

# Chapter 1

## Introduction

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# 1 INTRODUCTION

## 1.1 THIS DOCUMENT

This document presents the Environmental Impact Assessment (EIA) Report for the proposed Liquefied Natural Gas (LNG) Project associated with the gas fields within Area 1 Offshore of the Rovuma Basin (Area 1) and Area 4 Offshore of the Rovuma Basin (Area 4) (hereinafter referred to as 'the Project').

The document has been prepared by Environmental Resources Management (ERM) Southern Africa (Pty) Ltd in association with Projectos e Estudos de Impacto Ambiental, Lda. (Impacto) on behalf of Anadarko Moçambique Área 1, Lda (AMA1) and Eni East Africa S.p.A (eni), two companies licensed for the exploration and development of Area 1 and Area 4 respectively. This EIA consists of three volumes as described in *Section 1.6* below.

## 1.2 THE PROJECT PROPONENT

### 1.2.1 Context

AMA1 and eni are joint proponents for the Project. AMA1 has been leading the EIA process with the consultants since April 2011. AMA1 will continue to lead the EIA process on behalf of the proponents with the close cooperation and involvement of eni. Details about each of the companies' organisations are provided in *Sections 1.2.2* and *1.2.3* below. This section describes the relationship between these two companies, both offshore in the Rovuma Basin and onshore on Afungi Peninsula.

AMA1 holds exploration rights to explore, develop and produce natural gas reserves in Area 1 Offshore in the Rovuma Basin. Likewise, eni holds rights to explore, develop and produce natural gas reserves in Area 4 of Rovuma Basin. These areas 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 within each of the areas. AMA1 and eni will each coordinate the development of their natural gas reservoirs in compliance with the applicable Mozambican laws and regulations. The Proponents will also coordinate the development of the straddling natural gas reservoirs in compliance with the applicable Mozambican laws and regulations and a Master Depletion Plan jointly prepared by the two Operators.

Onshore, the Mozambican company, Rovuma Basin LNG Land, Lda. ('RBLL') incorporated by AMA1 and Empresa Nacional de Hidrocarbonetos, E.P., is the holder of the Right to Use and Enjoy Land (the 'DUAT') for an area identified on the Afungi Peninsula in Cabo Delgado Province, where the infrastructure for the natural gas liquefaction, namely the LNG trains, the common infrastructures, marine facilities, LNG storage tanks (the "LNG Facility"), etc.

will be built and operated. AMA1 currently possesses exclusive rights to the land within the DUAT for the development of the Project, under the terms of the assignment of exploitation agreement executed between AMA1 and RBLL, being ongoing the entrance of eni in RBLL's capital, as well as the granting to eni of rights to use the referred land on equal terms with AMA1.

With a view towards optimising the development, construction and operation of the initial liquefaction facilities, AMA1 and eni have entered into a Term Sheet that provides for the coordinated development, construction and operation of the LNG Facility. The Project will be implemented by means of one or more coordinated Development Plans which will be approved by the Government of the Republic of Mozambique.

### 1.2.2 *AMA1*

AMA1, a wholly-owned subsidiary of Anadarko Petroleum Corporation (APC), is a commercial entity duly registered under the Republic of Mozambique. AMA1 is the operator of Area 1 and has operating offices in Cabo Delgado Province at Pemba, Mocímboa da Praia and Palma. The head office is in Maputo, situated at Rua Joseph Ki-Zerbo, no. 227.

APC is headquartered in The Woodlands, Texas, United States of America (USA). With more than 2.56 billion barrels of oil equivalent (BBOE) of proven reserves at year-end 2012, APC is among the largest independent oil and natural gas exploration and production companies in the world. The company has major onshore operations in the USA comprising the Rocky Mountain Southern and Appalachian regions. The company is an offshore deepwater producer in the Gulf of Mexico and Ghana with additional deepwater exploration interests in New Zealand, Colombia, Brazil, China, Indonesia, South Africa, Kenya, Liberia, Sierra Leone and Côte d'Ivoire.

AMA1 made a commitment to the government and people of Mozambique to further the exploration and development of the country's potential petroleum resources in an environmentally and fiscally responsible manner. APC is a member of the International Association of Oil & Gas Producers (OGP) and is committed to safe, responsible and economically beneficial operation.

