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**ENVIRONMENTAL IMPACT ASSESSMENT FOR SASOL'S OFF-SHORE  
EXPLORATION PROJECT IN BLOCKS 16 & 19  
INHAMBANE AND SOFALA PROVINCES MOZAMBIQUE**

**Final Scoping Report**

**NON-TECHNICAL SUMMARY**

**March 2006**

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## NON-TECHNICAL SUMMARY

### Introduction

This document constitutes the non-technical summary of the Final Scoping Report, completed as part of the Environmental Impact Assessment (EIA) process for Sasol's off-shore gas exploration project in Blocks 16 & 19, in Inhambane and Sofala Provinces.

In accordance with the Government of Mozambique's (GOM) policy to promote international investment in the off-shore hydrocarbon industry, an Exploration and Production Concession Contract (EPCC) was signed with Sasol Petroleum Sofala Ltda (Sasol) and Empresa Nacional de Hidrocarbonetos, E.P. (ENH) for rights to conduct hydrocarbon exploration and production activities in the off-shore Blocks 16 and 19, Mozambique (see *Figure 1*).

In terms of the EPCC, Sasol has the obligation to adhere to all relevant environmental legislation of the Republic of Mozambique, and in pursuance of this obligation, Sasol has committed to undertaking a full EIA. Sasol has contracted CONSULTEC (a Mozambican Company) in association with Environmental Resources Management Southern Africa (a South African Company), to undertake the EIA process. According to the letter, dated 30/11/2005 from the Ministry for Coordination of Environmental Affairs (MICOA), through the National Directorate of Environmental Impact Assessment, the proposed project was classified as an A category project, requiring a full EIA, preceded by a Scoping Report.

### Background

The Scoping Phase of the EIA was initiated with the submission of a Project Brief to the Ministry for the Coordination of Environmental Affairs. This was followed by a number of key stakeholder meetings and the distribution of a Background Information Document. Advertisements were placed in local newspapers and radio adverts aired, inviting stakeholders to public workshops. Between the 1<sup>st</sup> and the 4<sup>th</sup> of November 2005 several public meetings were held in Maputo (59 participants), Vilankulo (36 participants), Inhassoro (103 participants) and Machamba (17 participants).

Several issues were raised during the initial consultation with key stakeholders and at the public meetings (see Section 7.1 of the Final Scoping Report), which have contributed to the identification of potential environmental impacts (see Section 8 of the Final Scoping Report).

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## Project Description

A number of off-shore seismic acquisition programmes have been previously conducted in the area by ENH, Arco and Western Geophysical. The objective of Sasol's off-shore exploration activities in Block 16 & 19 is to use this information, together with newly acquired data to identify additional economically viable reserves of hydrocarbons.

