; (vi) Community Health; (vii) Community Based Natural Resource Management; (viii) Functional Interventions; and (ix) Tracking/Monitoring. Table 4.3 provides a summary description of the PIIM program objectives.

**Table 4.3 – PIIM MP Program Objectives**

Focal Area	Summary of Objectives
Managing Inflow	<ul style="list-style-type: none"> <li>Identify in-migration pathways and work with key stakeholders (government) and Project functions to create systems that deter opportunistic in-migration</li> </ul>
Multi-Stakeholder Forum (MSF)	<ul style="list-style-type: none"> <li>Promote and facilitate active multi-stakeholder (Project, Government, private sector, development agencies, NGO/CSO and communities) involvement, participation and joint management of PIIM risks and opportunities.</li> </ul>
Spatial Planning	<ul style="list-style-type: none"> <li>Enable adequate planning and provision for social services and urban and spatial planning in relation to anticipated increase in demand for services, utilities and land, with the view of proactively managing the risk of unplanned and uncontrolled development.</li> </ul>
Urban Planning - Infrastructure, Services and Utilities and Capacity	<ul style="list-style-type: none"> <li>Support development of an urban plan for Palma Town (and surrounds) that provides the basis for ongoing development;</li> <li>Support assessment of Palma Town infrastructure, services and utilities capacity to meet future demand and where appropriate, design and plan measures to address key issues</li> </ul>
Community Strengthening	<p>Build and strengthen communities' resilience to adapt to an accelerated process of change and an environment with new demands through targeted programs aimed at:</p> <ul style="list-style-type: none"> <li>Strengthening their ability to articulate aspirations and assert own cultural norms and identity;</li> <li>Enabling the acquisition of new and diversified skills so communities are able to take advantage of opportunities for development;</li> <li>Strengthening community organizational and leadership structures,</li> <li>Strengthening community law and order and conflict management systems;</li> <li>Empowering those most marginalized and vulnerable, in gender-sensitive ways.</li> </ul>
Community Health Programs	<ul style="list-style-type: none"> <li>Support the coordinated development and implementation of strategic health programs in collaboration with Government and other partners including Area 4.</li> </ul>
Natural Resource Management	<ul style="list-style-type: none"> <li>Monitor trends in forest cover, land use change and natural resource use</li> <li>Support community level definition of community land boundaries and the definition and assessment of community resources as a basis for more pro-active planning</li> </ul>

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Focal Area	Summary of Objectives
	<ul style="list-style-type: none"> <li>Design and implement sustainable natural resource management programs focused on areas identified to be under threat.</li> </ul>
PIIM Interface	<ul style="list-style-type: none"> <li>Establish clear coordination and collaboration channels.</li> </ul>
Tracking/Monitoring	<ul style="list-style-type: none"> <li>Determine appropriate PIIM tracking/monitoring indicators that can be collected and shared with key stakeholders.</li> </ul>

## 5.0 BIODIVERSITY – ADDITIONAL STUDIES

The LNG Project EIA identified potential environmental impacts to biodiversity that may arise from the construction and operation of the Project and mitigation measures for the identified impacts. AMA1 also committed to undertake additional biodiversity studies to inform the Project's Biodiversity Strategy and Biodiversity Action Plan.



Building on the existing extensive data set developed during, the Project has undertaken numerous additional onshore and offshore studies to update baseline data to inform additional mitigation requirements and monitor priority biodiversity features such as:

- Various ecological evaluations onshore within the Afungi Peninsula and more regional.
- Avian surveys including, crab plover, vultures and other wetland species.
- Palma skink surveys;
- Large carnivore and terrestrial megafauna monitoring;
- Alien invasive species surveys;
- Aquatic ecology surveys, including water quality, fish, macroinvertebrates;
- Bush meat surveys; and
- Surveys of coral communities within the bay.

In addition, the following strategies/ studies / assessments have been undertaken to support the BAP efforts:

- Biodiversity Strategy;
- Ecosystem Services Assessment (including further community and internal consultation);
- Area 1 and Area 4 Preliminary Offset Screening;
- Residual Impact Assessment Framework;
- Critical Habitat Assessment for Area 1 and Area 4; and
- Alien Invasive Species Risk Assessment.

In addition, the Project has shared environmental baseline data with Area 4 to develop an integrated baseline, this provide both Area 1 and Area 4 operators with a wealth of additional data collected since the EIA. This is documented in the Integrated Environmental Baseline Report (Ref.; MZ-000-AM1-HS-RPT-00006).

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The various biodiversity studies are part of a methodical process to define the biodiversity baseline, assess residual impacts, critical habitat and ecosystem services, develop a biodiversity strategy and action plan, and implement appropriate biodiversity management measures (Figure 5.1).

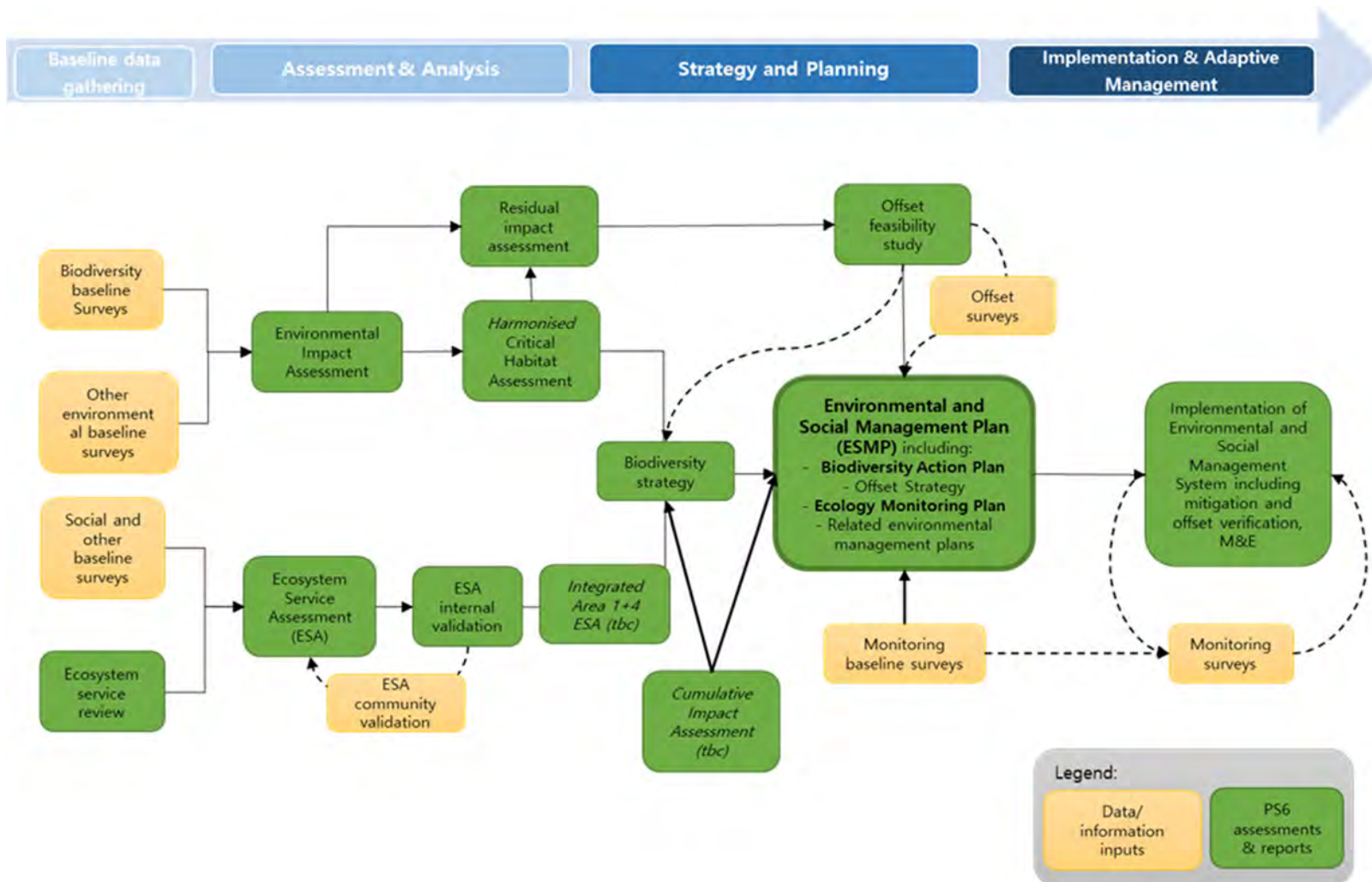




Figure 5.1 – Approach to Biodiversity Assessment and Management



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## 5.1 Ecological Areas of Influence

### 5.1.1 Onshore Area of Influence

The ADI for Onshore ecology is defined as the LNG DUAT area, and the Project construction footprints in particular. The Area of Indirect Influence (All) for terrestrial ecology is defined as the Palma District (Figure 5.2), possibly extending to southern Tanzania due to the potential impacts associated with population displacement and population induced in-migration.

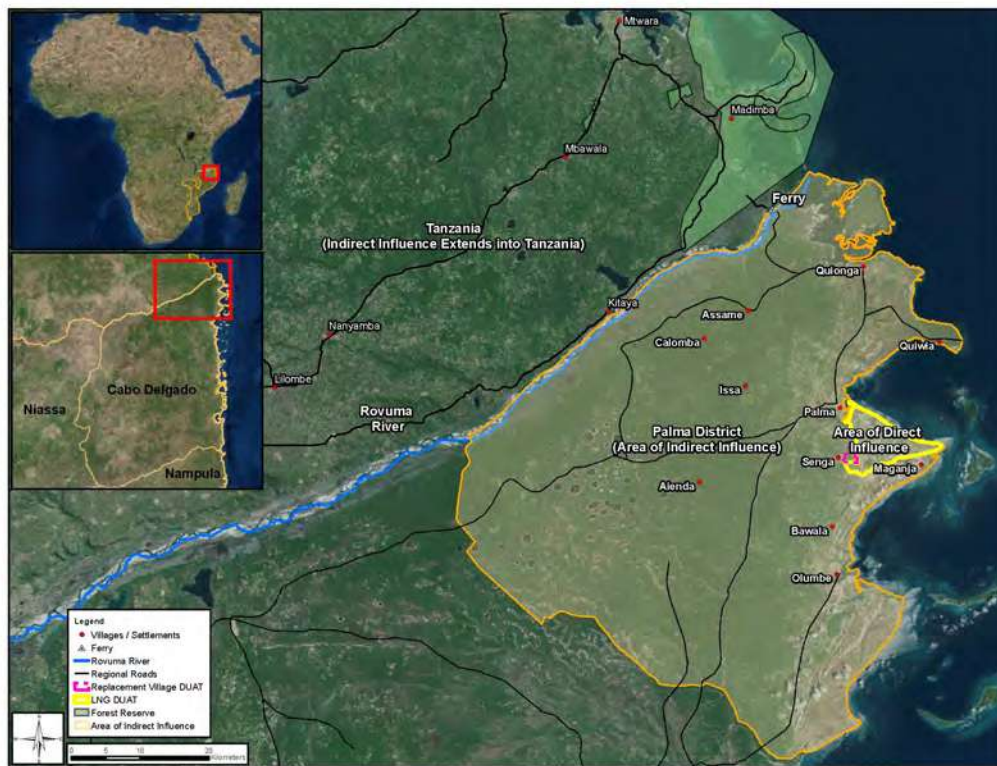


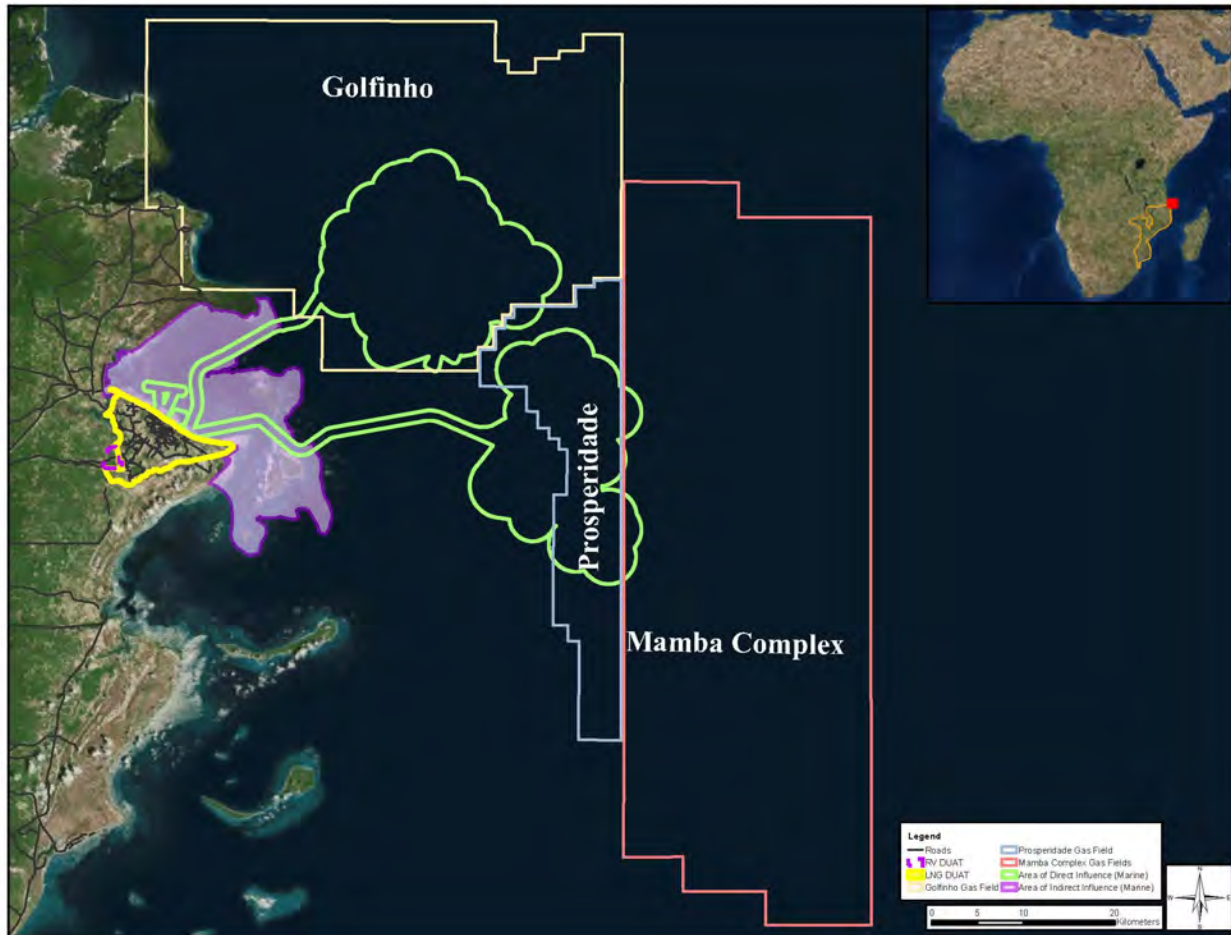


Figure 5.2 – Onshore ADI and All

### 5.1.2 Offshore Area of Influence

Offshore, the ADI comprises the locations of the offshore wells and the subsea production infrastructure, and the gas pipeline routes. Nearshore the ADI comprises areas disturbed by dredging, near shore infrastructure such as the jetties, the Nearshore pipeline routes, and navigational channels for Project vessels. The All for the marine environment is defined as Palma Bay, including the reefs fringing Tecomaji, Rongui and Queramimbi Islands (Figure 5.3).

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**Figure 5.3 – Near Shore and Offshore ADI and All**

## 5.2 Onshore Ecology Baseline

The DUAT comprises a relatively low-lying level coastal plain with three permanent rural villages whose inhabitants rely on shifting cultivation, and a mix of fishing and bushmeat hunting, and who depend heavily on natural resources for house building, food, drink and medicine for local use and/or sale. The immediate coastal areas are less suited to agriculture due to saline conditions and poor soils, but the coastline is frequented by fishermen who periodically live in temporary fishing camps along the shoreline.

Various native tree species have been preserved by local communities based upon their traditional uses and potential as a food source. These species may persist due to omission from land clearing (e.g. *Sterculia*, *Pterocarpus*, *Strychnos* species and the occasional Baobab tree, *Adansonia digitata*). Baobab fruit is brought into the region from neighbouring districts or regions where trees are more prevalent. Dependence of local communities on ecosystem services has been investigated as part of the Ecosystem Services Assessment, see Section 5.5.