### 1.2.3 *eni*

eni S.p.A is an Italian company with activities in close to 85 countries. eni is an affiliate of eni S.p.A. with a branch in Mozambique and offices in Maputo and Pemba. eni S.p.A. is one of the leading global operators in the deep-water sector worldwide and is currently involved, as operator or partner, in exploration activities in several deep waters in the Gulf of Mexico and along the coast of Brazil.

eni S.p.A. is a member of OGP and the International Oil Industry Environmental Conservation Association (IPIECA), an organisation

established to assist the oil and gas industry to improve its environmental and social performance.

In Mozambique, eni is committed to conserve biodiversity and preserve productive ecosystem services through all phases of its activities. More information on eni can be accessed on the internet at:

[http://www.eni.com/en\\_IT/media/casebook/casebook-mozambique.html](http://www.eni.com/en_IT/media/casebook/casebook-mozambique.html)

### 1.3 THE PROJECT

#### 1.3.1 Project Overview

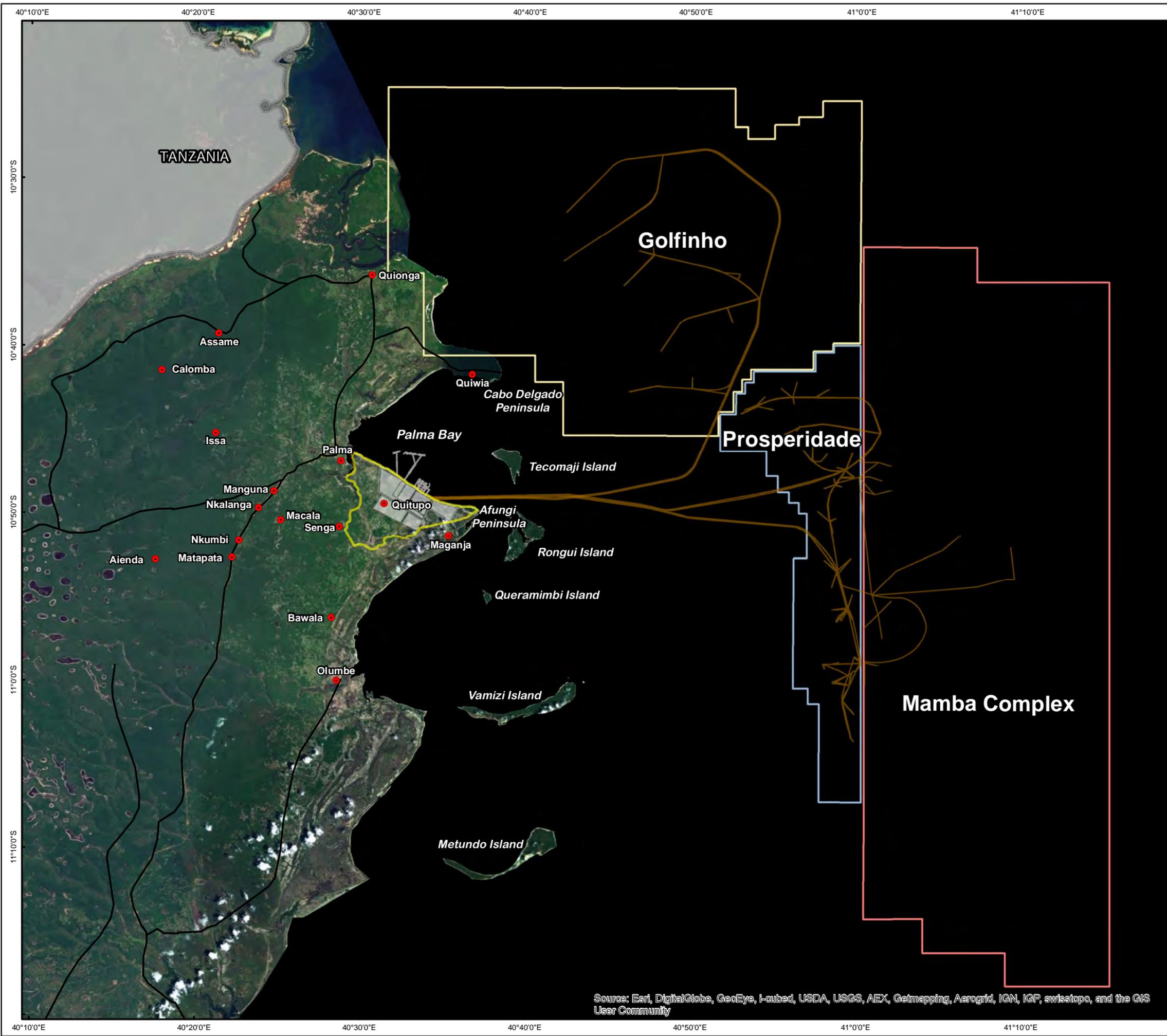
The Project is designed to gather, process and export (in liquefied form) natural gas. This process begins offshore in Area 1 and Area 4, where natural gas will be extracted from below the seafloor via subsea wells. The gas will be collected and transported to the onshore LNG Facility by subsea pipelines. Once onshore, the gas will be processed, converted to liquid (through cooling the gas) and stored in storage tanks. The liquefied gas will then be transported through insulated pipelines to an export jetty, where it will be loaded into specialised LNG ships to be transported to international markets. These specially designed ships maintain the LNG in a cold liquid state for sea voyages of several thousand kilometres.