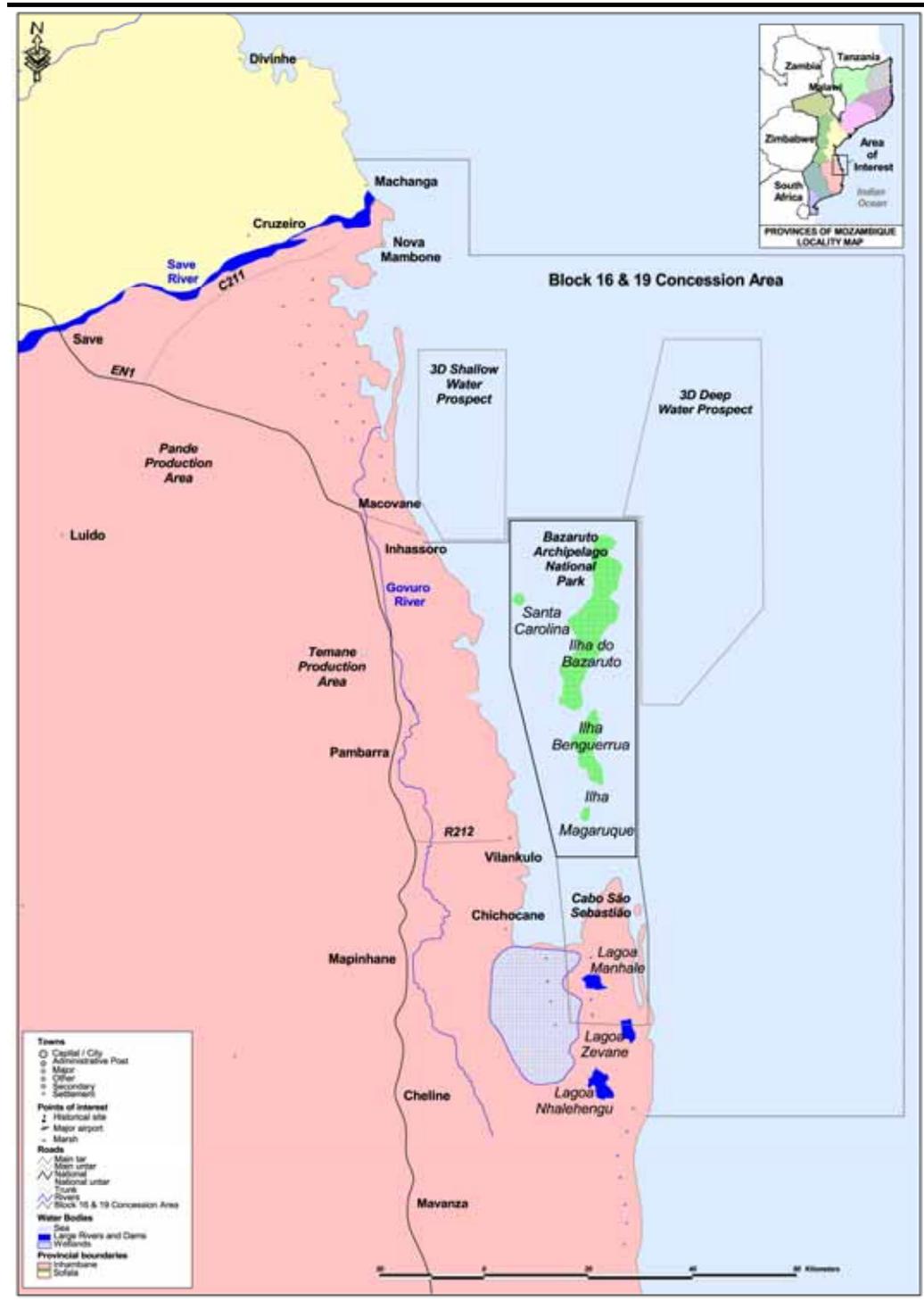
If hydrocarbon reserves are found to be economic the intention is to exploit these reserves to expand existing markets and to develop new markets in both Mozambique and South Africa.

Proposed exploration activities will include seismic acquisition surveys, and the drilling and testing of exploration and appraisal wells. The seismic acquisition surveys planned for the off-shore Blocks 16 and 19 are intended to delineate the aerial extent of hydrocarbon reserves. Drilling and well testing will then be undertaken to determine whether sub-surface geological structures contain hydrocarbons in potentially commercial quantities.

### *Project Location*

Blocks 16 and 19 are situated to the east and north-east of Bazaruto Archipelago National Park (BANP), Inhambane Province, Central Mozambique (*Figure 1*).

Figure 1: Locality map showing Blocks 16 & 19



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### *Project Duration*

The proposed off-shore exploration activities are planned to be conducted in two sequential stages comprising:

- Stage 1: Sep-Nov 2006 - Offshore seismic surveys, followed by seismic data processing and interpretation;
- Stage 2: Apr-Nov 2007/8 - Offshore exploration well drilling and well testing activities subject to the outcome of the seismic survey results and GOM approval.

Due to the results of previous seismic surveys, it is possible that drilling operations could precede seismic surveys. This will largely depend on the availability of the seismic and drilling vessels. In this event, GOM approval will be sought before commencing with drilling operations. Given the nature of the off-shore exploration activities, these must be conducted during the dry, winter months (April – November) when there is lower probability of the occurrence of tropical cyclones.