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## 5.2.1 Vegetation and Flora

### 5.2.1.1 Regional Vegetation Type

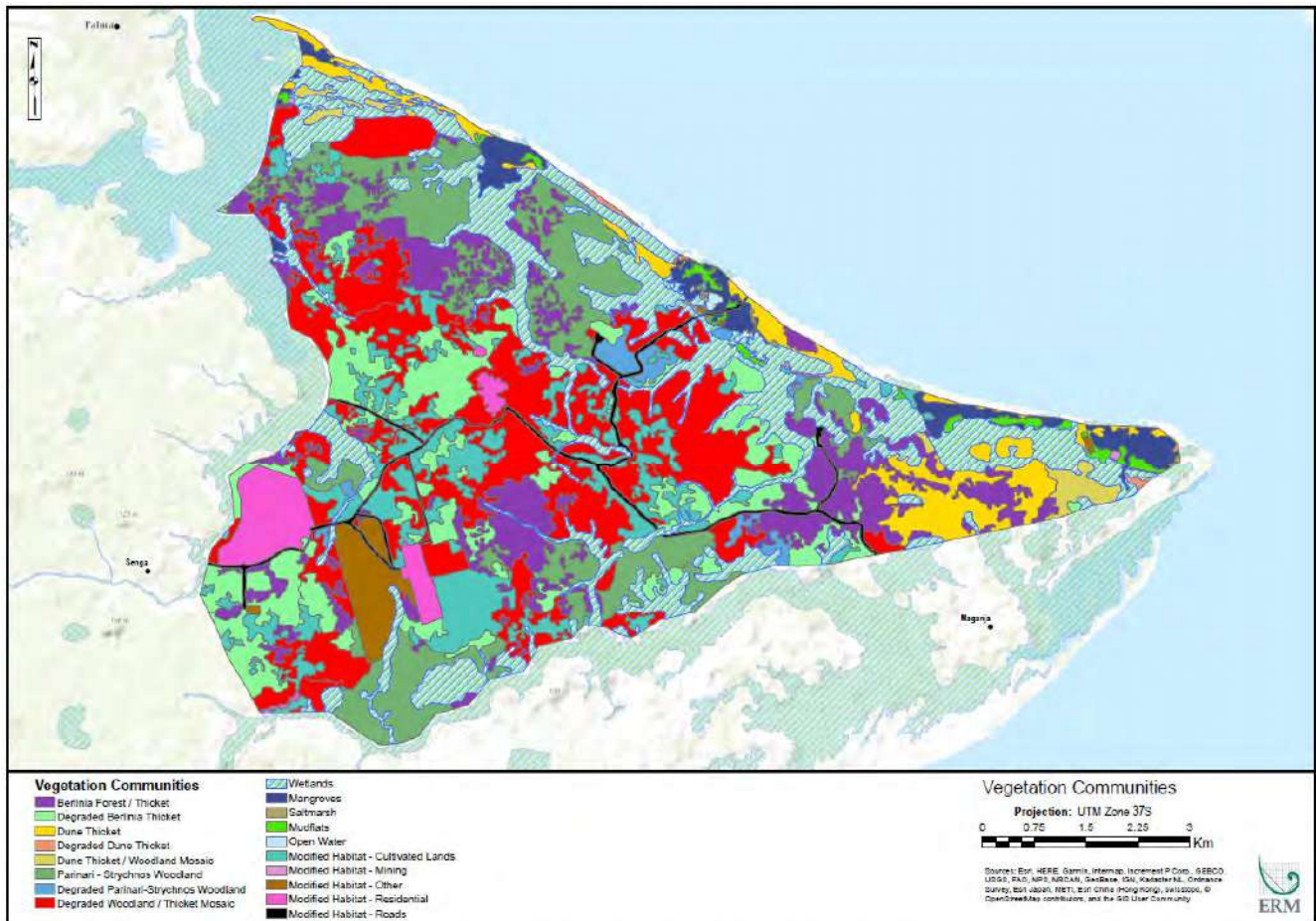
At a regional scale, the Project Area is situated within Deciduous Miombo Savannah Woodland / Deciduous Woodland (North-east Sublittoral), the dominant vegetation type on the coastal plain of northern Mozambique north of Pemba (Wild & Barbosa, 1967). Along the coastal plain in the Project Area, Burrows et al (2018) separated this broad vegetation type into five categories (with the local representative vegetation community in brackets):

- Rovuma Coastal Woodland (*Parinari – Strychnos* Open Woodland);
- Rovuma Basin Coastal Thicket – Forest (*Berlinia orientalis* Forest / Thicket);
- Dune Thicket – Forest (*Coptosperma littorale* Dune Thicket);
- Hygrophilous Coastal Grassland (*Cyperus prolifer* Wetlands); and
- Mangroves (*Rhizophora – Avicennia* Mangroves).

### 5.2.1.2 Vegetation Communities

Vegetation community mapping of the LNG and RV DUAT's (based on hand delineation of types recorded during fieldwork between August 2018 and January 2019) identified seven floristically and structurally distinct vegetation communities or associations that represent Natural Habitat. An additional five land cover types of Modified Habitat were mapped comprising cultivation, residential, mining, roads and 'other' (see Figure 5-4). Approximately 52% of the areas mapped is Natural Habitat and 48% is Modified Habitat.

The most sensitive vegetation types are the relatively intact portions of *Berlinia orientalis* forest/thicket patches and *Coptosperma* Dune Thicket-*Strychnos* Shrubland mosaic which contain populations of plant species of conservation concern (SCC), as well as *Cyperus prolifer* wetlands and mangroves for their high ecological functional value and low resilience.



**Figure 5-4 Vegetation Communities represented in the Project Area**



### 5.2.1.3 Flora of Conservation Concern

Ten threatened plant species were recorded in the Project Area. Five of these are classified by the IUCN as Endangered (EN), while one species (*Xylopia collina*) is currently EN but is in the process of being re-assessed and will be downgraded to a lower threat category (I. Darbyshire pers. comm.).

Four other threatened species occurring in the Project Area are classified as Vulnerable (VU), two of which are common to very common in *Berlinia orientalis* Forest / Thicket habitat (*Berlinia orientalis*, *Baphia macrocalyx*). Two other species are uncommon (*Premna hans-joachimii*) to locally common (*Monanthes trichantha*) in the *Berlinia orientalis* Forest / Thicket vegetation community in the Project Area.

### 5.2.1.4 Alien Invasive Species

Fourteen (14) Alien Invasive Species (AIS) of plants have been recorded in the LNG DUAT and surrounds. Most are typically associated with existing settlements and roads. The most common AIS recorded in the project construction areas are *Ricinus communis* (Castor Oil Bush) and *Lantana camara*.

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### 5.2.2 Mammals



Of the 69 mammals recorded in the region, 56 mammal species have been recorded in the LNG DUAT. Survey results indicated little difference in mammal assemblages between the wet and dry seasons, although mammal activity appears to be higher in the wet season correlating with the preferred bush meat hunting season.

Presence of large carnivores and megafauna such as elephant (VU), hippopotamus (VU), lions (VU), leopard (VU), and Africa wild dog (EN), which were reported several years ago, may potentially still occur as occasional visitors in parts of the LNG DUAT and adjacent areas, primarily in the wet season. Spotted hyena (VU) and leopard are considered to be resident in the LNG DUAT. After rain, the seasonal interlinked drainage lines with wetland habitat may form corridors along which animals such as elephant and hippopotamus may move from one area to another, including from Niassa and the Rovuma River to areas further south.

Although there are anecdotal reports of individual elephants and hippopotamus near the AMA1 Pioneer Camp and Senga two years ago, no large carnivores or megafauna have been recorded at any of the eight camera trap locations in the DUAT between July 2018 and February 2019; only widely distributed common species such as bushbuck, suni, duiker, side-striped jackal, vervet monkeys, yellow baboon, bushpig and civet have been photographed (all Least Concern (LC)), along with hunters and harvesters. Large antelope such as waterbuck, sable and kudu (all LC) which were previously recorded in the Afungi Project site are likely to be scarce due to hunting and human presence. Other medium-size mammals (all LC) such as honey badger; African clawless otter; serval; genets, polecat, water mongoose, and other mongoose species are also expected to occur in low numbers. Nocturnal primates such as Thick-tailed bushbaby and Grant's galago (both LC) are confirmed and relatively abundant.





*Baboons*

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### 5.2.3 Avifauna

A high diversity of birds are present in the Project Area. Of the 477 bird species which may occur in the wider Palma region, regional surveys have recorded 347 bird species of which 339 have been recorded in the LNG DUAT and surrounds (including coastal species). Bird communities can be separated into five groups:

- **Estuaries, Wetlands and Mudflats** – characterised by waders, plovers, and terns which concentrate around estuaries in the mudflats and coastal saltmarshes. The majority of waders are migrant species which breed in the northern hemisphere and migrate to Mozambique during the northern winter, meaning higher wading bird species abundance and diversity occurs around November-February. The baseline ecology study for the EIA (EnviroInsight 2012) identified the possibility that Palma Bay may host >1% of the global population of Crab Plovers and potentially qualify as a Ramsar site. To verify this, three surveys were undertaken in 2018 (September, October and November/December), which confirmed the presence of 1,633 Crab Plovers at nine sites along the coastline between Quirinde in the north and Olumbe in the south in the November/December survey. Highest Crab Plover presence was reported at Quiwie and Maganja. Only 78 of these birds was found at the Ngoji site in the DUAT suggesting the LNG DUAT is of low importance for these birds, which may be more subject to coastal disturbance from marine traffic.
- **Freshwater wetland birds** – comprising a number of typical wetland species (most LC) of which only the most notable is the Madagascar Pond Heron (EN) and Wattled Crane (VU). Recent surveys were undertaken to assess the presence of Wattled Crane, Saddle-billed Stork, African Skimmer (together with the Madagascar Pond Heron (EN) at various sites in and outside of the LNG DUAT. All except the African Skimmer was confirmed during surveys in August-September 2018.
- **Coastal Shrubland and Short Open Woodland Bird Community**, comprising multi species flocks of relatively common and widespread small passerine bird species. Notable species confirmed in the DUAT in recent surveys include Martial Eagle (VU).
- **Miombo Woodland** – comprising mostly common woodland species but notable for the presence of Southern –banded Snake Eagle (NT).
- **Generalist Woodland Birds** – comprising birds that can transition between the open and closed miombo woodland types, most of which are widespread species rated as LC. Priority species that may occur in the LNG DUAT (although considered uncommon) are Ground Hornbill (VU) and Bateleur Eagle (NT), and possibly Steppe Eagle (EN). Bateleur Eagle has been observed flying over the DUAT in recent surveys in 2018, but Ground Hornbill and Steppe Eagle have not been recently recorded.



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*Hornbill*

#### **5.2.4 Herpetofauna**

Of the 49 amphibians and 112 reptile species predicted to occur in the Palma region, a total of 40 amphibians and 61 reptiles have been recorded in the LNG Project Area based on all surveys and monitoring to date. The most notable of these are the newly discovered species: Palma Skink, *Scolopetes broadleyi* which has been confirmed at two localities in the LNG DUAT and three localities outside the LNG DUAT during pre- and post-EIA surveys. This species does not appear to be range restricted and is predicted may occur along the East coast as far south as the Messalo River in areas where soil conditions are suitable. It may possibly occur further northwards into southern Tanzania. Annual monitoring to confirm the ongoing presence at previously recorded sites and its potential presence in other localities in the LNG DUAT is underway. However, the first annual survey undertaken in April 2018 recorded no skinks and several other widely distributed herpetofauna species.

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*Palma skink*

A species of reed frog new to science, belonging to the genus *Hyperolius*, was discovered in the pan systems to the west of the LNG DUAT during post-EIA regional surveys (Enviro-Insight 2014). This species has a distinct morphology and a unique call from other *Hyperolius* species. Despite exhaustive searches, it was not recorded in the DUAT. Only one species of conservation concern (the southern African python; *Python natalensis*) was observed within the All.



### 5.2.5 Aquatic Ecology

A comprehensive aquatic ecology baseline was compiled in 2011/2012 (NSS, 2012) involving wet and dry season surveys at 12 sites in four catchments within the LNG DUAT, with follow up surveys in 2013 of 9 sites (Enviro-Insight, 2014). These covered macro-invertebrates, fish, diatoms and water quality variables, including macro-algae. Results of these surveys provides a robust basis for comparison with monitoring data. A summary of the key finds are documented here.

#### 5.2.5.1 Wetland Ecosystems

Most wetland habitats in the DUAT comprise unchannelled valley bottom wetlands, which form interconnected systems across five main catchments. All were categorised as Natural to Largely Natural in the baseline studies although exhibited limited habitat diversity – mostly gravel, sand and mud (GSM) substrates with marginal vegetation of grasses, reeds, and sedges and macro-invertebrate species that were dominated by air-breathers. The macro-invertebrate community are typified by low numbers of sensitive families, generally low family diversity and high percentages of air-breathers. This is indicative that only tolerant taxa can survive in these wetlands, which are typified by limited flow, low oxygen levels and high temperatures. Water temperature and oxygen levels in shallow wetland systems varies significantly across seasons and, as a life cycle cue, will influence the rate of development, reproductive periods and emergence periods of many organisms. The 2018 monitoring survey indicated that the wetlands appear to have become more vegetated in



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recent years, possibly due to reduced rainfall and runoff, and leading to fewer open pools.



*Example of typical wetland with limited open water*



One of the mitigation measures in the LNG Project EIA related to aquatic ecology was to create a channel to divert freshwater input to the wetland adjacent to the Revised Onshore Project Footprint Area (Figure 5.5).

This proposed LNG Project EIA mitigation was evaluated to identify potential risks and benefits. Potential risks are:

- Increased flow may alter the existing wetland habitat;
- The diversion channel may fragment habitats
- Increased water flow may inundate cropland and food trees; and
- Increasing the size of the wetland, may increase habitat to mosquito breeding, and associated malaria risk.

Possible benefits are:



- Extending the backshore lagoon may increase mangrove density on its fringes and provide a larger habitat for estuarine and estuary dependent fish; crustacean (crabs including *Scylla*) and molluscs; and
- In turn this could increase the areas for waders and piscivorous birds.

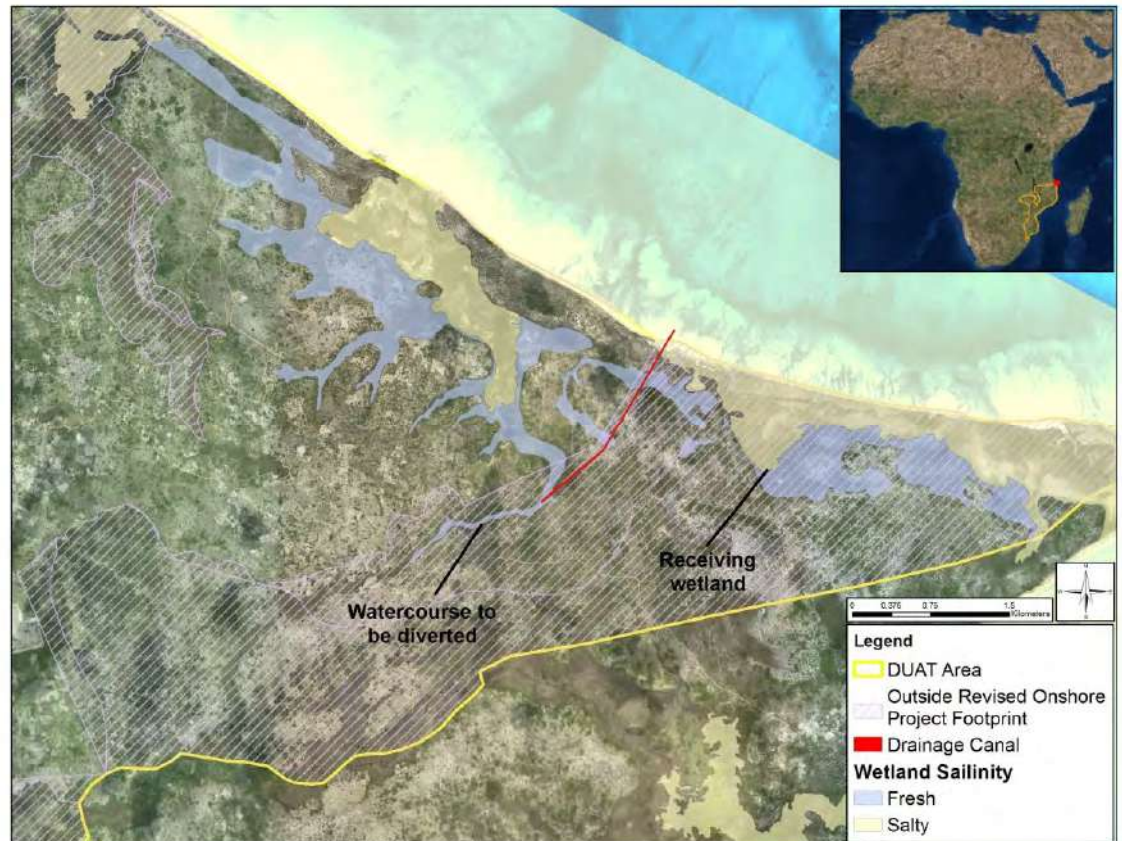
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**Figure 5.5 – Diversion Channel**

Taking a precautionary approach it was decided to leave the existing wetland adjacent to the Revised Onshore Project Footprint, untouched. The freshwater input will be directed to the bay via canal. This option eliminates any risk to the existing receptor wetland/ estuary. The exact alignment of the canal is currently uncertain but the initial recommendation is to parallel the eastern edge of the Project footprint area, offset by approximately 50 m. A conceptual alignment for the canal is shown in Figure 5.6.

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**Figure 5.6 – Conceptual Canal Alignment Directing Stream into the Bay**

#### 5.2.5.2 *Macroinvertebrates*

Macro-invertebrate data from the previous baseline studies highlighted the low diversity of aquatic habitats present within the study area, as revealed by low Ephemeroptera, Plecoptera and Trichoptera (EPT) richness, indicative of low numbers of sensitive taxa. The number of macroinvertebrate families represented at the different survey sites ranged between 13 and 25 taxa, with highest abundances of families with low sensitivity. Of the sensitive EPT taxa, no stoneflies (Plecoptera) were recorded in the baseline studies, probably due to low habitat availability – primarily a lack of stone habitats. The more recent monitoring survey in 2018 confirmed the relatively low diversity of species with only 5 to 11 species recorded at four sampled sites which held water; the majority of species are adapted to withstand extreme conditions.