The location for the onshore LNG Facility and offshore Area 1 and Area 4 are shown in *Figure 1.1*. The Project will comprise the following key components listed below:

- offshore gas wells and subsea gathering systems;
- offshore gas subsea transmission pipeline system linking the offshore gas fields to the onshore LNG Facility;
- Multi-Purpose Dock (MPD);
- LNG Export facilities;
- 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;
- a 1.7km pioneer airstrip and a 3.5km permanent airstrip and associated facilities; and

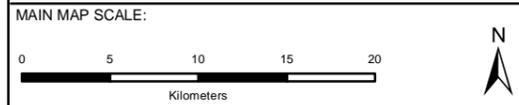
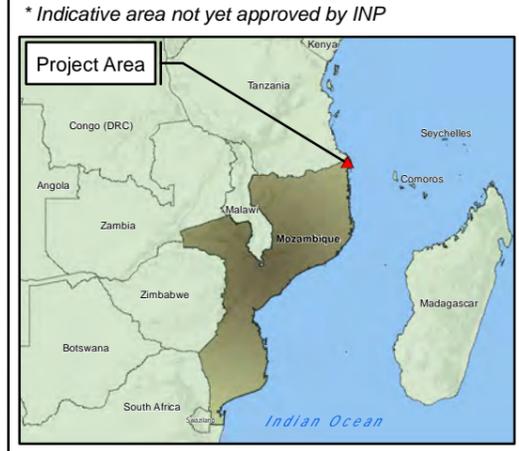
- associated infrastructure including roads, water treatment, wastewater treatment and waste management infrastructure, storage facilities, office buildings, etc.

For purposes of this EIA, it is assumed that the Project will have an initial 30 year period. A full description of the Project is provided in *Chapter 4*.



**Legend**

- Villages / Settlements
- Regional Roads
- Proposed Pipeline Corridor Route
- Jetty
- Onshore Layout
- Afungi Project Site
- Prosperidade Gas Field
- Golfinho Gas Field \*
- Mamba Complex Gas Field



TITLE:  
**Figure 1.1:**  
 Project Location and Onshore, Near  
 Shore and Offshore Indicative  
 Project Layout

CLIENT:

DATE: Oct 2013	CHECKED: KG	PROJECT: 0133576
DRAWN: AB	APPROVED: KG	SCALE: 1 : 400 000
DRAWING: Fig1.1 Indicative Project Layout.mxd		REV: A

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 Great Westerford Building  
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Projection: UTM Zone 37 S. Datum: WGS84  
 Source: Bing Maps ©2010 Microsoft Corporation.  
 AMA1, 2012. Inset Map: Esri Data & Maps

SIZE:  
**A3**

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Exploration for hydrocarbons (oil and gas) in Mozambique started in 1904 when the early explorers discovered thick sedimentary basins onshore in Mozambique. Poor technology and lack of funds halted those early exploration attempts (Instituto Nacional de Petróleo, 2012). From 1948 onwards, international oil and gas companies moved into Mozambique and carried out extensive onshore exploration but limited offshore exploration. In 1961, the Pande Gas Field, discovered by Gulf Oil, was the first field to be discovered in the country. This was followed by the Búzi and Temane gas fields in 1962 and 1967 respectively. Exploration activity on the Pande/Temane Block by another operator later led to the discovery of the Inhassoro Gas Field, all located in Inhambane Province, in southern Mozambique.