In the event that a commercially viable discovery is made, Sasol must submit an Appraisal Programme to the GOM.

### *Stage 1: Seismic Activities*

Seismic surveys are carried out in the investigation of sub-sea geological formations during marine oil and gas prospecting. To identify and evaluate a specific potential hydrocarbon accumulation, seismic data must be acquired and evaluated. The seismic data is used to not only determine where to drill but to estimate potential hydrocarbon volumes.

During seismic surveys high level, low frequency sounds are directed towards the seabed from near-surface sound sources that are towed by a ship. These are normally between 2 and 8 km of length and referred to as a streamer. Signals reflected from geological discontinuities below the sea floor are recorded by hydrophones mounted inside streamer cables. The reflected signals are recorded and transmitted to the seismic vessel for electronic processing. Analyses of the signals allow for interpretation of sub-sea geological formations.

Depending on the information needs, a seismic acquisition program consists of the acquisition of two-dimensional (2D) and/or three-dimensional (3D) data, with the 3D survey providing more detailed data.

During the seismic surveys, an exclusion zone is enforced where no fishing boats or ships are allowed within a radius of 6 km from the seismic vessel.

#### *Seismic Activities – Alternatives Methodologies*

There are a number of alternative survey methods available to Sasol. The method that would be adopted to acquire seismic data would depend on physical restrictions of the area, environmental considerations, the cost of acquiring data and the timing of the surveys. The method to be used can only be finalised after a contractor has been assigned to perform the work.

The differences between the alternative seismic survey methods are mainly related to the depth of the water (deep or shallow) in which the survey is undertaken, which affects the size of the vessels and the number of streamers that are towed behind the vessel. A separate set of alternative survey methods are used for surveys in the transition zone, (area between dry land and the low water mark).

#### *Seismic Activities in Blocks 16 & 19*

Both 2D and 3D seismic surveys are planned off the Mozambican Coast in off-shore Blocks 16 & 19. The 2D seismic program is separated into deep water (greater than 500m depth), shallow water (between 5m and 20 m). The 2D survey is expected to last up to 3 months.

The planned 3D surveys are separated into deep and shallow water surveys, identified as 3D Deep and Shallow Water Prospects in Figure 1. The shallow water survey is expected to last up to 1 month, while the deep water survey is expected to last up to 4 months.

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## Stage 2: *Exploration Drilling & Well Testing Activities*

Exploration drilling and well testing operations are undertaken to determine whether sub-surface geological structures, referred to as “prospects”, contain hydrocarbons in potentially commercial quantities. Exploration drilling will take place in both deep and shallow water.

For the Shallow Water Prospect, at least two wells are predicted to be drilled. Each well is expected to take 15 to 18 days to drill to a depth of 2,200 m. In the event of a discovery, a further 6 to 10 days will be taken to test the well. This test will involve flowing hydrocarbons to surface. The hydrocarbons flowed to surface will be disposed of by flaring through custom-made off-shore burners and flares, which will ensure 100% combustion.

At least two exploration wells are anticipated for the Deep Water Prospect. Each well is expected to take 20 to 25 days to drill to a depth of 2,200 m. The exact locations of these wells are not yet confirmed and further detailed technical work is still to be done.

There are a number of alternative drilling rigs that can be used. The choice of rig mainly depends of the depth of the water. Moving from shallow water to deeper water the choices range from a Jack-up Rig (fixed on the sea floor), a semi-submersible rig that is fixed to the sea floor, a semi-submersible rig that uses dynamic positioning (i.e. not fixed to sea floor) and a drill ship that also uses dynamic positioning.

The city of Beira in Sofala Province is the nearest port able to support the logistics for the drilling operations, including supply boat service and importation and storage of drilling equipment and materials. Foreign personnel will enter and leave Mozambique via Vilankulo International airport and be transferred to the drilling rig by helicopter.