#### 5.2.5.3 *Fish*

Previous baseline surveys recorded nine fish species in the freshwater wetlands of the LNG DUAT (with each site having between one and five species) and 32 fish species in the estuaries of the LNG DUAT. The majority of fish species recorded are classified as Least Concern (LC) or Data Deficient (DD). Megalops

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cyprinoides is a DD species found at a wetland site in the LNG DUAT while Silver Barb *Barbus choloensis*, is listed as VU and has been recorded in the region but is not confirmed to occur in the LNG DUAT. Mozambique Tilapia, *Oreochromis mossambicus* is classified NT but its presence in the LNG DUAT is uncertain. The killifish, *Nothobranchius cf. hengstleri*, is listed as DD and is considered endemic and has been recorded up the Rovuma River. This species was found at four locations in seasonal wetland systems in the LNG DUAT during surveys in 2011-2012, but it has not been observed in more recent surveys. Killifish is a group of relatively small (3 -15 cm), short-lived (3 -12 months) fish which mainly inhabit temporary habitats, such as isolated pools.





*Killifish, Nothobranchius cf. hengstleri*

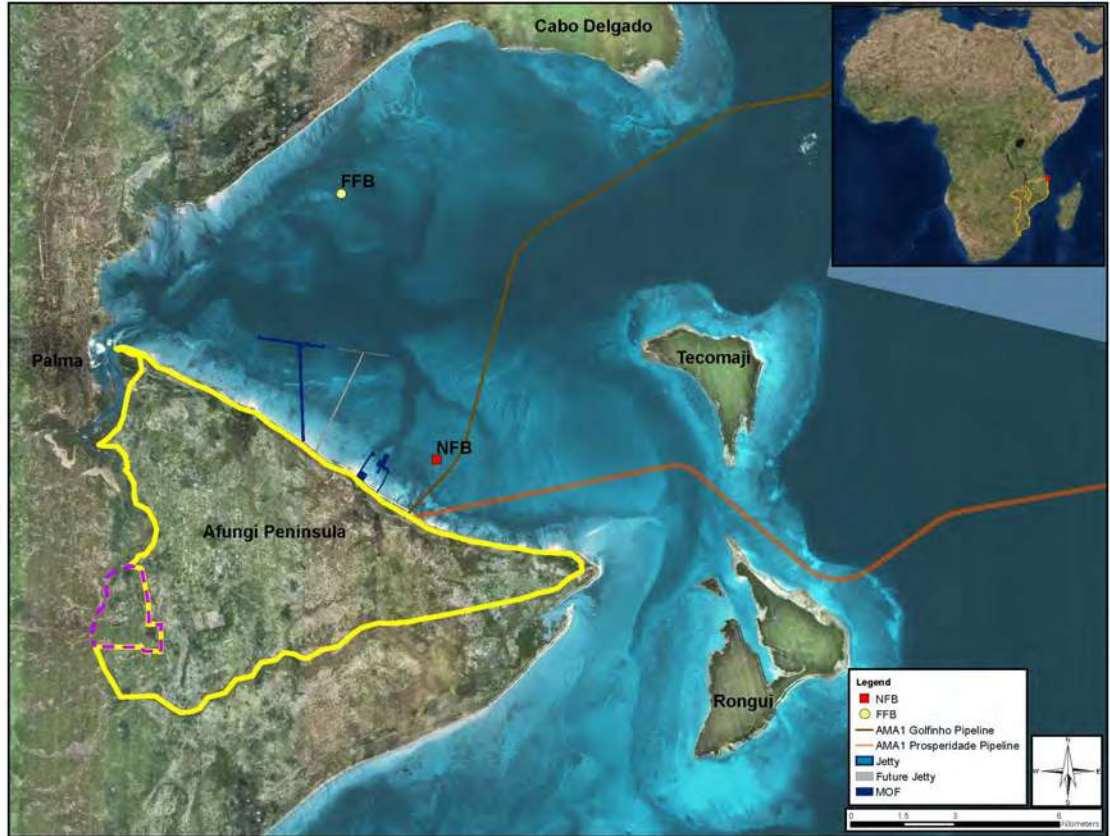
### 5.3 Marine Ecology Baseline

#### 5.3.1 Palma Bay

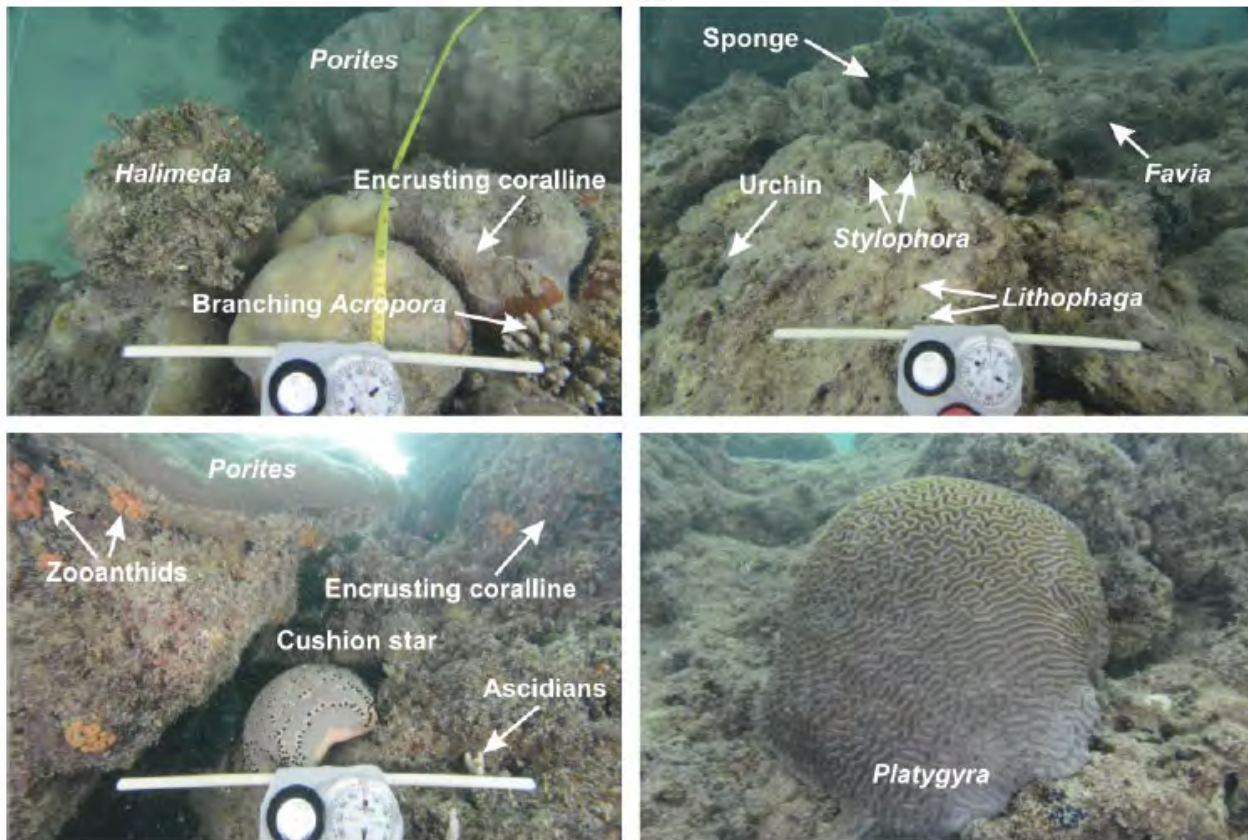
The survey describes the benthic diversity and health status of the patch reef habitats (known as bommies) within Palma Bay. A Near Field Bommie (NFB) and Far Field Bommie (FFB) site was investigated (Figure 5.7). The three coral bommies selected at the NFB site were dominated by *Porites* (Figure 5.8), with overgrowth by a low

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cover of dense algal and hydroid ‘fuzz’, crustose and articulated coralline algae, green foliose algae and a variety of invertebrates.



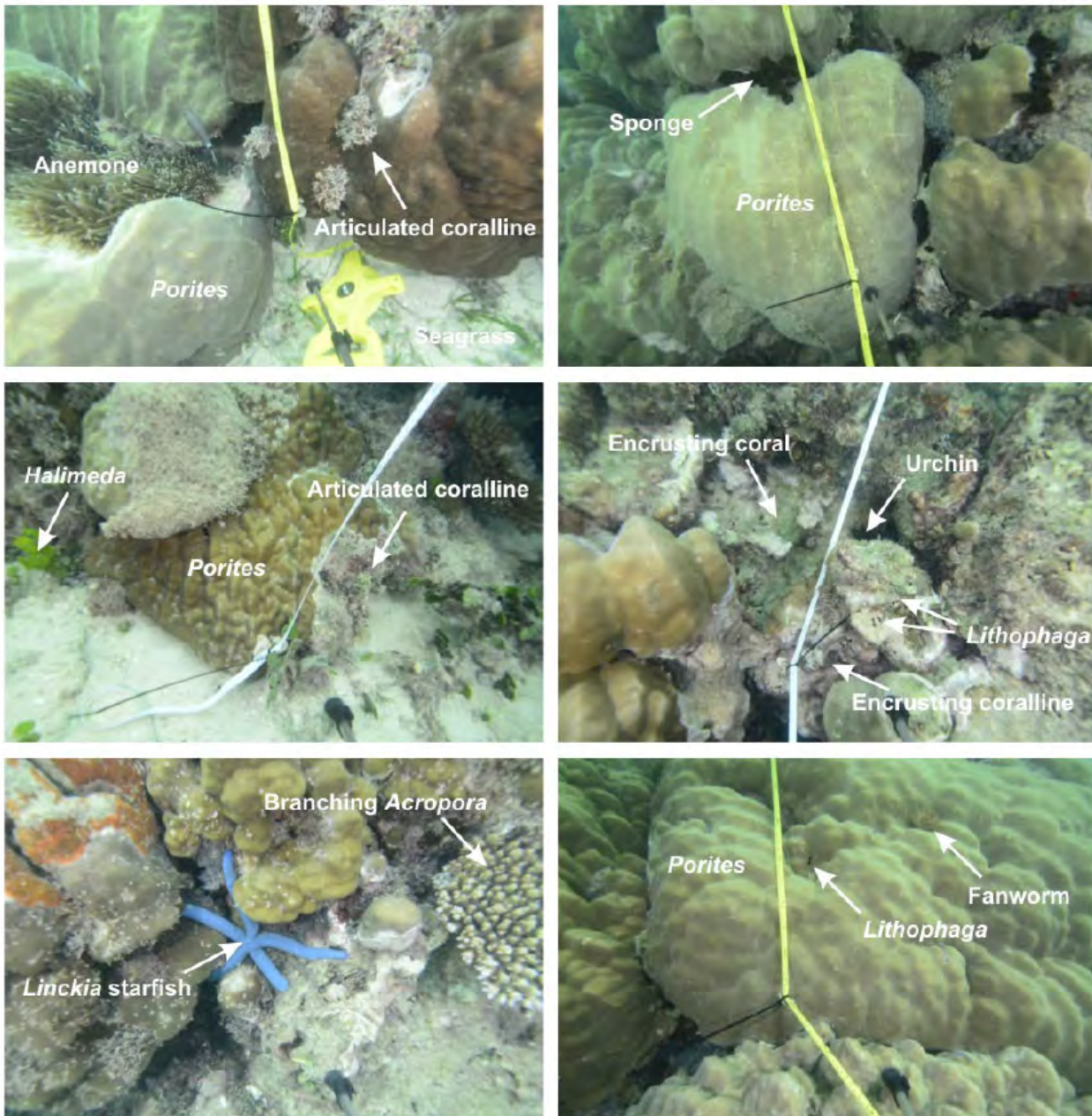
**Figure 5.7 – Location of NFB and FFB Sites Investigated**



**Figure 5.8 – Benthic Biota Associated with the *Porites* Bommies at the NFB site**

Other coral genera growing on the bommies included various digitate species of *Acropora*, the branched corals *Pocillopora* and *Stylophora*, and massive and submassive species of *Platygyra*, *Favia* and *Goniastrea*. Temporal differences in the percentage cover of growth forms were evident between the 2012 and 2014 surveys, but in no case were the differences significant. Noteworthy, however, was the deterioration of a small digitate *Acropora* following predation by horn drupe snails (*Duprella cornus*).



The FFB site was located at a similar depth and showed similar topography, but the communities differed from those at the NFB site in that there was significantly higher cover of both massive and tabulate growth forms and significantly lower cover by overgrowth of dead coral by algae and other growth forms. A diversity of invertebrates was associated with the bommies and other coral genera growing on the bommies included various digitate and tabulate forms of *Acropora*, encrusting forms of *Montipora*, *Echinopora* and *Favites*, and the solitary corals *Fungia*. Figure 5.9 shows the biota at the FFB site.



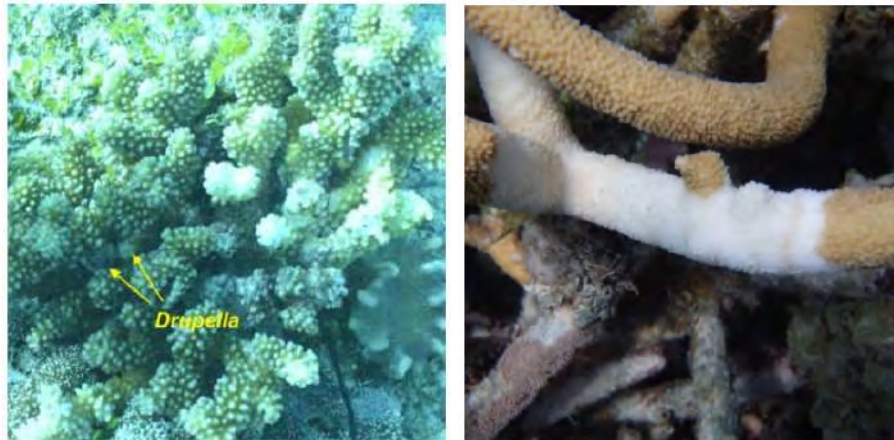
**Figure 5.9 – Benthic Biota Associated with the *Porites* Bommies at the FFB site**

### **5.3.2 Coral Communities at Tecomaji Island**

The four sites surveyed at Tecomaji Island had diverse hard and soft coral communities. Branching *Acropora* species were the most dominant at all sites surveyed. Diseased colonies were most prevalent at the shallow reference site north of Tecomaji, and Crown-of-Thorns starfish were recorded at the shallow site south of Tecomaji. A wide variety of diseases and/or factors affecting coral health were recorded at the four sites including growth deformities, predation by *Drupella* snails

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and fish, pigmentation responses, focal bleaching and tissue loss, white band disease and white syndrome, and aggressive overgrowth by soft coral and sponge.



**Figure 5.10 – Predation by *Drupella* (left) and White Band Disease (right)**

### **5.3.3 Coral Communities at Cabo Delgado Peninsula and Rongui Island**

The south eastern shallow fringing reef of Cabo Delgado Peninsula was characterised by a diverse hard and soft coral community, dominated by dense stands of branching *Acropora* species (34.1%) and interspersed by patches of coarse coral sand (16.7%) and rubble (4.0%). The reef was highly structured, with the sub-layers comprising dead branched corals overgrown with macroalgae, encrusting coralline algae and a mixed turf.



The four sites surveyed at Rongui Island also had diverse hard and soft coral communities. Branching *Acropora* species were typically the most dominant species. Diseased colonies were most prevalent at the shallow reference site to the south-east of Rongui Island. All diseased colonies observed in the belt transects were *Acropora* spp. However, within at one of the Rongui shallow sites a number of *Stylophora* colonies were infested by *Drupella* snails, and at both the deep and shallow sites small dead *Pocillopora* colonies were recorded.

### **5.3.4 Pockmarks**

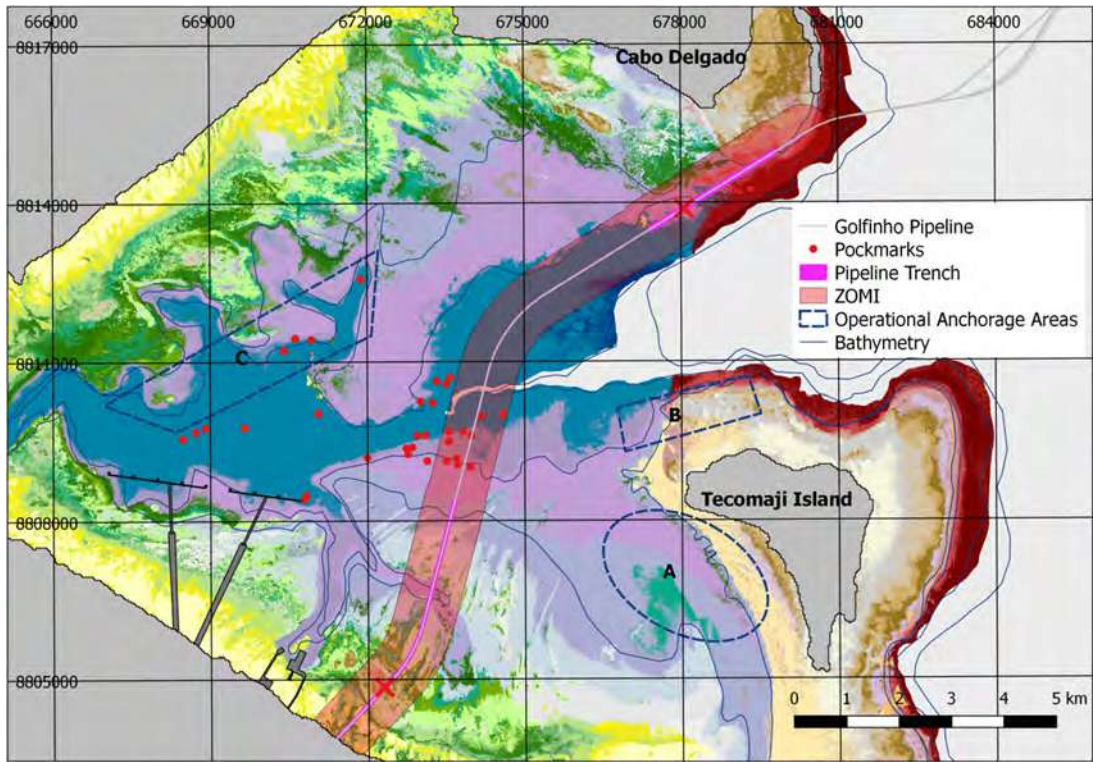
The proposed Golfinho pipeline (from 5.32 km to 7.49 km offshore) crosses predominantly sandy seafloor with varying degrees of macroalgae cover. This region has pockmarks in it and the proposed pipeline trench runs directly over pockmark #026 and is within 100-200 m of pockmarks #020, 019, 023, 024 and 022 (see Figure 5.11). Pockmarks show features consistent with those recorded for hydrocarbon fluid expulsion sites including the presence of methane derived authigenic carbonate (MDAC) rocks (Lwandle 2015<sup>13</sup>). These provide refugia for a wide variety of fish species and are colonised by sessile organisms, including hard corals.