Between 1990 and 2003, exploration activities including 2-D seismic acquisition and the drilling of eight wildcat wells<sup>(1)</sup>, (six onshore and two offshore) were undertaken in the Pande and Temane fields.

Onshore gas resources in Inhambane Province have been exploited since 2004. The natural gas is exported to South Africa and is also used to supply the local Mozambique market (Matola Industrial Park in Maputo Province). In Sofala and Inhambane provinces, exploration activities (seismic and/or drilling) were undertaken in the M-10 and Sofala Blocks in 1998 and 2007 by Arco and Bang respectively. Both Blocks have since been acquired and seismic and drilling exploration activities continue within Blocks 16 and 19, M-10 and Sofala, within Sofala and Inhambane provinces. Seismic acquisition followed by exploration drilling is proposed in Onshore Area A, in Inhambane Province.

Hydrocarbon exploration in Cabo Delgado Province in northern Mozambique, and specifically in the Mocímboa da Praia and Palma districts, started in the 1980s by French and American companies, and the results were subsequently analysed by Artumas. In 2008, Artumas conducted seismic acquisition and exploratory drilling to certify whether or not hydrocarbons exist in commercially viable quantities in the Rovuma Basin Onshore Block. Natural gas was found in a well drilled in Mocímboa da Praia (MOC-1). This Block was acquired by AMA1, which has undertaken similar exploration activities over the past several years.

In the offshore Rovuma Basin, exploration activities have recently been carried out by a number of operators in offshore blocks, namely AMA1 (Area 1), eni (Area 4), Statoil (Areas 2 and 5) and Petronas Carigali Mozambique Rovuma Basin Limited (PCMRB) (Areas 3 and 6). Significant commercial quantities of gas have been discovered in Areas 1 and 4.

(1) A wildcat well is a well that is drilled where the existence of gas has not been confirmed.

### 1.3.3

#### *Benefits of the Proposed LNG Project*

In 2011, Mozambique published the third edition of its medium-term national development strategy known as the Poverty Reduction Action Plan (PARP), 2011 to 2014. The strategy places emphasis on the need for economic growth as a means of reducing poverty. To achieve the objective of inclusive economic growth, the government has defined general objectives <sup>(1)</sup>, to which government efforts will be directed. These are:

- (i) to increase output and productivity in the agriculture and fisheries sectors;
- (ii) to promote employment; and
- (iii) to foster human and social development, while maintaining a joint focus on governance and macroeconomic affairs and fiscal management.

The strategy, policies and practices of the Ministry for Mineral Resources are in alignment with the goals of poverty reduction, with 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 this 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 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:

(1) Mozambique Poverty Reduction Strategy Paper, June 2011:  
<http://www.imf.org/external/pubs/ft/scr/2011/cr11132.pdf>

- 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 REQUIREMENT FOR AN EIA**

In Mozambique, conducting an EIA process is a legal requirement under the Environmental Law (Law No. 20/1997 of 1 October) for any activity that may have direct or indirect impacts on the environment. These activities are regulated by the Environmental Impact Assessment Regulations (Decree No. 45/2004 of 29 September and Decree No. 42/2008 of 4 November, which amends some articles of Decree No. 45/2004).

Article 2 of Decree No. 45/2004 states that EIAs required for oil, gas and mineral resource-related activities or developments are regulated by specific regulations. The Environmental Regulations for Petroleum Operations is set out in Decree No. 56/2010 of 22 November. The Project will undertake all activities in accordance with the applicable Mozambican legislation. Therefore, the EIA process for this Project has complied with the Environmental Regulations for Petroleum Operations (Decree No. 56/2010 of 22 November) as well as the Petroleum Law (Law No. 3/2001 of 21 February), the Regulations on Petroleum Operations (Decree No. 24/2004 of 20 August) and the Licensing Regulations for Petroleum Installations and Activities (Ministerial Decree No. 272/2009 of December 30).

## **1.5 ENVIRONMENTAL PRACTITIONER**

### **1.5.1 Overview**

ERM, in association with Impacto, was commissioned in April 2011 to undertake the EIA for this Project.