During the drilling operations all waste will be handled according to international best practice and waste management practices will be described in a Waste Management Plan. On completion of the well testing, wells will be closed according to international best practice.

### *Employment*

Drilling vessels/rigs will be sourced from the International Market, including related equipment and specialized personnel. As a result limited local labour will be employed for the project.

### **Description of the affected biophysical and social environment**

A number of environmental research studies have been undertaken in the Bazaruto area. The description of the environmental baseline has been compiled using this existing information, together with the information obtained and observations made during field visits by the project team during the Scoping Phase.

### *Climate*

The climate in the region is humid tropical with average summer temperatures of 30°C, average winter temperatures of 18°C and a mean annual temperature of 24°C. The hottest period is January to December and the coolest period is June to August.

The archipelago's rainfall is highly variable both infra- and inter-annually. The wettest period is between December and February (140 mm to 170 mm), while the months from July to October are the driest (typically < 40 mm).

The winds are predominantly from the southeast quadrant and strengthen in the afternoon.

The study area is a high risk area in terms of tropical cyclones. In 2003, two cyclones were recorded that caused considerable damage in the region.

### *Physical Oceanography*

The off-shore region is dominated by the Mozambique Current comprising a number of large scale eddies. The surface currents in the off-shore region flow southwards throughout the year (> 50% occurrence at an average speed of approximately 0.6 m.s<sup>-1</sup>) with slightly stronger southwards flows occurring during the period from November to April when compared with the period from May to October.

The water temperature ranges from 23°C in winter to 27°C in summer and the salinity ranges from 35.4 psu in winter to 34.7 psu in summer.

The tides are semi-diurnal. The mean spring tidal range is approximately 3m during normal spring tides, increasing to approximately 4.4m during equinoctial spring tides (measured at 4.39m during the equinox of 9 March 1989).

The tidal range at spring highs produces strong tidal currents in the channels between the islands that have transported vast quantities of sand to form extensive flood- and ebb-tide deltas. These strong tidal flows also maintain the deep channels on the landward side of the islands and transport sand across the tidal flats.

The cyclones of 2003 drastically resulted in significant modifications not only to the beaches of Bazaruto, but also to the northern part of Inhassoro and the Cabo de São Sebastião.

#### *Marine Ecology*

Due to high diversity of marine fauna that lead to the creation of the Bazaruto Archipelago National Park (BANP) in 1970, the area has been the focus of marine fauna studies since the 1970's. From the early 1990's the area has been the subject of special attention, from the WWF and the Natural History Museum. The Eduardo Mondlane University have also conducted several studies on the marine fauna of the area. However, some of these studies are focused in the BANP and do not include the northern part of Inhassoro.

According to existing studies, several crustaceans species (crabs and lobsters) were identified and associated with different types of marine habitats (sand flats, deep waters, coral reefs, sandy beaches, intertidal rocky shores, mangroves and salt marches associated with mangroves).

There are records of the occurrence of 2000 species of fish around the Archipelago, which represent more than 80% of all marine fish families of the Indo-pacific region. There is also indication that the incidence of endemism is either absent or very low.

Fish species common to the deeper water off the continental shelf include sailfish, three species of marlin, sharks and migratory tuna. Within the floodplains of the Govuro and Save Rivers, Redbreast Tilapia, Mozambique Tilapia and Black Tilapia are known to occur.

More than 180 bird species have been identified in the Bazaruto Archipelago. The existence of extensive sandy beach habitat around the Bazaruto Archipelago and extensive wetland areas creates an important and internationally known habitat for a number of bird species.

Five species of dolphins and seven species of whales, all of them considered protected species in Mozambique, have been identified in the study area. Some of these species generally occur in shallow waters, while others are more frequent in off-shore deep waters. These species are common in the area between May and October. In the latter months, during the southward migration to the Antarctic Ocean, calves with their mothers have been observed.

The area of Bazaruto is well known as an important area for Dugongs who mainly feed off the sea grass beds in the area. The largest remaining population in the Western Indian Ocean Region is believed to be in the Bazaruto Archipelago. In Mozambique, Dugongs are considered protected species. They are threatened worldwide and are listed globally by IUCN as vulnerable to extinction.