<sup>13</sup> Lwandle 2015. Characterisation of Pock Mark Features in Palma Bay, Northern Mozambique. AMA1 LNG- Post EIA programme of Works. Prepared for ERM (PTY) LTD. Document #LT168/08. 24 pp.

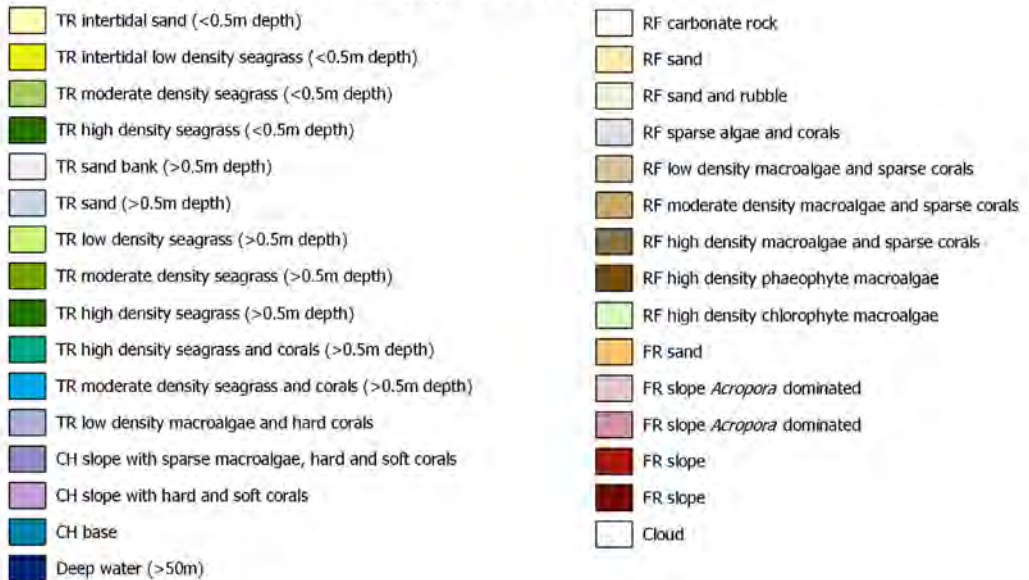


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It is not known whether pockmarks have a unique occurrence within the bay or whether they extend to other embayments on the coast. For the purposes of the EMP Update assessment a precautionary approach was followed, and it was assumed that they were unique to Palma Bay.



**Channel (CH), Reef flat (RF), Forereef (FR), Terrace (TR)**



**Figure 5.11 – Multi-spectral satellite image of Palma Bay showing the distribution of seabed types and associated biological communities. The location of the Golfinho gas import pipeline corridor, trench area, zone of moderate impact (ZOMI), pockmarks, and operational anchorage areas are displayed. (modified from MEP 2015<sup>14</sup>)**

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#### 5.4 Critical Habitat Assessment

In early 2019, a joint, “harmonized” Critical Habitat Assessment (CHA, Ref.: MZ-000-TBC-HS-RPT-00004) was undertaken between AMA1 and Area 4. Both projects recognize the importance of identifying biodiversity priorities through a single, unified CHA that accounts for the contiguous landscape and seascape. It was based upon existing data sets and studies (i.e. field-based surveys, evaluations and assessments) from both Area 1 and Area 4, global biodiversity datasets and published literature. It considers both biodiversity recorded in the project area and those likely to be present based on information available through global and regional assessments, often supported by expert input and consultation.

The CHA identified Critical Habitat (CH)-qualifying species and ecosystems within the onshore, nearshore and offshore areas of assessment (Table 5-1). Not all of these species and ecosystems have been confirmed as present (through field verification) in the Onshore, Nearshore or Offshore areas, but have been included where there is reasonable evidence of the presence of the species.

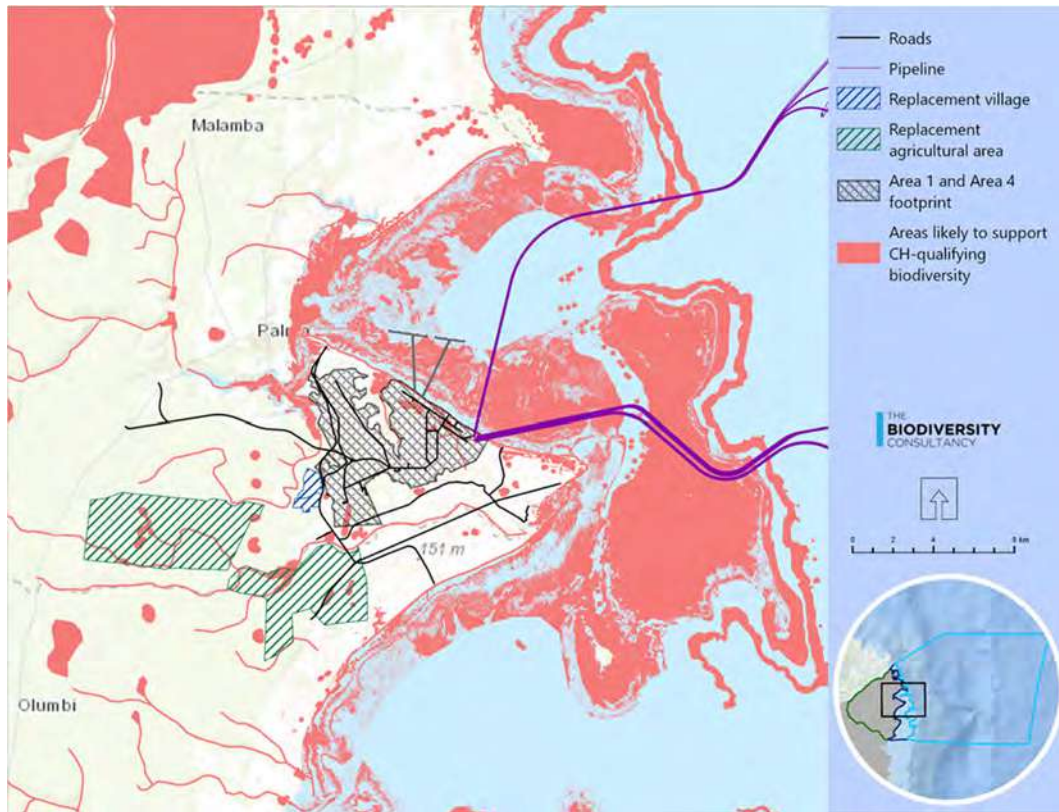
In addition to CH-qualifying species a number of terrestrial and marine species are likely to be of particular stakeholder concern, and thus may still warrant particular consideration in mitigation planning. These include the African Elephant, Leopard, Manta Ray and at least 17 species of whales and dolphins, including Humpback Whales.

Figure 5.12 highlights areas that are likely to support critical habitat-qualifying biodiversity features (species or ecosystems). Some of these areas are important for supporting critical habitat-qualifying turtles, birds and fish. Others are ecosystems that qualify as critical habitat in their own right (e.g. coral reefs, mangroves and seagrass beds).

From a terrestrial perspective, the majority of the interior of the Area of Assessment (AoA), away from the coastal plain is Natural Habitat and retains most native species, and ecological functions, despite varying levels of disturbance from harvesting natural resources. Both the nearshore and the offshore AoA are largely Natural Habitat and retain all or most species and ecological functions, in spite of modifications due, mainly, to fishing. Ecosystems along the coastal plain have been heavily populated for centuries, resulting in high levels of disturbance in many areas (evidenced by secondary woodland, settlements and agricultural activities). Therefore the Coastal Plains ecosystem, including the dryland parts of the LNG DUAT, is likely to be predominately Modified Habitat, although small patches of Natural Habitat persist, including *Berlinia orientalis* thickets

CH-qualification does not necessarily mean that any specific action is required from the Project. First, CH-qualifying biodiversity does not occur across the whole area: some parts of the landscape and seascape are more important than others. Second, action is only necessary for CH-qualifying biodiversity upon which the Project have measurable adverse impacts. AMA1 has taken significant steps to avoid areas containing critical habitat-qualifying biodiversity. This assessment thus identifies a clear focus for mitigation, particularly for avoidance of impacts, and to determine if any additional remediation and/or offset measures are required to deliver no net loss (for Natural Habitat) or net gains for CH-qualifying biodiversity.



<sup>14</sup> MEP 2015. Marine baseline for the resettlement action plan: fish stocks and fish habitat mapping study. Anadarko Mozambique Area 1, Lda: Mozambique Gas Development. 125pp.



**Figure 5.12 – Ecosystems and sites in the immediate vicinity of the Project likely to contain CH-qualifying biodiversity.** A number of CH-qualifying features could not be mapped at this time, including *Berlinia orientalis* thickets (onshore) and locations of deep-sea vents.

**Table 5-1: Critical Habitat-qualifying biodiversity confirmed or inferred present in the Projects’ Areas of Assessment**

PS6 CH criteria	Biodiversity features		Confirmed present in AoA?
1: Critically Endangered and/or Endangered species	Onshore AoA		
	Four birds	White-headed Vulture	Yes
		White-backed Vulture	No
		Hooded Vulture	No
		Madagascar Pond Heron	Yes
	17 plants		Yes
	Nearshore AoA		
	Three marine fish	Humphead Wrasse	Yes
		Largetooth Sawfish	No
		Green Sawfish	No
Two marine turtles	Green Turtle	Yes	
	Hawksbill Turtle	Yes	
One marine mammal	Indian Ocean Humpback Dolphin	Yes	
Offshore AoA			
One marine fish	African Coelacanth	No	
Onshore AoA			

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PS6 CH criteria	Biodiversity features		Confirmed present in AoA?
2: Endemic and/or restricted-range species	One amphibian	<i>Hyperolius stictus</i>	Yes
	One reptile	<i>Scolecoseps broadleyi</i>	Yes
	One freshwater fish	<i>Nothobranchius hengstleri</i>	Yes
	22 plants (13 of which also qualify under Criterion 1 – listed above under Criterion 1)		
	Offshore AoA		
	Two marine fish	Narrow Skate Mozambique Numbfish	No No
3: Migratory and/or congregatory species	Onshore AoA		
	Two birds	Madagascar Pond Heron	Yes
		Crab Plover	Yes
4: Highly threatened and/or unique ecosystems	Three terrestrial ecosystems	Coral rag forest East African coastal dry forest <i>Berlinia orientalis</i> thickets	Yes Yes Yes
	Three nearshore ecosystems	Mangroves Warm-water corals Seagrass	Yes Yes Yes
	One offshore ecosystem	Gas seeps	Yes
	5: Areas associated with key evolutionary processes: None currently identified		
6: Legally Protected Areas & Internationally Recognized Areas: None currently identified			

## 5.5 Ecosystem Services

The Ecosystem Services Assessment (ESA, Ref.: MZ-000-TBC-HS-RPT-00001) identifies Priority Ecosystem Services (ES) through a process of screening, prioritisation, and baseline characterisation. These findings were subsequently validated with Project specialists through an internal workshop and further community and internal consultation in 2018. Table 5-2 below presents a summary of the 21 ES identified as priorities for the Project. These include 20 ES which are likely to be impacted by the Project and one ES on which the Project is dependent for its operations.

Potential impacts to Priority ES from the Project can be placed into four broad categories:

- Loss or degradation of ecosystems within the Project footprint, hence the services they potentially provide;
- Beneficiaries exclusion from the Afungi Peninsula and inshore waters and hence loss of access to farm land, and marine and terrestrial natural resources, and cultural links to the land and sea;
- Increased capital input required by beneficiaries who need to spend more in order to access ecosystem services which are farther away due to the exclusion, or relocation;
- Potential indirect impacts to ecosystems and natural resources through Project induced in-migration and increased wealth with a subsequent increased demand for natural resources; and
- Potential cumulative impacts arising from the interaction of this Project with other current or planned projects or developments in the region.



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**Table 5-2: Summary of estimated pre- and post-mitigation impacts to Priority Ecosystem Services**

ALRP = Agricultural Livelihood Restoration Plan; FLRP = Fisheries Livelihood Restoration Plan; PIIM = Project Induced In-migration Impact Assessment



ES category	Priority ecosystem service	Pre-mitigation impact significance	Key ES impact mitigation measures and project plans	Residual impact significance	Risk management	Monitor
<b>Regulating</b>	Storm protection	MODERATE	Contractors' contractual requirements and ESMP for avoidance and minimisation measures.	MINOR		Changes to marine ecosystem health and coastal hydrology, sedimentation and shoreline stability.
	Shoreline protection	MAJOR		MODERATE <sup>15</sup>		
	Terrestrial and riparian erosion control (Type 1)	MINOR	Contractors' contractual requirements and ESMP for avoidance and minimisation measures.	MINOR		
	Terrestrial and riparian erosion control (Type 2)	MINOR		MINOR		
<b>Provisioning</b>	Intertidal fisheries resources	MAJOR	BAP (in prep.) for habitat avoidance and minimisation measures FLRP and Resettlement Plan for restoration and compensation measures. PIIM for minimisation measures.	MODERATE	To manage additional risks associated with in-migration the Project could support community fisheries management bodies, local empowerment and capacity building	Changes to ecosystem health, and fish catches. Effectiveness of FLRP for compensating lost fishing grounds and increase in capital input needed to benefit from the ES.
	Inshore fisheries resources	MAJOR		MODERATE		
	Surface water	MINOR	Contractors' contractual requirements and ESMP for avoidance and minimisation measures.	MINOR		Surface and groundwater levels to ensure they do not fall below acceptable levels.
	Ground water	NEGLIGIBLE		NEGLIGIBLE		
	Wetland agricultural land	MODERATE	PIIM for minimisation, Resettlement Plan and ALRP for compensation measures.	MINOR		Effectiveness of ALRP for compensating for lost agricultural productivity.
	Dryland agricultural land	MAJOR		MINOR		
	Bushmeat	MODERATE	PIIM, Resettlement Plan, and Community Investment Execution Plan for minimisation, management and compensation measures.	MINOR	Community engagement on these issues, combined with participatory monitoring will manage any risks associated with community perception that Project-induced impacts are greater than they actually are.	Effectiveness of RP for maintaining livelihoods. Changes in community access to, and use of wild resources.
	Wild fruit, roots and tubers	MODERATE		MINOR		
	Firewood	MODERATE		MINOR		
	Poles and other building materials	MINOR		MINOR		
	Mat weaving materials	MINOR		MINOR		
	Thatch materials	MINOR		MINOR		
	Medicinal plants	MODERATE		MINOR		
Musirro face mask materials	MINOR	MINOR				

<sup>15</sup> Minor residual impacts when considering only the Golfino and not the Prosperidade pipeline

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ES category	Priority service ecosystem	Pre-mitigation impact significance	Key ES impact mitigation measures and project plans	Residual impact significance	Risk management	Monitor
Cultural	Tourism and recreation	MAJOR	PIIM, Cultural Heritage Management Plan and Resettlement Plan for Avoidance minimisation and compensation measures	MAJOR <sup>16</sup>	Continued engagement with and support to tourism sector to build a positive relationship.	To be determined
	Sense of place, sense of belonging	UNKNOWN		UNKNOWN	Better understand importance of sense of belonging and opportunities to compensate for impacts.	To be determined
	Ethical and spiritual values	MAJOR		MODERATE	Continued engagement in order to develop appropriate mitigation on a case-by-case basis.	Effectiveness of CHMP and cultural acceptance of avoidance or re-location efforts.

<sup>16</sup> Residual impacts are particularly relevant to Vamizi. It should be noted that the Project has already undertaken measures to minimize the visual impact of the Project (see Appendix 6).

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The Project will result in households being physically or economically displaced and will affect fishers during construction and operations. The majority of affected households are highly dependent on natural resources for their livelihoods, especially for agriculture, fishing and foraging. Patterns of ES use vary respective to the distance from the villages to the coast. Villages that are located farther inland, such as Senga, mainly utilise terrestrial natural resources and agriculture. Other villages located closer to the coast such as Maganja and Milamba primarily use the natural resources from the intertidal area, and the village of Kibunju consists of mainly intertidal and inshore fishermen (fishing village). This pattern of use has been considered in the impact assessment of Priority ES identified in the ESA.