### 1.5.2 *Environmental Resources Management Southern Africa (Pty) Ltd*

ERM is a global environmental consulting organisation employing over 4,000 specialists in more than 41 countries. Founded in 1971, ERM has built an organisation based on the supply of a full range of environmental and social policy, scientific, technical and regulatory expertise. ERM has been involved in numerous projects in southern Africa over the past 30 years and, in 2003, established a permanent presence in South Africa to meet the growing needs of clients. ERM has offices in South Africa (Cape Town, Johannesburg, Pretoria and Durban) and in 2013, opened an office in Maputo. In Southern Africa, ERM has a staff of over 180 dedicated environmental and social professionals, who have undertaken numerous EIAs in Mozambique in association with Impacto. ERM has extensive LNG experience globally. ERM has been involved in various phases of 12 other LNG developments across Africa including projects in Algeria, Angola, Libya, Nigeria, Equatorial Guinea and South Africa.

### 1.5.3 *Projectos e Estudos de Impacto Ambiental, Lda.*

Impacto is a fully registered Mozambican company based in Maputo. Impacto was officially registered on 14 August 1996 and currently has a staff of 25 consultants with considerable knowledge of the environmental and social issues throughout the country. Impacto is registered with the Ministry for the Coordination of Environmental Affairs (MICOA) to conduct EIAs in Mozambique, and has extensive experience in undertaking such studies. Over the past five years, Impacto has carried out EIAs for AMA1's onshore and offshore exploration activities in Cabo Delgado Province. Impacto has also undertaken several EIAs for eni (including EIAs seismic and exploration drilling in Area 4) as well as various other international oil and gas companies operating in the country including Statoil, Petronas, Sasol and DNO.

### 1.5.4 *Project Management Team*

The key project management team responsible for the management of the EIA process is outlined in *Table 1.1*. The team of specialists involved in the Project is outlined in *Chapter 3*.

**Table 1.1** *Project Management Team*

<b>Role</b>	<b>Name</b>	<b>Organisation</b>
Partner in Charge	Andrew Bradbury	ERM
Partner in Charge	Antonio Emilio Leite Couto	Impacto
Project Manager	Kamal Govender	ERM
Assistant Project Manager	Uke Overvest	Impacto
Assistant Project Manager	Isobel Evans	ERM
Assistant Project Manager	Chris Zeisloft	ERM

## 1.6 STRUCTURE OF THIS REPORT

### 1.6.1 Structure of the Report

This EIA Report comprises 19 chapters, which have been organised into three volumes. In addition, the Report includes a set of annexes, which support the material covered in the chapters of the EIA Report.

The structure of the EIA Report is as presented in *Box 1.1* below.

#### **Box 1.1** EIA Report Structure

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<b>Volume I</b>	<b>Introduction, Project Description and Baseline</b>
	Non-Technical Summary (NTS)
Chapter 1	Introduction
Chapter 2	Regulatory Framework
Chapter 3	The EIA Process, Approach and Methodology
Chapter 4	Project Description
Chapter 5	Consideration of Alternatives
Chapter 6	Introduction and Geographical Context
Chapter 7	Environmental Baseline - Offshore and Near Shore
Chapter 8	Environmental Baseline - Onshore
Chapter 9	Socio-economic and Community Health Baseline
<b>Volume II</b>	<b>Impact Assessment, Management, Implementation and Conclusions</b>
Chapter 10	Introduction to Impact Assessment and Mitigation
Chapter 11	Offshore and Near Shore Environmental Impact Assessment and Mitigation
Chapter 12	Onshore Environmental Impact Assessment and Mitigation
Chapter 13	Socio-economic Impact Assessment and Mitigation
Chapter 14	Unplanned Events
Chapter 15	Cumulative Impacts
Chapter 16	Impact Assessment Summary
Chapter 17	Environmental and Social Management System and Environmental and Social Management Plan
Chapter 18	Conclusion
Chapter 19	References
<b>Volume III</b>	<b>Annexes</b>
Annex A	Public Participation Report
Annex B	MICOA Approval of EPDA and ToR
Annex C	Baseline Methodologies
Annex D	Tabulated ESMP
Annex E	Waste Management Plan
Annex F	Decommissioning and Rehabilitation Plan
Annex G	Baseline Support Material
Annex H	Emergency Response Plan
Annex I	Initial Resettlement Plan

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