Five species of sea turtles are likely to occur in the study area in the inshore waters of Inhassoro and Bazaruto Bay. The nesting season of these turtles species occur between October and February and hatched turtles are found between January and April. Two species of seals are also found in the study area.

Several sensitive marine habitats occur in the study area, including:

- Coral reefs
- Angiosperm beds
- Sandy beaches
- Estuaries and
- Mangroves.

In 1971, due to the high ecological importance of the study area, the Bazaruto National Park (PNB) was created, covering three Islands of the archipelago. The aim of creating the park was to protect the marine fauna. In 2001 new boundaries were defined, the limits of the Park were extended and the Park renamed the Bazaruto Archipelago National Park (BANP). Further south, the Total Protection Zone of Cabo São Sebastião exists where a private natural reserve is established.

#### *Socio-Economic*

The proposed study area is limited to Machanga district in Sofala Province and the districts of Govuro, Inhassoro and Vilankulo in Inhambane Province.

Sofala province supports approximately 8.5% of the total population of Mozambique. The population is mainly concentrated in Beira and Dondo cities and along the designated *Corridor of Beira*. The Machanga district supports only 10% of the population of the province.

The Inhambane province supports 8% of the total population of Mozambique, and the population is mainly settled along the coast. The population distribution in this province is determined by agro-ecological conditions as well as fishing and tourism.

The main economic activities in Sofala and Inhambane Provinces, affecting population distribution are agriculture, forestry, fishing and tourism. Approximately 90% of women are employed in these sectors. These provinces have weak commerce, manufacturing and administrative service sectors.

Agriculture is mainly practiced on small plots at a family level, where cassava and peanuts are the predominant crops. The soils are poor and agriculture is practiced only for subsistence. The population are therefore extremely vulnerable and have alternative ways of subsistence, mainly linked to the exploration of natural resources.

Fishing is the dominant activity which provides employment and income to a significant number of economically active members of the population. Small-scale fishing is predominant in the four districts, however, there are also semi-industrial fishing operators who operate in the area. These semi-industrial fishers operate from the Port of Beira.

Associated with fishing are other related economic activities such as the supply and management of fishing equipment and the sale of the fish.

There are a number of fishing centres in the four districts, with most of these situated in the coastal regions or on the islands. The districts with the greatest number of fishing camps are Machanga (868) and Vilankulo (362).

Most of the people who are involved in fishing assist as permanent or casual crewmembers on fishing boats. It is estimated that there are approximately three hundred (300) fishers in Machanga District and one hundred and eighty-five (185) fishers in Vilankulo District who do not have boats.

People who collect shells and crabs represent an important proportion of the fishermen, with a relatively high number in Vilankulo District of approximately eight hundred and fifty (850) collectors. Govuro District is unusual in only having thirty-two (32) registered collectors. In Inhassoro district, divers also represent a significant portion of the people involved in small-scale fishing (generally fishing for lobster), with a total of five hundred and thirty-two (532).

The fisheries sector in the four districts are represented by various role players, each playing an institutional role as well as having a specific economic significance. These include the Institute for Fisheries Investigation, Fisheries Foment Fund, Institute for Development of the Small Scale Fishing, Artisan Fishing Project in the Sofala Bank, and Fisheries Associations.

Although there are tourism activities located around the inland lakes, most tourism investments are located along the coastal zones and on the Islands. In the coastal areas of Machanga and Govuro Districts tourism is limited apart from Eko Turismo Gorongosa Lda, which operates in the Coutada de Caça (hunting block) number five.

The establishment of the BANP as a protected area has contributed significantly to the development of tourism activities in the districts of Vilankulo and Inhassoro as well as on the islands. The BANP Management Plan defines various zones, in which subsistence resource use and fishing activities are restricted, and the catching of certain species, such as the dugong and sea turtle, are prohibited.