Some ES, particularly fisheries, are not currently managed sustainably and are likely to undergo significant changes even in the absence of the Project. The Project has an opportunity to improve fisheries management which could lead to an improvement in fish stocks and generate a lasting positive impact.

In most cases planned measures, primarily mitigation for impacts to habitats/ecosystem through the Biodiversity Action Plan (BAP, in preparation) and the compensation programmes through the Resettlement Plan and livelihood restoration plans, are expected to adequately mitigate potential ES impacts found in this assessment. The ESA found that these measures will potentially maintain the value and functionality of most Priority ES



Significant residual impacts are predicted to remain after application of currently planned mitigation measures for five Priority ES: shoreline protection, intertidal and inshore fisheries, tourism and recreation, and sense of place/ sense of belonging. To address these, the Project will continue to:

- Develop and engage community resource management groups and associated initiatives to better manage marine and terrestrial natural resources, and manage the impacts of in-migration;
- Conduct community consultation to better understand cultural links to the land and sea; and
- Engage with the tourism sector to identify potential positive collaborative actions.

## **5.6 Ecology Monitoring Plan**

The Ecology Monitoring Plan describes AMA1's approach to monitoring ecological impacts in the onshore, near shore and offshore, from its activities and the effectiveness of mitigation measures to protect the integrity of the host environments and deliver on conservation targets. It provides the framework for demonstrating the Project's environmental compliance to stakeholders. The monitoring methodology described in the Ecology Monitoring Plan is designed to provide a comprehensive approach to evaluate changes to priority biodiversity. The interpretation of monitoring data will provide insight into the cause of environmental changes and determine if those changes were naturally occurring, Project-induced or attributable to another source. Once the cause of the impact is identified, corrective actions can be implemented, and monitoring can assess the effectiveness of any new or additional measures implemented. This methodology will also assist in observing trends over time so that preventative measures can be implemented before critical thresholds are reached, ensuring the Project stays on track to meet its conservation targets.



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The Ecology Monitoring Plan is intended to be a ‘living document’ and will be continuously improved through the evaluation and application of monitoring results and corrective actions. The Ecology Monitoring Plan includes terrestrial, nearshore and offshore monitoring requirements. It has recently been updated (as of March 2019) to include the findings of the recently undertaken Harmonized Area 1 and Area 4 Critical Habitat Assessment (see Section 5.4).

## 6.0 CUMULATIVE IMPACTS

### 6.1 Introduction

Cumulative impacts are those incremental impacts on areas or resources used or directly affected by the Project from other existing, planned or reasonably defined activities, developments or projects. Existing, planned or reasonably defined activities, developments or projects are identified at the time the Project’s risks and impacts are being identified. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities. In this regard, Valued Environmental and Social Components (VECs) have been identified based on the environmental and social studies undertaken to date in the Palma district and Cabo Delgado province. VECs are environmental and social attributes that are considered to be important in assessing risks and impacts.

Undertaking the cumulative impact assessment often requires participation by other stakeholders and is best led by government or regional planners. The Project has developed this cumulative impact assessment based on best knowledge of planned activities and commits to supporting the Government of Mozambique (and its designated agency) with their spatial planning efforts, acknowledging that the Project’s level of control is commensurate with its level of contribution to the cumulative impact.



#### 6.1.1 Planned Activities, Developments or Projects

Existing activities, developments or projects were considered in developing the environmental and social baseline against which the Project was assessed. For example, the terrestrial ecology baseline takes into account past agricultural practices that have transformed the natural landscape and resulted in an alteration of the habitat for various fauna species. Thus, such previous activities have already been considered in the LNG Project EIA and used as the baseline to assess the potential impacts of the proposed Project activities.

The expected cumulative impacts of Area 1 and Area 4 project activities have been considered in the EMP Updates in which cumulative issues such as air quality and groundwater use were modelled. Cumulative modelling of effluent discharges and sediment dispersion are underway.

In addition to the Area 4 project, the following have been identified as ‘reasonably defined’ activities that could act together with the Project to cumulatively affect VECs:

- Establishment of an Industrial Development Zone (IDZ) by the Government of Mozambique in the vicinity of, or incorporating, the Afungi Project Site;

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- Future phases of exploration and development of hydrocarbon resources by AMA1, MRV and others; and
- Growth and development which is occurring in Palma and northern Mozambique in anticipation of the hydrocarbon developments and associated projects.

### 6.1.2 Potentially Affected VECs

Based on the social and biodiversity support studies undertaken during and subsequent to the LNG Project EIA, the following potentially affected VECs have been identified:

- Biodiversity and Critical Habitat;
- Ecosystem Services;
- Community Health; and
- Livelihoods and Cultural traditions.

The baseline assessments of these VECs are presented in Chapters 4, 5 and 6 of the LNG Project EIA and are not repeated here.

## 6.2 Cumulative Impact of the Area 4 Project

### 6.2.1 Overview

The Area 4 project (called the Rovuma LNG Project) will develop and produce gas from the Mamba gas field, adjacent to AMA1's Prosperidade field. Gas from the Mamba field will be routed to an LNG Facility through the Prosperidade pipeline corridor described in the LNG Project EIA. Onshore, the Rovuma LNG Project infrastructure will be located within the build zone (the "Revised Onshore Project Footprint Area" described in the LNG Project EIA).

Area 1 and Area 4 have been working together and sharing information to inform cumulative assessments. Where information was not readily available, reasonable assumptions were made. These cumulative assessments were included in the 2019 EMP Updates (see Section 3.6).



Project activities that have the potential for cumulative impacts include:

- Groundwater use;
- Air emissions;
- Effluent discharges to the bay; and
- Turbidity from dredging and dredge disposal.

### 6.2.2 Assessment and Mitigation/Management

#### 6.2.2.1 Groundwater

The peak cumulative demand for Area 1 and Area 4 Exclusive Facilities and Shared facilities (including resettlement village and airstrip) is approximately 5 000 m<sup>3</sup>/d, which will occur over a three month period in 2020. The revised

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modelling shows that despite predicted drawdowns of potentially 30-60 m in some boreholes, modelled groundwater levels are not drawn down below 3 m ASL at the wetland locations where tidal influences are expected; hence, saline intrusion is not predicted to occur. The model drawdowns are similar to those measured during the EIA. The resettlement of affected communities to the resettlement village will effectively mitigate the potential impact on surrounding communities, as modelling shows that, drawdown at the resettlement village wells under the most likely abstraction scenario is not considered significant to impact supply and saline intrusion is not anticipated.

The potential impact on groundwater abstraction in surrounding communities is thus considered to remain of low magnitude and *NEGLIGIBLE* significance. The key mitigation is to maintain a dynamic groundwater level of  $\geq 3$  m ASL at the groundwater interface at tidally influenced estuaries or wetlands.

Although the model used cannot accurately predict effect of groundwater abstraction on streams, the two Projects will be drawing from deep aquifers, not likely to be connected to surface water. Thus, it is expected that the potential impact is expected to remain be *NEGLIGIBLE*. An adaptive management approached is recommended in order to monitor and mitigate/manage potential unanticipated impacts on surface water. The mitigations regarding surface water ecology in the EMP Updates will apply as well.

#### 6.2.2.2 Air Emissions

The results of the updated cumulative air dispersion modelling indicate that all pollutants, considering the worst case scenario, fall below the Project air quality standards committed to in the EMP Updates.



Regardless of being under the Project air quality standards in the worst case scenario, the methodology assigns significance based on the Projects' percentage contribution to the air quality standard and the predicted environmental concentration (comprising the Projects' contribution plus the existing ambient concentration). Pollutants will have a *NEGLIGIBLE* impact on human receptors, with the exception of NO<sub>2</sub> (1 hour maximum) and Benzene (annual maximum).

NO<sub>2</sub> (1 hour maximum) emissions will contribute 50% to 75% of the Project air quality standard and the predicted environmental concentration will be below the Project air quality standard. Per the methodology, this is a *MODERATE* significance. The Projects' contribution of benzene (annual maximum) will be between 25% and 50% of the Project air quality standard and predicted environmental concentration will be less than the Project air quality standard. Therefore, per the methodology, the impact significance is expected to be *MINOR*.

No additional mitigation measures (from those described in the EMP Updates) apply as there are no exceedances of the Project's air quality standards.

#### 6.2.2.3 Effluent Discharges

Further modeling is currently underway to predict whether the combined Area 1 and Area 4 discharges will meet the ambient water quality standards. Where

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modelling predicts areas of concern, engineering solutions will be investigated to allow conformance with the standards.

#### 6.2.2.4 Dredging Turbidity

Further modeling is currently underway to predict whether the combined Area 1 and Area dredging would have any cumulative impacts. Regardless of the modelling, dredging contractors will develop and implement dredging management and monitoring plans that will monitor turbidity in real time and inform mitigation strategies to ensure that the turbidity thresholds in the EMP Updates are adhered to.

### 6.3 Cumulative Impact of the Proposed Industrial Development Zone (IDZ)



#### 6.3.1 Overview

Information currently available related to the location, extent or timing of the establishment of the potential IDZ by the Government of Mozambique is sparse.

The Government envisions the establishment of an IDZ in the vicinity of, or incorporating, the Project Site. To attract future projects and promote domestic and international investment in the IDZ, the Government of Mozambique has established Empresa Nacional de Hidrocarbonetos Logistics (ENHL) to build two ports in Cabo Delgado Province (one in Palma and another in Pemba). It is assumed that the Palma location will be part of the establishment of this IDZ in the vicinity of the Project area or possibly incorporating the Project area. The IDZ will serve as the area within which future industrial activity (onshore) will be located. The aim, as currently understood, is to consolidate infrastructure and services in one area and to avoid impacts of discrete projects occurring in different areas within Cabo Delgado province. Other developments within the IDZ are anticipated to be subject to separate EIAs as administered by MITADER.

In addition, AMA1 has reached a Memorandum of Understanding (MOU) with the Government of Mozambique to provide natural gas from its Mozambique LNG development for domestic use. Under the terms of the MOU, Offshore Area 1 will provide initial volumes of approximately 50 million cubic feet of natural gas per day (MMcf/d) per train (100 MMcf/d) for domestic use in Mozambique. The natural gas will be provided at pricing that is fair to all parties and supports local natural gas development, and the concessionaires are prepared to sell up to 300 MMcf/d of additional volumes into the domestic market in future years as projects are matured and commercial terms agreed.

The proposed development of the IDZ (which is approximately 18,000 ha in addition to the Project's DUAT area) is a concept at this stage but which, if implemented, could transform a relatively large area from its current rural/agricultural state to facilitate industrial use. Such transformation may affect regional biodiversity, may affect identified critical habitat, and may restrict access or otherwise alter the traditional livelihoods of the local communities reliant on the land. It is difficult to quantify the extent of the potential impacts at this stage as the scale, timing and other details relating to the IDZ are unknown. AMA1 continues to engage with the government and potential developers to understand the plans for the area.

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### 6.3.2 Assessment and Mitigation/Management

Because the specifics of the proposed IDZ and the associated operating scenarios are unknown at this stage, quantifying the potential cumulative impact is not possible. The primary pathway that the VECs could be affected is through the footprint of the IDZ. The land use changes, influx of people and new projects within the IDZ could:

- Modify habitats and affected regional biodiversity;
- Alter ecosystem services;
- Affect the health of local communities; and
- Change local communities' livelihoods and cultural traditions over time.

Qualitatively, it is expected that the IDZ, if managed properly, could have an overall positive impact on VECs at the regional level. This is because, while there may be direct and indirect impacts on VECs at the local level, in the long term, consolidating this development within the IDZ will ensure impacts are largely concentrated in one area and easier to manage. The IDZ also offers the opportunity for spatial planning such that potentially conflicting land uses or businesses (e.g., tourism and industrial development) can be supported in a planned, coordinated fashion, thereby maximising the economic potential of northern Mozambique and minimising negative impacts as far as possible.

Should the IDZ be located adjacent to or incorporating the Afungi Project Site, the Project will share non-proprietary data and information with third parties (such as ENHL and its contractors) to support the impact assessment and consolidated mitigation/management measures that should be used as part of the IDZ planning. AMA1 will also support government-led processes to collaborate with other stakeholders (local operators in the oil and gas sector, supporting industries, and NGOs) to manage cumulative impacts. Finally, AMA1 will try to positively influence area developments by sharing best practices from their operations inside the Project controlled area.



## 6.4 Cumulative Impact of Future Exploration and Development

### 6.4.1 Overview

In addition to the proposed Project, several other oil and gas exploration activities are currently underway or scheduled to occur within the vicinity of Offshore Area 1, which may contribute to cumulative effect on the environment.

Exploration activities (seismic and drilling) have been carried out for the following oil and gas operators in the vicinity of the offshore Rovuma Basin:

- Onshore Area 1 (AMA1);
- Offshore Area 1 (AMA1);
- Offshore Area 4 (MRV);
- Offshore Areas 2 and 5 (Statoil); and
- Offshore Areas 3 and 6 (PCMRB).

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AMA1 completed seismic exploration in Onshore Area 1 in April 2013 and commenced exploratory drilling in April 2014. Onshore drilling activities were completed in June 2015 and AMA1 is in the process of relinquishing the onshore block. Other operators are likely to take over the block.

In addition to the Area 4 Project addressed in Section 6.2 above, there is the potential for MRV to develop an offshore gas development project, but details are not known at this stage.

Statoil concluded seismic activities in 2011 and submitted EIAs for exploratory drilling in Areas 2 and 5. Statoil drilled two wells, in 2013 and undertook 3D seismic acquisition in the south of Area 2. Both blocks were subsequently relinquished by Statoil in June 2014.

Petronas Carigali Mozambique Rovuma Basin Limited (PCMRB) began exploratory drilling in Areas 3 and 6 in late 2012.



#### **6.4.2 Assessment and Mitigation/Management**

Should AMA1 or MRV expand their activities, or should other companies develop new projects based on their hydrocarbon discoveries, VECs could be affected through:

- An increase in population, with potential for culturally or ethnically diverse communities living and working together;
- Greater reliance on ecosystems to provide services (e.g., food and water) to a growing populations;
- Increase pressure on infrastructure (e.g., roads) and services (e.g., healthcare) in northern Mozambique; and
- Modification of sensitive or critical habitat.

The primary negative cumulative impacts would be the gradual transformation of the relatively undeveloped area and the associated impacts on ecological functioning of some ecosystems and habitats. Positive cumulative impacts would be related to the significant economic development of Cabo Delgado Province and the country. From a sociocultural perspective, the positive cumulative impact would be associated with economic development and establishment of a skilled workforce. Other potential cumulative impacts would be changes to the local culture and livelihoods, which could be perceived as positive or negative.

The proposed LNG Project is the first project in what could be a significant development initiative in northern Mozambique by the oil and gas industry. Strategic spatial planning by the Government of Mozambique and its agencies at this early stage is important to ensure development in the region is promoted, while maintaining ecosystem functions and services and social well-being. Mitigation and management of the negative cumulative impacts depend on effective management strategies to reduce risk to VECs, and to offset impacts where appropriate. AMA1 will contribute to such strategies by cooperating with Government and other developers in the region, and leading by establishing good management practices.

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## 7.0 ANADARKO MANAGEMENT SYSTEM AND ESMP

Anadarko has a Management System that comprises ten elements (see Figure 7.1). The Project Environmental and Social Management Plan (ESMP) has been designed to align with the Anadarko Management System (AMS).

### 7.1 Project Standards and Guidelines

The Project has always sought to identify and commit to standards and guidelines that are protective of human health and the environment (bio-physical and social environment). In this regard the LNG Project EIA Report commits the Project to complying with the relevant Mozambique standards and limits as provided in various decrees including, but not limited to:

- Environmental Law (Law no. 20/97, of 1 October);
- Petroleum Law (Law no. 21/2014 of 18 August, which revoked revoking Law no. 3/2001 of 21 February);
- Regulations on Petroleum Operations Regulations (Decree no. 34/2015 of 31 December, which revoked Decree no. 24/2004, of 20 August);
- Environmental Regulations for Petroleum Operations (Decree no. 56/2010, of 22 November);
- Licensing Regulations for Petroleum Installations and Activities (Ministerial Decree no. 272/2009, of December 30);
- Regulation on the Resettlement Process resulting from Economic Activities (Decree no. 31/2012, of 8 August);
- Decree Law that establishes the special legal and contractual regime applicable to the LNG Project in Areas 1 and 4 of the Rovuma Basin (Decree Law no. 2/2014, of 2 December);
- Regulation on the Process of Environmental Audit (Decree no. 25/2011, of 15 June); and
- Regulation on the Process for EIA (Decree 54/2015, of 31 December, which revoked Decree no. 45/2004, of 29 September);
- Law for the Protection, Conservation and Sustainable Use of Biological Diversity (Law no. 5/2017, of 11 May, which amends and republishes Law no. 16/2014 of 20 June);
- Regulation on Hazardous Waste Management (Decree no. 83/2014, of 31 December);
- Regulations on Urban Solid Waste Management (Decree no. 94/2014, of 31 December, revoking Law no. 13/2006 of 15 June);
- Regulations on the Prospecting and Extraction of Groundwater (Decree no. 18/2012, of 5 July);
- Forestry and Wildlife Resources Law (Law No. 10/99, July 12, 1999).

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- Regulations of the Forestry and Wildlife Resources Law (Decree No. 12/2002, June 6, 2012);
- Forestry and Wildlife Regulation (Decree no. 11/2003, of 25 March, which amending articles 20, 21 and 29 of Decree no. 12/2002 of 6 June);
- Land Law (Law No. 19/97, October 7, 1997);
- Regulations approving the Terms and Conditions of the Concession Contract relating to the LNG Marine Terminal, at Point Afungi, Tongue Bay, Palma District, in Cabo Delgado Province (Decree no. 37/2017 of 21 July); and
- Regulations approving the Terms and Conditions of the Concession Contract relating to the Material Offloading Facility (MOF) at Point Afungi, Tongue Bay (Decree No. 36/2017, of 21 July).



Furthermore the Project will align itself with Good International Industry Practice as provided by:

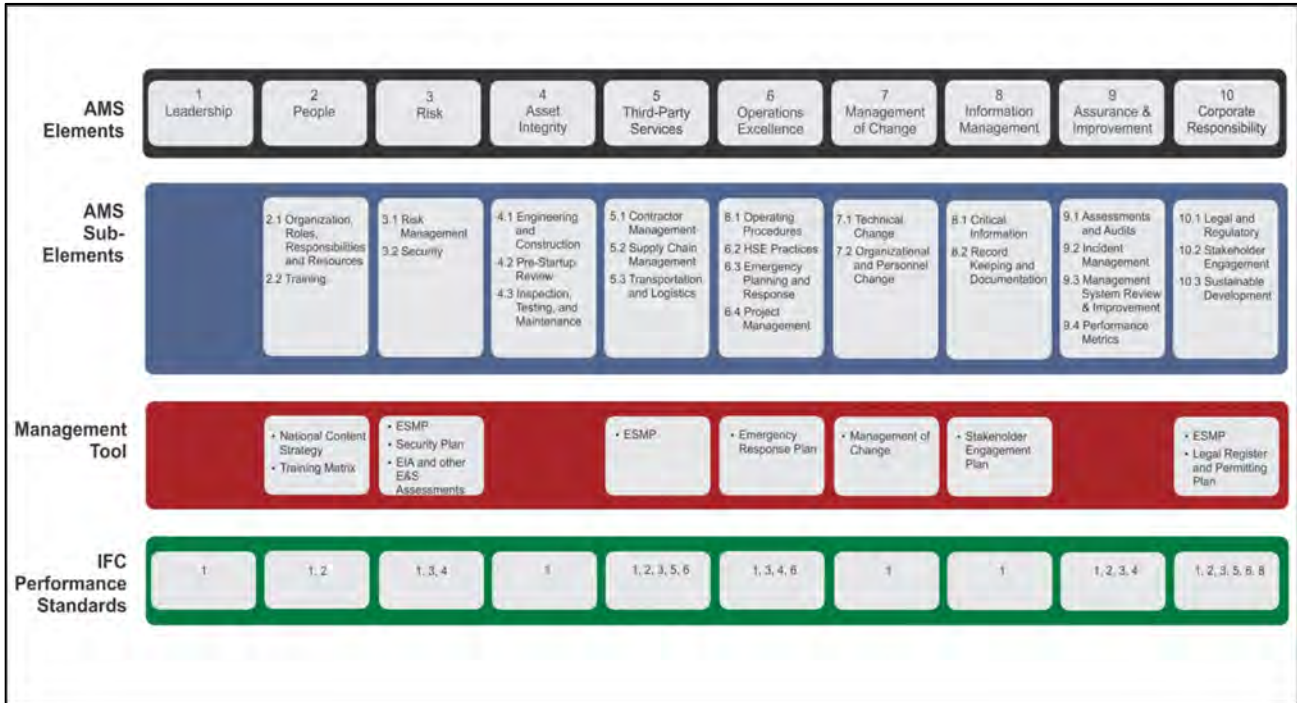
- Equator Principles (2013); and
- IFC Performance Standards on E&S Sustainability (updated in 2012) and Environmental, Health and Safety (EHS) Guidelines (2007)

#### **7.1.1 Alignment with UFC Performance Standards on E&S Sustainability**

The IFC PS provide environmental and social performance requirements and also address aspects such worker relations, occupational health and safety, security, and emergency response. Figure 7.2 maps out how the Anadarko Management System and the assessment and management tools that have developed, align with the IFC PS.



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**Figure 7.1 – Conceptual relationship between AMS, ESMP and IFC PS**

## 7.2 Overview of the ESMP

The ESMP (MZ-000-AM1-HS-PLN-00007) is a programme of actions to manage environmental and social risks and impacts, and other performance improvement measures, which have been identified developed during, and after, the LNG EIA into a suite of Company Plans. The ESMP also establishes the framework within which the plans will be implemented, i.e., it provides guidance on organisational roles and responsibilities, on training and competency, on monitoring and evaluating, reporting and managing change. Company Plans will be implemented by AMA1. Project contractors and sub-contractors will develop their own plans and procedures to align with the ESMP, Company Plans, and Environmental Licensing Commitments Register.

The structure of the ESMP and its underlying Company Plans is illustrated in Figure 7.2 below.

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**Figure 7.2 – ESMP and Underlying Company Plans**

### 7.3 Company Plans



The following Company Plans are in various states of readiness.

**Table 7.1 – List of Company Plans**



Plan	Key Objectives
<b>Resource Management</b>	
<b>Soil Erosion, Reinstatement and Landscaping</b>	Eliminate, minimize, mitigate and in general manage any adverse impacts arising from vegetation clearance, erosion and topsoil stripping; and guide reinstatement to ensure is carried out effectively.
<b>Pollution Prevention and Control</b>	
<b>Air Emissions and Greenhouse Gas</b>	Reduce the impacts of Project on ambient air quality and the associated sensitive resources and receptors. Reduce project-related GHG emissions.
<b>Water and Wastewater</b>	Eliminate, minimize, mitigate and in general manage any adverse impacts to water resources. Eliminate, minimize, mitigate and in general manage any adverse impacts to surface water and groundwater quality, arising from wastewater discharge or other Project activities.
<b>Waste</b>	Define approach for the identification, classification, minimization, handling, treatment, storage and disposal of all wastes generated

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Plan	Key Objectives
	as a result of Project activities, to avoid or reduce potential impacts on the environment and human health.
<b>Hazardous Materials</b>	Facilitate the correct management of hazardous materials in terms of handling, storage and use, to minimize potential impacts to human health, safety and the environment.
<b>Noise and Vibration</b>	Reduce noise and vibration impacts on sensitive resources and receptors arising from construction activities and equipment.
<b>Dredging</b>	Reduce and manage turbidity levels during dredging activities including disposal of dredge material to eliminate, minimize, mitigate and in general manage any adverse impacts to the marine ecosystem.
<b>Biodiversity</b>	
<b>Biodiversity Strategy</b>	Sets out the goals, objectives and focus for the Project's biodiversity effort, and provides context to the BAP.
<b>Biodiversity Action Plan – Preliminary Framework</b>	Sets out the key biodiversity related mitigation measures and actions that will be undertaken as part of the Project's biodiversity effort. Also sets out roles and responsibilities related to the biodiversity management measures, as well as the schedule and KPI's etc. The Biodiversity Action Plan will also incorporate the Ecological Constraints Mapping, Biodiversity Stakeholder Engagement Plan and the Marine Mammal Observation Procedure.
<b>Engagement</b>	
<b>Stakeholder Engagement</b>	Sets out the context, principles, overarching goals and strategy according to which the Project will build and maintain positive relationships with parties interested in and affected by the development and implementation of the Project. Identifies and describes the key stakeholder groups (government, communities, media, donors, NGOs and civil society, business and industry, communities and internal stakeholders), activities, methods of engagement and tools that will be used with each group to achieve the SEP goals and objectives. It contains the Project's Grievance mechanism. The SEP will be supported by topic specific SEPs, i.e. a Biodiversity SEP.
<b>Land and Livelihoods</b>	
<b>Resettlement Plan</b>	Avoid and minimize the need for physical and/or economic displacement. Compensate affected parties or Project affected persons for lost assets in cash or in kind. Provide opportunities for displaced people to improve their living standards. Design and implement, in a timely manner, culturally appropriate and economically sustainable livelihood restoration measures. Provide measures to support physical relocation and re-establishment. Identify any people or households that may be especially vulnerable to displacement impacts and provide special assistance, where warranted, to help them participate and benefit from resettlement programmes.

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Plan	Key Objectives
<b>Community Impacts and Development</b>	
<b>Community and Construction Interface Plan</b>	Anticipate, avoid, minimize, mitigate and manage risks and adverse impacts of project construction activities on community safety and well-being, and sets out the project's performance expectations in relation to the management and mitigation thereof. Ensure that safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes adverse impacts to project- affected communities.
<b>Community Health</b>	Document and record the appropriate planning, development, integration and management of community health mitigation measures proportionate to their impact ranking and relevant area of influence.
<b>Social Investment Strategy</b>	Facilitate the participation of project-affected communities in project-supported sustainable development programmes and opportunities, based on community needs and priorities. Enhances community capacity and capital to be more resilient in their response to adverse impacts as a result of Project development.
<b>Security</b>	Ensure that safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes adverse impacts to project-affected communities.
<b>Emergency Management Plan</b>	Mitigate or prevent, as far as practical, injury or loss of life, damage to property, and/ or harm to the environment and communities. It is applicable to all AMA1 operations in Mozambique, both onshore and offshore. Specific site information, emergency preparedness actions and procedures, emergency contacts and resources for each site location are documented as attachments to the plan.
<b>Project Induced In-migration</b>	Prevent or minimize the influx of speculative job seekers and those seeking to access Project-related opportunities in the Project-affected area. Minimize and/or mitigate negative environmental and social impacts related to the influx of in-migrants into the Project area. Monitoring requirements to measure the magnitude of PIIM and the effectiveness of the mitigation and if required, additional mitigation measures.
<b>Cultural Heritage</b>	
<b>Cultural Heritage</b>	Protect cultural heritage (tangible and intangible) from any adverse impacts of Project activities and support its preservation.
<b>Industrial Relations</b>	
<b>Project Industrial Relations Handbook - A Guideline for Contractors</b>	Align with the Project Industrial Relations Policy. Provide a framework within which the Project will drive and manage sound industrial relations practices. Ensure active engagement with all Contractors which will provide a consistent industrial relations approach across all areas of the Project. Create a stable working

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Plan	Key Objectives
	environment in which Project goals can be achieved. Establish clear expectations and accountabilities around industrial relations management in order to avoid, eliminate, reduce, or minimize potential labour-related impacts and risks to the Project.
<b>HSE Plan</b>	Define the responsibilities, control practices, commitments and monitoring to be implemented to: minimize, mitigate and manage health and safety events and impacts during construction; and provide a consistent approach to Occupational Health and Safety to streamline worker acceptance and conformance.
<b>Monitoring</b>	
<b>Site Environmental and Social Baseline Establishment</b>	Provide a systematic approach and methodology to document and verify environmental and social conditions on-site, as well as to provide a process for the identification of site-specific mitigation measures prior to the handover of a work site to Contractor and the commencement of construction activities.
<b>Contractor Verification and Assurance</b>	Describe and clearly define the process by which AMA1 will inspect and assess Contractors' environmental and social performance and drive continuous performance.
<b>ESMP Monitoring Programme</b>	Summarise environmental and social monitoring requirements detailed in the various Company Plans.

#### **7.4 Commitments Registers and Contractual Obligations**



A key tool to support the implementation of the ESMP and Company Plans are commitments registers. AMA1 has developed an Environmental Licensing Commitments Register that includes all the environmental and social mitigation and management requirements from the various regulatory EIAs, EMPs and Approval Letters from MITADER. Where appropriate, requirements from Company Plans may be incorporated into either a separate ESHIA Commitments Register, or integrated into an overall Project Commitments Register, or similar, in order to consolidate and track all environmental and social commitments.

Contract documents contain an HSE Exhibit or Attachment, which describes contractor's responsibilities with respect to environmental and social performance. It includes the Environmental Licensing Commitments Register (where contractors obligations are clearly defined) as well as guidance notes on specific topics such as biodiversity, cultural heritage and community health to ensure Contractor meets the requirements of the ESMP and Company Plan. Contractor will develop environmental and social management and monitoring plans and procedures accordingly. These will be reviewed and approved by Company prior to implementation.

#### **7.5 ESMP Implementation**

This section provides detail on how the ESMP is to be implemented and is structured as follows:

- Organisation, Roles, and Responsibilities;
- Competency, Training, and Awareness;

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- Monitoring and Evaluation;
- Incident Management and Notification;
- Reporting; and
- Management of Change.

### **7.5.1 Roles and Responsibilities**

Primary responsibility for management and implementation of this ESMP rests with the AMA1 Project Management team(s). The AMA1 HSE Team, as well as various other functional leads (e.g., social performance, environmental management, resettlement, engagement, industrial relations etc.) are responsible for providing support which includes coordination, oversight, facilitation and tracking of Key Performance Indicators (KPIs), monitoring and implementing of specified environmental and social mitigation measures

Contractors will develop environmental and social plans and procedures to ensure alignment with the Project's environmental and social commitments and any other obligations arising are incorporated into work activities. Contractors will ensure that sufficient experience and competent resources are allocated by demonstrating relevant experience and providing a staff organisation chart). Contractor' plans, procedures and other relevant provisions will be subject to review and approval by AMA1 prior to commencement of construction activities. Subcontractors are required to adopt or be aligned with Project environmental and social standards and minimum requirements.

### **7.5.2 Competency, Training, and Awareness**



All Project personnel, both AMA1 and Contractors, that have responsibility for the execution of tasks and requirements contained within the ESMP and associated plans must have the necessary competencies, skills and experience to perform their work. AMA1 is responsible for ensuring all AMA1 personnel with such responsibilities are adequately skilled and receive the necessary training. Similarly, Contractors have the same responsibilities for their personnel and Subcontractors.

The extent of environmental and social training provided to personnel must be appropriate to the scope of activity and level of responsibility. A training needs assessment will be undertaken by AMA1 and Contractors to determine the level of training required for each member of the organisation, based on job description and level of environmental and social responsibility and involvement.

ESMP training and awareness programmes will be developed by AMA1 and Contractors and will be provided throughout the Construction Phase. At a minimum, programmes to be developed consist of the following:

- Induction and ESMP Awareness;
- ESMP Awareness for Management; and
- Focused ESMP Training

Refresher courses will be provided and will be updated as needed. All personnel training records and matrices will be retained by the relevant AMA1 or Contractor executing the work and will be kept up to date through Project activities.

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### **7.5.3 Assessment and Improvement**

Both AMA1 and Contractors have responsibilities to monitor and report environmental and social performance. Assessment and improvement processes associated with the ESMP must be followed by AMA1 and Contractors. These processes include monitoring, inspection and verification, validation, and corrective action and improvement of environmental and social performance.

Contractors will also be required to perform field based environmental and social monitoring such as surveys, sampling, and analysis to ensure the effectiveness of mitigation measures and that compliance requirements are being followed. AMA1 will also perform monitoring activities in addition to that required by Contractors. To ensure the effectiveness of these mitigation measures, inspection programmes will be implemented by the Contractors. AMA1 will routinely inspect that these measures align with requirements and will also review inspection programmes of its own activities.

KPIs will be developed for AMA1 and Contractors to continuously improve Project environmental and social performance and satisfy Anadarko Policies and Core Values. The objective of implementing KPIs is to establish conformance with, and continuously improve Contractor performance. In addition, internal and external audits will be undertaken to evaluate the Project's environmental and social performance. These audits include internal, private environmental, public environmental, and lender audits.



A system of conformance or non-conformance is part of the assessment and improvement process of the Project which requires corrective action where there is a non-conformance against a mitigation or control measure.

### **7.5.4 Incident Management and Notification**

AMA1 has developed an Incident Management Plan (IMP) that defines the requirements for managing incidents: identifying causes, determining corrective actions to prevent or reduce the likelihood of recurrence of similar incidents and communicating corrective actions.

All incidents and near miss events will be investigated in accordance with AMA1 Incident Reporting and Investigation Procedure (ref.: MZ-000-AM1-HS-PRO-00004) which comprises the following steps:

- Report, record and communicate the initial incident information as required by HSE-3 (Health, Safety and Environment Incident Reporting) and applicable HSE Programmes;
- Assemble the Investigation Team and resources needed to conduct the investigation;
- Conduct the investigation to identify the causal factors of the incident (Contractors will allow AMA1 to participate in incident investigations);
- Determine, implement, and track corrective actions to completion; and
- Communicate the investigation findings and lessons learned, as needed.

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AMA1 also has an Emergency Management Plan, which has been developed to aid the Project mitigate or prevent, as far as practical, injury or loss of life, damage to property, and/ or harm to the environment and communities. The Emergency Management Plan is applicable to all AMA1 operations in Mozambique, both onshore and offshore. The Emergency Management Plan defines an organisational structure that will be implemented with roles and responsibilities assigned to ensure safe, rapid, effective and efficient response to an incident. Specific site information, emergency preparedness actions and procedures, emergency contacts and resources for each site location are documented as attachments to the Emergency Management Plan Core Plan. The following plans also support emergency preparedness and response:

- Medical Emergency Response Plan;
- Oil Spill Contingency Plan;
- Emergency Evacuation Plan (managed by Security Department); and
- Aviation Emergency Response Plan (currently under review).

The Emergency Management Plan operates within a tiered approach in responding to emergency situations. The response level is determined by the complexity of the incident, the risk to personnel and the public, and the impact on the environment, and is further determined by the need for mobilisation of resources.

#### **7.5.5 Reporting**

The Project will prepare and publish regular reports on its environmental and social performance. Performance will be communicated to Project stakeholders including the Government of Mozambique, Project affected communities, and Lenders. The results of the implementation of the ESMP will be reported internally to capture the performances of AMA1 and Contractors.