In general, the four districts of the project area have little social infrastructure, where this exists it is concentrated in the District Headquarters and in some Administrative Post Headquarters. The region of Inhambane is one of the poorest provinces in the country.

The following important plans affecting social development are either being implemented or in the process of being developed,:

- Action Plan for Reduction of Poverty (PARPA)
- Strategic Plan for the Development of Tourism in Mozambique (2004 - 2013)
- Bazaruto Archipelago National Park Management Plan (2002 - 2006)
- Local Economic Development Team – DEL
- Strategic Environmental Assessment (SEA) for the Vilankulo, Inhassoro and Govuro Areas

With regards to cultural aspects in Sofala and Inhambane, the predominant ethno-linguistic groups are the *Ndau* (Machanga and Govuro) and the *Matswa* (in Inhassoro and Bazaruto). The native population of the Bazaruto Archipelago belongs to another ethnic group, known as *Mahoca*. They have a strong spiritual connection with the sea. Traditional ceremonies dedicated to the sea are often held in the coastal areas of the continent.

### *Shipping*

The study area is located to the south of Port of Beira, an important a transit port, handling the import and export cargoes from all the country neighbours. In 1998 an average monthly movement of 71 vessels was recorded. Ship movement statistics will be verified and updated during the execution of the EIA.

### **Concerns and Expectations**

During public consultation undertaken for the Scoping Phase , several concerns and expectations were raised relating to Sasol's proposed seismic and drilling exploration activities. More strategic issues, related to the long term compatibility of the gas exploration activities with other economic activities such as fishing, tourism and nature conservation, were also raised.

Issues and concerns raised by the stakeholders during the consultation process are presented in Chapter seven of the Final Scoping Report, Table 7.1. Responses to each of the issues are provided in the same table. These issues were considered during the identification of potential impacts and the preparation of the Terms of Reference of the specialist studies.

Comments received on the Draft Scoping Report, together with response, are included in Annex G5 to the Final Scoping Report.

### **Potential Impacts**

Chapter eight of the Final Scoping Report presents a list of potential impacts associated with the seismic and drilling exploration activities. These potential impacts are detailed in Table 8.1 of the Final Scoping Report and listed below:

In relation to the Seismic Survey:

- Impacts on marine ecosystems
- Impacts on marine species
- Impacts on conservation areas
- Impacts on fisheries and related activities
- Impacts on tourism
- Impacts on the socio-cultural aspects
- Impacts on marine traffic

In relation to the Exploration Drilling and Well Testing:

- Changes in water quality
- Impacts on air quality
- Impacts on marine/coastal ecosystems
- Impacts on marine species
- Impacts on nature conservation areas
- Impacts on fisheries and related activities
- Impacts on tourism
- Impacts on marine traffic
- Impacts on terrestrial biota

The Terms of Reference (ToR) for the EIA (Annex A of the Final Scoping Report) include the Terms of Reference of the following specialist studies:

- Marine Ecology Study;
- Dispersion Modelling Study (Hydrocarbon spill and drill cutting dispersion);
- Fisheries Study;
- Socio-economics Study;
- Waste Management Study; and
- Marine Shipping Study.

In addition to the specialist studies listed above, the EIA project team has recommended that a formal stakeholder forum be constituted to encourage communication between directly affected stakeholders, the EIA project team and Sasol. Such a forum has been set up and initial meetings were conducted between February and March 2006.

The outcome of the independent specialist studies including information on the potential impacts of the activities and proposed mitigation measures will be presented in a Draft Environmental Impact Report (EIR), the results of which will be presented to the public at a series of public meetings.

The recommendations contained in the Draft EIR will be included in two separate Environmental Management Plans (EMP), one for the seismic activities, and one for the drilling and well testing activities. The EIR will be finalized following a formal public comment period.

The Final EIR and EMPs will include a Comments-Response report which will address all comments raised by the public. These reports will then be submitted to MICOA for decision making. Once a Record of Decision is issued the EIA consultants will inform the stakeholders of the decision issued by MICOA and the intended course of action.