Environmental and Social Performance Reports will be submitted to the Government of Mozambique (every 6 months as noted in the LNG Project EIA approval letter) and Lenders, which will present details on the Project's environmental and social performance. The Project will also hold public meetings (every 6 months to begin with) in the areas that are directly affected by the Project and provide a platform to raise any comments, concerns, or questions that the public may have. These notes will be reviewed and formally submitted to the relevant entities and made publically available on the Project's website.

#### **7.5.6 ESMP Management of Change (MOC) Procedure**

Changes in the Project may occur during all phases, including design and construction. Any recommendations or changes that impact the ESMP or any of its supporting plans or procedures are considered a change. Changes may be planned or unplanned, sudden or gradual, and temporary or permanent. AMA1 has established a Change Management Procedure (MZ-000-AM1-PM-PLN-00013) to provide a standardised method to identify, manage, and track change requests through implementation and documentation of the change.

Project Management of Change (MOC) is the responsibility of AMA1. AMA1, Contractors and subcontractors can identify or initiate the MOC process, and will be





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required to apply the appropriate MOC procedure for all changes or deviations to agreed designs, facilities and operations activities and to approved plans and procedures. AMA1 will also notify and report changes to Lenders in accordance with applicable agreements.

Table 7.2 defines the three tier classification process and the detailed criteria that differentiate between significance in terms of ESMP changes. These will serve as the basis for Lender notification and/or review as outlined in the table below.

**Table 7.2 – Lender Management of Change Classification and Review Process**

Level	Description	Subsequent Action
Level 3	<ul style="list-style-type: none"> <li>• Change includes activities with potential impacts to environmental and social receptors or resources that are not considered in the LNG Project EIA Report(s) and EMPs, that are physically located outside the study area of an Environmental License, that are reasonably likely to have significant adverse impacts which are not mitigated by the ESMP.</li> <li>• A change to the Project or to the ESMP and/or associated plans that results in one or more of the following being irreversibly impacted:               <ul style="list-style-type: none"> <li>○ Critical habitat;</li> <li>○ Protected species;</li> <li>○ Permanent exceedances of emissions/effluent standards;</li> <li>○ Physical relocation or economic displacement of households not covered by the compensation measures addressed in the Resettlement Plan; and/or</li> <li>○ Significant cultural heritage.</li> </ul> </li> <li>• Change will require substantial additional environmental and social assessment and mitigation measures to ensure that it does not irreversibly impact important resources.</li> <li>• Change of Project Standards.</li> </ul>	<p>Lender review/acceptance is required.</p> <p>MOC report and mitigation measures are sent to Lender for comment and acceptance.</p> <p>Project addresses comments and engages with Lender to resolve any comments that are not immediately accepted/addressed.</p> <p>Once Lender and Project agree on MOC and any additional mitigations, Project will proceed with the MOC.</p> <p>If MOC is not accepted by Lender, it will not be implemented.</p>
Level 2	<ul style="list-style-type: none"> <li>• Change including activities with potential impacts on environmental and social receptors or resources that are not considered in the LNG Project EIA Report(s) and EMPs, that are physically located outside the study area of an Environmental License, that:               <ul style="list-style-type: none"> <li>○ does not impact critical habitats but might impact natural habitat;</li> <li>○ does not result in significant impacts to communities, or households that are not covered by mitigation, compensation or other measures previously adopted by the Project;</li> </ul> </li> </ul>	<p>Lender is informed of MOC as part of the bi-annual reporting.</p> <p>Proceed with MOC in compliance with Mozambican law.</p>

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	<ul style="list-style-type: none"> <li>○ involves economic displacement of people not covered by the compensation measures addressed in the Resettlement Plan;</li> <li>○ does not impact significant cultural/archaeological finds or social infrastructure, because they can be avoided or approved mitigation measures implemented; and/or</li> <li>○ does not require significant changes to the ESMP or associated plans.</li> <li>● Change requires additional, but limited, cultural heritage surveys or environmental and social assessments.</li> </ul>	
Level 1	<ul style="list-style-type: none"> <li>● Change including activities considered in the LNG Project EIA Report(s) and EMPs, or covered under an Environmental License that does not impact Project's ability to meet the requirements of the ESMP or associated plans.</li> </ul>	<p>No information concerning MOC is released to Lender.</p> <p>Proceed with MOC in compliance with Mozambican law.</p>

## 8.0 STAKEHOLDER ENGAGEMENT AND CONSULTATION

Stakeholder engagement is an essential activity and an ongoing process throughout the lifecycle of the Project.



The Project's engagement approach has evolved considerably since the completion of the regulated EIA and resettlement public consultation processes. The initial emphasis was on soliciting stakeholder input to understand issues and concerns in relation to potential Project impacts and risks in order to consider these during the impact assessment and development of environmental and social impact management plans. Subsequently, at the start of the construction period, stakeholder engagement is recognized as a Project activity implemented on a daily basis across the organization to ensure establish and maintain relationships with stakeholders, to ensure awareness and understanding of Project activities, to support delivery of Project activities and more generally to deliver a project enabling environment and

The following sections outline the approach and strategy driving the Project's stakeholder engagement activities, and current and forward-looking stakeholder engagement activities for the Project construction phase.

### 8.1 Stakeholder Identification and Prioritisation

Key stakeholders relevant for stakeholder engagement during the construction phase have been defined using the following criteria:

- Proximity to Project site translating to increased probability to experience Project-related impacts – both direct and indirect, and induced, as defined in various E&S management plans;
- Potential beneficiaries and/or those with expectations thereof;
- Those with a role (or perceived role) in Project delivery or aspects thereof;



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- Those with key roles in the broader public dialogue related to the Project's E&S performance.

The focus is as much on stakeholders with a potential positive influence or impact as it is on stakeholders who may experience potential negative impacts as a result of or associated with Project development.

An additional consideration has been the Project's geographic reach and scope. The in-country stakeholder engagement effort is aligned with the defined Project AOI and focuses on the three geographic areas of primary business (Project) activities within Mozambique:

- Palma District including Palma Town and the Palma-Afungi operating environment, inclusive of the Project Site and Surrounds, where the following stakeholders are engaged:
  - Local communities, categorized as resettlement affected communities (RACs), directly affected communities (DACs) and indirectly affected communities (IDACs) as well as some community-based organisations (CBOs), community structures and influential people;
  - Palma District Government and the various district-level Government services;
  - District-based civil society and NGOs, platforms and forums;
  - Local businesses including SMEs and MSMEs interested in participating in Project-related or spin-off business opportunities;
  - Internal stakeholders (employees, contractors and subcontractors) based within the Project site as well as those operating from Palma;
  - Fellow oil and gas and associated industry developers such as Area 4.
- Pemba, the provincial capital of Cabo Delgado province, is a secondary geographic focal point for the Project as it will support the subsea production and drilling program. The following stakeholders are engaged at the Provincial level:
  - Cabo Delgado Provincial Government and the various Government departments; committees and commissions;
  - Provincial CSOs, NGOs and forums;
  - Businesses located in the provincial capital, provincial trade and industry associations;
  - Indirectly affected communities and partners as relevant for Social investment and other Project initiatives.
- Maputo, as the capital of Mozambique, where the AMA1 Project head office is located, and from where the following stakeholders are engaged:
  - National Government, Government institutions and directorates;
  - National-level CSOs and NGOs, platforms and forums;
  - Donor and development agencies;
  - National businesses, trade and industry associations;

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- Internal stakeholders, including employees, contractors and subcontractors working from Maputo;
- National media groups – newspapers, television, radio.

## **8.2 Stakeholder Engagement Approach and Plan**

Key elements of the Project's engagement approach are:

- A geographical focus placing the Palma-Afungi operating environment at the centre of the engagement effort. Within this environment engagement with RACs and DACs is key;
- A focus on key stakeholder groups (Government, CSOs, etc.) where an understanding and analysis of a group and their distinct issues, concerns and role in Project development form the basis of the engagement strategy; and
- Initiatives around key programs such as the PIIM management plan that promotes the establishment of a multi-stakeholder development forum for Palma District.



The Project's stakeholder engagement approach is informed by the stakeholder analysis, the geographic, social and political contexts within which stakeholder engagement is taking place, and an understanding of how stakeholders' defined roles and responsibilities in relation to the project can be realized while pursuing the project engagement goals. The approach is consolidated in the Project's Stakeholder Engagement Plan (SEP; MZ-000-AM1-SP-PLN-00002), which is a constituent Company Plan within the Project's ESMP.

Through implementation of the SEP, the following objectives are pursued:

- To develop and maintain quality, trust-based relationships with Project stakeholders that allow for mutual benefit, based on a comprehensive understanding and recognition of stakeholders' defined roles and responsibilities;
- To promote awareness and understanding of the Project and its potential evolution among stakeholders by enabling access to timely, accurate information with a view of cultivating an increasing sense of stakeholder participation in and ownership of the Project development process;
- To recognize and promote shared understanding among various stakeholder groups of the pathways, timelines and acceptable mechanisms through which stakeholders' diverse project value propositions<sup>17</sup> can be fulfilled/ actualized;
- To employ stakeholder engagement processes that are socially and culturally appropriate and that include well-defined and open channels for reciprocal communication, and build the capacity of stakeholders to be involved in these processes; and
- To be responsive to stakeholder issues and grievances with a view to seek resolution in a timely, effective and constructive manner.

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<sup>17</sup> A Project Value Proposition (PVP) is defined as the perceived value of a project to a stakeholder.

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### **8.3 Stakeholder Engagement Plan Implementation and Management**

This section provides a snapshot of some of the key programs, aspects and modalities employed as part of implementing the Project's overall SEP, including:

- Palma District Engagement Framework as an example of the geographic approach to engagement;
- Resettlement-focused engagement as an example of the role of engagement in the delivery of risk and impact mitigation programs;
- The CSO/ NGO Engagement Program as example of key stakeholder/ group approach; and
- Multi-Stakeholder Forum as example of an initiative linked to a key Project program.

#### **8.3.1 Palma District Stakeholder Engagement**

The Community and Social Affairs (CSA) function embedded in the Social Performance team is responsible for establishing and maintaining relations with stakeholders in Palma District and thereby: (i) facilitating a link between Project operations and stakeholders; (ii) promoting participation, support and a sense of ownership of the Project by stakeholders and (iii) achieving a project enabling environment/social license to operate.

In support of this objective, the community stakeholder environment is characterized as follows:

- Resettlement affected communities (RACs) comprise households and settlements that (i) are directly affected by physical and/or economic displacement and eligible for compensation for impacts to agriculture and/ or marine livelihoods as well as participation in livelihood restoration programs, or (ii) serve as host settlements providing access to resources for construction of the replacement village, agricultural lands and/or marine resources. The majority of settlements on the Afungi Peninsula are considered to be RACs;
- Directly affected communities (DACs) comprise communities outside the Afungi Peninsula which will be impacted by and/or have regular contact with the Project



Key aspects of the Palma District Stakeholder Engagement approach include:

##### **8.3.1.1 Geographic Coverage of RACs and DACs**

CSA team members are assigned responsibility for geographic areas and clusters of villages, to:

- Act as a Project point of contact in specific villages/communities;
- Ensure regular presence of Project team and maintenance of constructive relationships between the community and the Project;
- Ensure regular and ongoing disclosure and dissemination of information and dialogue opportunities around disclosed information;

The geographic assignment of CLOs facilitates the following:

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*Maintenance of Relationships with RACs and DACs*

- Early involvement of the local government and community leadership structures (community leaders, influential community members and or existing CBOs) as an entry point to communities;
- Upkeep of communities' social profiling (i.e. community dynamics, leaders, governance structures, key concerns and priorities beyond the Project, etc.) to ensure a detailed understanding of all communities with whom the Project engages.

*Formalised Community-Based Structures and Entry Points*



- Promoting community-based meeting locations (nkutanos). Early on during Project exploration activities, the Project supported the establishment of nkutanos in many of the villages on the Afungi peninsula. Nkutanos are neutral meeting places where community members - regardless of political affiliation or gender - and Project representatives engage in discussion and horizontal dialogue, and where grievances can be received in writing or verbally. Communities have identified and designated these meeting places in their villages and are responsible for the upkeep and gentrification of it. In all existing nkutanos, at least one notice board has been erected for the display of information materials, notices and opportunities. Apart from providing a physical space for engagement, symbolically nkutanos indicate that a village has 'made space' for the Project in their village. Formalized infrastructure recognizes nkutanos as a distinct focal point in each village.
- Engagement of community level facilitators as entry points in all DACs and RACs.

*Operation of the Palma Information Centre*

- Operating the Project Information Centre in Palma Sede as the engagement base of for the Palma community including local government, civil society, and other specific stakeholders groups. More generally the Centre is a hub where stakeholders from across the district and beyond can obtain information about various aspects of the Project. The Centre is an interactive space that encourages dialogue and enquiry and stimulates learning about the Project and its vision, as well as the LNG industry and what that means for the development of the region. Information materials such as brochures, posters, booklet, 3D models, educational videos and exhibitions provide stakeholders with updated information on progress with Project construction activities, business and job opportunities, and Project-sponsored socio-economic development programs.

*Palma Community Radio*

- The Project supported the establishment and operation of Palma Community Radio, which broadcasts from Palma Sede and has a transmission radius of 60 kilometres, reaching the entire district. From a Project point of view, the CSA team works closely with the radio to develop programs focusing on specific Project topics and share these via weekly 'Project talk hours', news flashes, announcements and Q&A sessions.

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### 8.3.1.2 Community Communication Systems

The Palma-Afungi environment stakeholder engagement framework provides the means to engage stakeholders on all aspects of the Project, using a variety of tools, methods and modalities, including:



- Face-to-face engagement (one-to-one meetings, focus groups, community meetings, community leaderships and influential people meetings, participatory rural appraisal sessions, etc.), making use of *nkutanos* where appropriate;
- Palma community radio;
- Development and use of information, education and communication (IEC) materials during outreach activities and to support and complement all streams of engagement. IEC materials are crafted to have a distinct visual appeal, are story-oriented and reflects and is aesthetically responsive to the biophysical and social environment. Materials take into account the high illiteracy levels and language preferences of communities, religious and cultural customs and preferences, and gender roles. Examples of IEC materials are pictorial non-technical Project information brochures and leaflets in local languages; video materials; posters with key Project messages, specifically on topics such as the Project's grievance mechanism, traffic safety, protection against malaria, notice of specific construction activities, etc.
- The community enquiry phone line enables community stakeholders to contact the Project with a question, issue or recommendation. The line is maintained in all of the local languages, as well Portuguese and English.
- Visits to the Palma information Centre enable community members to interact with the centre and learn about the Project.

### 8.3.1.3 Building Community Capacity

- The CSA team, and a range of implementation partners, work with communities to establish and/or train existing community based organizations to interact with the Project on a variety of issues (e.g. facilitation of capacity building around village governance structures, work with community investment plan implementing partners, etc.) to ensure that communities are aware and make use of the opportunities arising from Project activities. This includes the development of theatre groups and support to existing dancing and singing groups/CBOs to help raise awareness and understanding of Project (and wider) social issues/impacts.

### 8.3.1.4 Support Project Operations and Activities

- Support Project construction and related activities in the Palma-Afungi environment, and beyond, for the duration of these activities by means of dedicated awareness and engagement campaigns. The CSA team prepares focused engagements with Affected Communities prior to the commencement of any operational activity to support safe delivery thereof from a community perspective. Examples of community engagement undertaken by the CSA team to support Operations are:

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- Providing community safety training such as interaction with equipment, traffic safety, marine exclusion zone training, hazard awareness, etc.
- Ongoing liaison with communities on any risks or impacts due to construction that may affect their lives and livelihoods, and soliciting input and collaboratively devising means to avoid or mitigate such negative impacts, e.g. dredging campaign, site and land clearance, etc.
- Support contractor recruitment processes – ensuring a fair, transparent and consistent local recruitment process and guiding contractors on which villages to approach for employment opportunities.



### **8.3.2 Resettlement-Focussed Stakeholder Engagement**

The resettlement implementation phase commenced in November 2017 with the announcement of the moratorium by the Government of Mozambique, supported the Project proponents. The engagement strategy for the resettlement implementation phase entails ongoing and focused community and household preparation for resettlement implementation, and continued engagement and involvement of households throughout asset verification, compensation and household agreements; physical relocation of households affected by physical displacement; and, implementation of livelihood restoration activities.

Targeted engagements with physically and/or economically displaced households include, but are not limited to:

- Discussion on the contents of planning phase asset surveys and how this relates to compensation;
- In-depth engagement around household agreements, delivery and explanation of proof of electronic transfer of funds to the household's bank account and progress on delivery of other compensation measures;
- Psychologically preparing households to be physically relocated and to prepare for and visualize the process of moving and getting adjusted to the Replacement Village, and their future in the new village;
- Site visits and familiarization with the resettlement village;
- Engagement to enable social integration into the new village, i.e. on matters relating to health, safety and sanitation; adjusting to and getting acquainted with the basic operation of the house (electricity, water, etc.)
- Social etiquette training for the new village;
- Ongoing dialogue to resolve any grievances;
- General support and assistance, as well as monitoring of households after they have been relocated;
- Engagements related to livelihood restoration and development programs and actively facilitating community participation in a variety of diversified livelihood options; and



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- Engagements with vulnerable households to ensure that vulnerability does not increase, and encouraging and facilitating opportunities for participation in programmes fostering resilience.





*Community member from Quitupo reading the moratorium brochure in Quitupo*



*Community member from Milamba paging through the Amina's Big Move booklet, prepared to facilitate the physical relocation process.*

In addition to household, focus group and general community meetings to provide updates on progress with the resettlement implementation process, meetings with the Government of Mozambique at district, provincial and central level continue, as well as engagement with other stakeholders (such as civil society at local, provincial and central level) as part of implementing the Project's SEP.

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### 8.3.3 CSO/NGO Engagement

CSOs and NGOs play an active role in good governance, sustainable rural development, service provision and capacity development in Mozambique and it is important for the Project to maintain open communication lines and solicit input from the stakeholders in this sector. A dedicated CSO and NGO engagement program is implemented across Palma/Afungi, Pemba and Maputo, maintaining contact with key CSO and NGO stakeholders on an ongoing basis.

In recognition of the insight and local perspectives CSOs and NGOs bring in relation to the Project's E&S performance and community matters, the Project has formalized the establishment of an independent CSO monitoring program for the Mozambique LNG Project.

### 8.3.4 Multi-Stakeholder Engagement

Cognizant of Project development within the context of wider regional development, multiple LNG developments and associated cumulative impacts (such as project-induced in-migration) present a particular opportunity for cross-sectoral multi-stakeholder dialogue and participation. The Project is supporting the establishment of a multi-stakeholder platform as a mechanism to facilitate deliberation, joint decision-making and action among different stakeholders, seeking the common goal of making natural resources work for broad-based development. Constituent members of the multi-stakeholder structure are envisaged as the Government, the Project and other private sector developers, development and donor agencies that are knowledgeable of development challenges, Affected Communities and representation by civil society. Apart from the more strategic objectives of such a structure, it will also enable information-sharing and consistent messaging across stakeholders, at regular intervals.



## 8.4 MANAGEMENT OF STAKEHOLDER ENGAGEMENT ACTIVITIES

This section summarizes key aspect supporting SEP implementation including:

- Quarterly planning;
- Information management;
- Issues management approach and high-level process overview of the Grievance Resolution Mechanism (GRM);
- Operation of the Above Ground Risk Platform;

### 8.4.1 Quarterly Planning

The Project maintains a Quarterly Project Engagement Look-Ahead that serves as a schedule of engagement activities across the Project, both geographically as well as in relation to the identified key stakeholder groups. Each Project function contributes information on their core deliverables, critical milestones and detail of their schedule of activities (including engagements), on a quarterly basis, which is combined into the overall Engagement Look-Ahead. The Quarterly Project Engagement Look-Ahead serves as the compass for Project-wide stakeholder engagement activities execution for the upcoming quarter and identifies strategic engagement goals and priorities,

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specific activities and engagements and a schedule that is plotted into the overall project schedule.

#### **8.4.2 Stakeholder Engagement Information Management System**

To ensure a record of engagement and a continuous assessment of the stakeholder environment, all functions with stakeholder engagement responsibilities record information related to all aspects of stakeholder engagement in an Information Management Systems (Isometrix Stakeholder Engagement Module) , which is a customized software solution developed according to Project specifications. The system enables the keeping and maintenance of a central Project stakeholder database and provides a route for all Project teams with external engagement responsibilities to capture and manage information in relation to on-going engagement and day-to-day community processes. Grievances are also tracked in the Isometrix Stakeholder Engagement Module.

#### **8.4.3 Issues Management**

Considering stakeholder issues that arise during the life of the Project is a key component of successful stakeholder engagement. The Project approach to issues management is based on:



- Anticipating potential issues at every stage of the Project’s activities. This is done during daily coordination events, as well as structured sessions – such as the AGR Platform described in Section 8.4.4 below
- Responding to stakeholders about their issues according to agreed roles and responsibilities and recording both issues and responses in Isometrix to ensure awareness of the content of the response and any forthcoming actions;
- Keeping relevant stakeholders advised of mitigation steps that are both underway and planned, and also ensuring these are captured in Isometrix;
- As much as possible managing issues at the most immediate/ local level to allow contextualised responses and avoid unnecessary escalation; and
- Tracking and reporting on progress, also in Isometrix.

#### **8.4.4 Above-Ground Risk Platform**

The Project maintains a Palma – Afungi Above Ground Risk (AGR) Working Group focusing primarily on the Palma - Afungi operating environment. The purpose of the AGR Working Group is to promote improved coordination and collaboration between all functions with a ‘social interface’ within the Palma – Afungi environment (the geographic focus of the Project’s engagement activities), with the aim of improving Project awareness and management of socio-political risk and thereby promoting a project-enabling environment. The AGR Working Group prepares and creates awareness of the Quarterly Look-Ahead.

### **8.5 GRIEVANCE RESOLUTION MECHANISM**

Even with a proactive issues management system there will be a need to maintain a reactive mechanism as well to receive, assess, fairly and promptly respond to and effectively resolve complaints received by third parties who may have experienced or

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perceived to have experienced harm or negative impacts due to the action, or lack of action, by the Project.

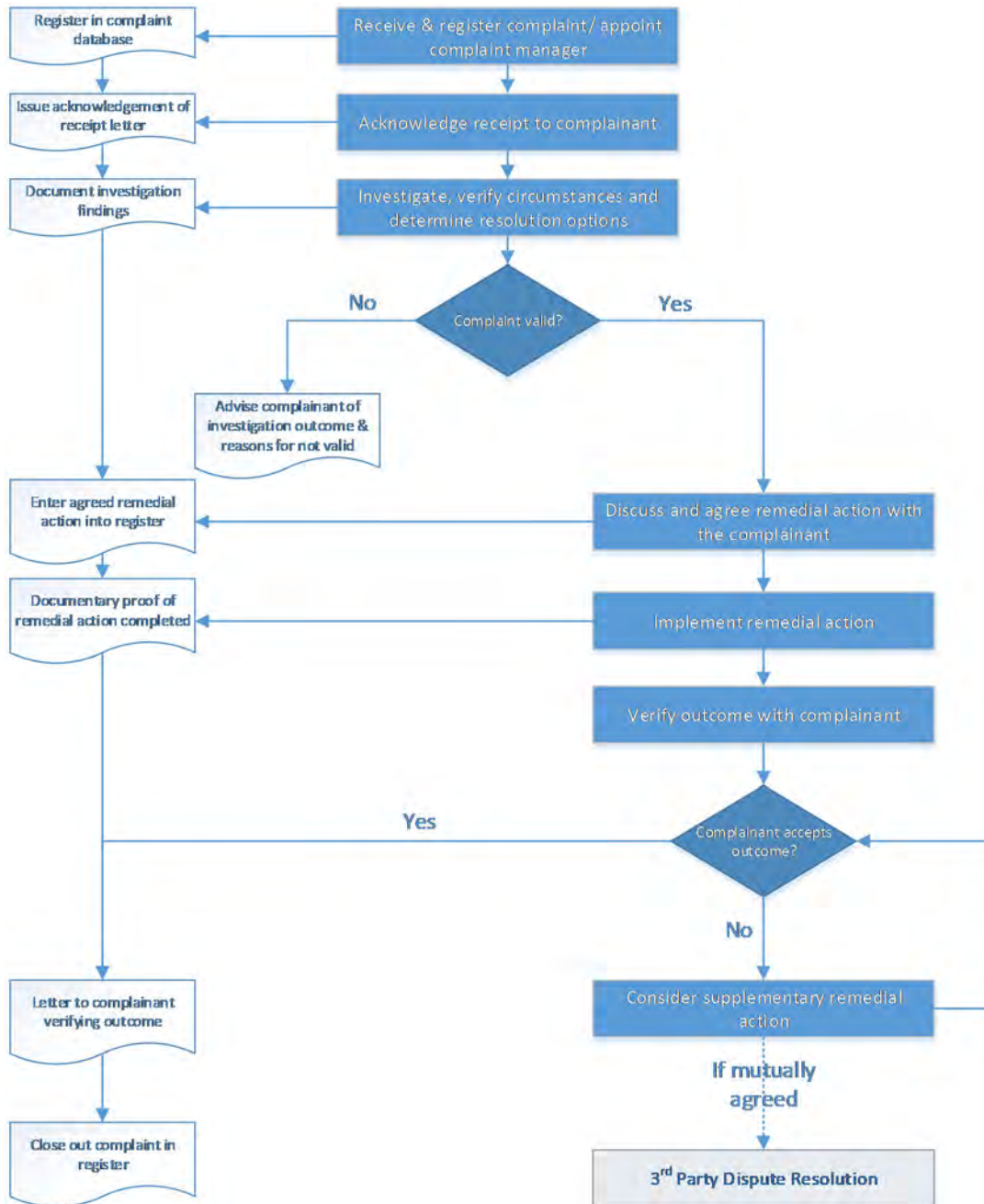
The Project Grievance Resolution Mechanism (GRM) was developed in recognition of the need to maintain a free, accessible, legitimate, transparent, and culturally appropriate mechanism. The GRM manages Project-related complaints received during the construction phase of the Project. It applies to the Project as well as its contractors and sub-contractors but does not apply to complaints related to industrial relations or working conditions. The mechanism covers all locations where the Project has activities in Mozambique.

The grievance management process has 5 steps, as set out below and summarized in the process flow below.

1. Receiving, registering and acknowledging receipt of a complaint;
2. Investigating, verifying and determining resolution options;
3. Agreeing resolution actions with the complainant;
4. Implementing the agreed remedial action;
5. Verifying outcome with the complainant

Avenues for lodging a complaint have and will continue to be widely publicized within the Project area as part of ongoing community engagement, placed on public notice boards and communicated verbally at public meetings as well as the Project's website ([www.mzlng.com](http://www.mzlng.com)).



The Project reports on grievance performance to communities on a monthly basis in a monthly community report, as well as to a wider public audience via the reporting channels described in Section 8.6.



**Figure 8.1 – Flow Diagram of Grievance Resolution Mechanism**

### 8.6 Monitoring, Evaluation and Reporting

To ensure the Project’s stakeholder engagement effort is effective in accomplishing its objectives, and that the SEP is being implemented as intended, stakeholder engagement processes and activities will be recorded, monitored, evaluated and reported on. Analysis of the results of monitoring and evaluation informs a better understanding of the Project

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operating environment; provides direction in terms of required adjustment of engagement programs, approaches and messaging; informs learning and improved practice; and serves as a barometer of social well-being in the Project area of influence.

Based on M&E activities, a number of internal and external stakeholder engagement reports are prepared. External reporting demonstrates a commitment by the Project to keep stakeholders well informed of Project performance and progress. The following reports are prepared:



- A bi-annual environmental and social performance report for relevant national and provincial entities of the Government that present details of Project activities during the reporting period, document the measures implemented to demonstrate compliance with the approved EMP requirements, E&S performance and any environmental-related incidents arising. Stakeholder engagement activities and grievance management are social performance areas included in the report.
- Environmental and Social Performance Reports for the Project Lenders. This report will contain a comprehensive stakeholder engagement section as well as a summary description of grievances and related management. The final version of the Lender report will be published on the Project's website, as will the IESC's monitoring reports.
- A quarterly Stakeholder Engagement Report serving as a comprehensive view of the Project's engagement in terms of scope, reach and performance, during the preceding quarter. This report will refer to the Quarterly Engagement Look-Ahead and compare actual; performance against planned activities.
- Monthly report to communities reporting on a variety of aspects related to management of impacts and risks at community-level, as well as initiatives and progress with the delivery of project commitments.
- Monthly community newsletter that will serve as an informal communication channel to share news about joint community-project endeavours, achievements and initiatives.

### 8.7 High-level engagement activities program



Table 8.1 provides a high-level consolidated timetable of anticipated engagement activities and expected periodicity of activities and events

**Table 8.1 – High-Level Engagement Activity Timetable**

Stakeholder Sector	Activity	Participating Stakeholders	Frequency
Communities	Community meetings to build and maintain relationships, create awareness of upcoming Project activities and facilitate opportunity for dialogue	DAC, RAC, IDAC	On-going Coinciding with Project and construction schedule
	Distribution of community monthly report	DAC, RAC,	Monthly

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	Distribution of monthly community newsletter	DAC, RAC,	Monthly
Government	Project-GoM Forum	Central GoM	Quarterly
	Provincial Government meetings	Provincial Steering Committee	Bi-annually
	Provincial Government Project update meetings	Provincial Governor and Government members	Monthly
	District Government Meetings	Palma District Government	Bi-weekly
	District Consultative Council meeting to provide Project update and facilitate opportunity for stakeholder dialogue	DCC members	Quarterly
Civil Society and NGOs	Regular engagements as per CSO/ NGO Engagement Program	Palma Civil Society Platform; Civic Coalition; FOCADE National Platform for the Extractives Industry	Quarterly
	Focus groups	Various CSOs and NGOs	Regularly scheduled
Donor Agencies	'Transparency and Accountability' platform	Donors	Quarterly
Cross-Sector	Palma multi-stakeholder forum (MSF)	Project, Government, communities, donors, CSOs, Area 4, private sector	TBD, Quarterly
All Stakeholder Sectors	Public audience (Palma and Afungi)/ Project Update Meeting	Open to all interested and affected stakeholders, including GoM, civil society, NGOs, business and industry	Bi-annually
	Open House (Maputo, Pemba, Palma and Afungi)	Open to all interested and affected stakeholders	Annually
	Distribution of Project Newsletter	Stakeholders on Project database	Quarterly
	Site visits	Government, communities, CSOs and NGOs	Coinciding with key Project

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## 9.0 CONCLUSION

Leading up to and during construction, operations and decommissioning, the Project will continue to evaluate changes, impacts and risks. Ongoing inspection, monitoring, and verification as part of the ESMP implementation will facilitate the Project constructing and operating in an environmentally and socially responsible manner.





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## 10.0 REFERENCES

This ESHIA Executive Summary is based on the following documents:

- Environmental Impact Assessment Report (EIA) for the Liquefied Natural Gas Project in Cabo Delgado (EA-MZ-SR0100-ERM-U17-00001-00);
- Resettlement Plan (EA-MZ-SR0504-APC-U13-00002-00);
- Replacement Village EIA (EA-MZ-SR0100-ERM-U17-00013-00);
- Community Health Impact Assessment (MZ-000-AM1-HS-ASM-00001);
- Project Induced In-Migration Management Plan (MZ-000-AM1-SP-PLN-00001);
- Stakeholder Engagement Plan (MZ-000-AM1-SP-PLN-00002);
- DUAT Terrestrial Ecology Baseline (EA-MZ-SR0000-RRG-U17-00012-00);
- Regional Onshore Ecology Baseline (EA-MZ-SR0100-RRG-U17-00013-00);
- Ecological Assessment of the Proposed Diversion Channel (EA-MZ-SR0100-RRG-U05-00002-00);
- Baseline Survey of Near Shore Coral Reef Structures (EA-MZ-SR0000-ERM-U17-00016-00);
- Biodiversity Baseline Survey of Coral Communities at Tecomaji Island (EA-MZ-SR0100-LWA-U17-00003-00);
- Biodiversity Baseline Survey of Coral Communities at Cabo Delgado Peninsula and Rongui Island (EA-MZ-SR0100-LWA-U17-00004-00);
- Critical Habitat Assessment for Area 1 and Area 4 LNG, Northern Mozambique (MZ-000-TBC-HS-RPT-00004) Critical Habitat Assessment
- Ecosystem Services Assessment (ESA, MZ-000-TBC-HS-RPT-00001).
- Ecology Monitoring Plan (MZ-000-AM1-HS-PLN-00001)
- Environmental and Social Management Plan (MZ-000-AM1-HS-PLN-00007);
- Updated EMPs:
  - Environmental Management Plan (EMP) for the Liquefied Natural Gas Project in Cabo Delgado - Area 1 Exclusive Facilities (MZ-000-SLR-HS-PLN-00001)
  - Environmental Management Plan (EMP) for the Liquefied Natural Gas Project in Cabo Delgado - Area 1 and Area 4 Shared Facilities (MZ-000-AEO-HS-PLN-00001)
  - Environmental Management Plan (EMP) for the Liquefied Natural Gas Project in Cabo Delgado - Marine Terminals (MZ-000-AEO-HS-PLN-00002)
  - Environmental Management Plan (EMP) for the Liquefied Natural Gas Project in Cabo Delgado - Materials Offloading Facility (MZ-000-AEO-HS-PLN-00003)
- EMP Supplementary Reports:

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- Environmental Management Plan (EMP) for the Liquefied Natural Gas Project in Cabo Delgado - Area 1 Exclusive Facilities – Supplementary Information Report (MZ-000-SLR-HS-RPT-00001)
- Liquefied Natural Gas Project in Cabo Delgado - Supplementary Information Report for Area 1 and Area 4 Shared Facilities EMP (MZ-000-AEO-HS-RPT-00002)
- Liquefied Natural Gas Project in Cabo Delgado - Supplementary Information Report for the LNG Marine Terminal EMP (MZ-000-AEO-HS-RPT-00003)
- Liquefied Natural Gas Project in Cabo Delgado - Supplementary Information Report for the Materials Offloading Facility EMP (MZ-000-AEO-HS-RPT-00004)
- AECOM. 2018. AMA1 Updated Groundwater Model. Water Sustainability Study. Draft Report. Prepared for Anadarko Moçambique Área 1, Lda. 26 November 2018.
- Lwandle 2015. Characterisation of Pock Mark Features in Palma Bay, Northern Mozambique. AMA1 LNG- Post EIA programme of Works. Prepared for ERM (PTY) LTD. Document #LT168/08. 24 pp.
- MEP 2015. Marine baseline for the resettlement action plan: fish stocks and fish habitat mapping study. Anadarko Mozambique Area 1, Lda: Mozambique Gas Development. 125pp.