ECOMOZ, Ltd. intends to build a Natural Gas Power Station in Ressano Garcia, Moamba district of Maputo province, to supply the Southern African Energy Group (SAPP - Southern African Power Pool). Starting from an existing 110kV power line transmission of which links the Corumana substation in Mozambique to the Komatipoort substation in the South African province of Mpumalanga.

The licensing of the project requires an environmental permit, preceded by the Environmental Impact Assessment (EIA) process regulated by Decree n.º 45/2004 of 29 September. For the purpose, Ecomoz promoted the development of an Environmental Impact Study, of which this document is the Non-Technical Summary.

PROJECT DESCRIPTION

The project consists of the construction of a Natural Gas Power Station, which will occupy an area of approximately 5 ha, near the Ressano Garcia village. At the south of this area is located the Sasol pipeline and the west Matola Gas Company (MGC) pipeline.

The Station will have a set of 54 power generators (with engines and natural gas), each with a capacity of 1.1MW. It is undertaken that 50 generators shall operate simultaneously and four of which can be kept for maintenance. Thus, the total production capacity of the station will be 50MW.

The energy produced in the generating units will be sent to 11/110 kV transformers, which will occupy an area of approximately 0.5 ha. This area will be fenced and waterproofed, and will be built a septic tank for oil retention in the transformers area, that will allow to make possible spillages.

The supply of natural gas to the Station will be made from the MGC pipeline. This will built an underground extension of about 900m in length, from that point up to the new High Pressure Metering (High Pressure Customer Metering Station - HPCMS1). The HPCMS 1 is a Pressure Reducing Station; with the aim of reducing the pressure at which gas is transported through the new extension to the proper pressure Generating Units.

The connection to the energy produced in the Station will be ensured by building a new transmission line that will connect the 110 kV Transmission Line between existing Corumana and Komatipoort, with about 600m long.

For the construction of the Station are expected 120 construction workers and 30 workers for the electrical system. The project will run for three months and a half.
The station includes about 0.65 ha for the installation of infrastructure support, i.e., for installation of administrative areas, warehouses and health facilities.

Both during construction and operation, there will be noise emission. The waters of rainwater drainage will be routed to the treatment basin that will be built for the purpose. Emissions of air pollutants shall be limited to vehicles and machinery during the construction phase and dust, but during the operation phase will be combustion of natural gas, mainly carbon monoxide (CO) and nitrogen dioxide (NO2).

ENVIRONMENT CARACTERIZATION IN THE PROJECT AREA

CLIMATE

The Power Station project of Ressano Garcia is located in the South of Mozambique, 80 km from the Indian Ocean coast, in a region where the climate is tropical dry type. The average annual temperature is between 23 and 24°C, with average rainfall (period 1957-1983) of 581 mm, with an incidence especially from December to February. The prevailing winds are generally mild, occurring with a frequency of wind speed below 12 km/h, around 80%.

GEOLGY, GEOTECHNICAL AND GEOMORPHOLOGY

The study area belongs to the super large geological structure of the complex of the Karoo. The geological substratum of the area surrounding Ressano Garcia, and more specifically the project area, corresponds to outcrops of volcanic rocks formed in the Jurassic. The project is developed in a region of moderately rugged relief, corresponding to the Lebombo chain, in a relatively flat area, with inclination to the north, about 220m altitude, 2 km from the Incomati River. The implementation area of the power station is relatively low to moderate seismicity.

SOIL

Soils are soils liters that are characterized by being slightly extended and shallow. These soils have high infiltration capacity of water and low water retention capacity. They are subject to considerable risk of erosion. Its reduced thickness and the presence of stones do not allow its use for agricultural purposes, being particularly suitable for forestry use.

WATER RESOURCES

The project is part of the Incomati River basin, approximately 2 km south of the right shore. The Incomati River is a major river that runs through South Africa and Swaziland and enters Mozambique by Ressano Garcia. The mean annual runoff noted in Seawater Ressano Garcia (period from 1953-1998) is 1,748 million m³. Minimum runoff occurs in September / October, but reduced runoff between May and November may also occur.

The potential for short-term groundwater extraction in the area corresponds to less than 1m³/h flow rate. For refilling, it is estimated to be between 15 to 30 mm/year. The combination of these aspects is concluded that the availability of groundwater in the project area is reduced.
Regarding the quantity, the surface water does not show significant pollution, while groundwater has a good quality and can be used for public water supply.

ECOLOGY

The project area is located approximately 3 km south of the Great Limpopo Border Conservation Area. This area includes the Limpopo National Park (Mozambique component) and the Kruger National Park; Republic of South Africa. The vegetation is an acacia treed savanna, consisting of prairie with scattered trees and shrubs and is well represented in region. Regarding the fauna, the animal’s community is very poor, consisting of bats, small medium sized herbivores, gnawing animal and small carnivores. In respect of birds, it’s important to point the possible presence of the following species, all of them are rare species: eagle-without-tail of the Senegal lapwing, partridge starfish, white-stork and Episcopal-stork. Not likely the presence of amphibians and reptiles with relevant conservation value.

NOISE

There is no national legislation defining the criteria for identification of sensitive receptors and sound sources and establishing arrangements for the prevention and control of noise pollution. For the assessment of the noise levels were followed Guides of Environmental Noise of the World Health Organization. The values obtained in measurements; to the study air of undisturbed zone (values below 45 dB (A), characteristic of areas without significant sources noise.

AIR QUALITY

There are no industrial units in the area so the air quality is affected only by road traffic in EN 4. Although there are no data of air quality, the area can be considered as good, characteristic of rural areas.

SOCIOECONOMY

The Ressano Garcia village is the main town of the Moamba district, with 12,600 inhabitants and a population density of 61 inhabitants/km². The population is young and predominantly female, with the lowest rate of illiteracy and the highest percentage of Portuguese speakers of the district. In this village we find about half of the shops in the district. The project area has no meaningful occupation.

According to the survey conducted in the project area 8 farms were identified on the ground, one of them being part of an old house with six bedrooms, a kitchen and outdoor latrine and an ox-stall, all this located in the project area.

HERITAGE
No archaeological sites or intangible assets were identified. It is important to mention the presence of the shrine of Our Lady of the Assumption at about 900 m southwest of the project site, but this is not classified.

**LANDSCAPE**

The vegetation is an Acacia treed savannah. Land use is limited to very specific agricultural occupations, except in the Ressano Garcia village, where there is an old urban core and along the EN 4 where a school is located, storage areas and pipeline station.

**IMPACT**

*Construction phase*

For **climate**, no impacts to local and regional climate level were identified. The environmental impacts on **geology, geotechniques and geomorphology**, are restricted to this stage. The actions of earthworks (excavation and fill) and the construction of access shall not affect any location with particular geological interest, considering irrelevant the geological impact. Since landfills and excavations will be reduced, the associated geomorphologic impact is negative, direct, local, permanent, low magnitude and not significant.

Regarding soils, vegetation removal makes the soil subject to phenomena of water erosion and subsequent transport by water from surface drainage. Given that soil affecting is less productive and very common occurrence, it is considered that the impact is negative, direct, local, temporary, magnitude and meaning. Another impact that may occur is the accidental discharge of pollutants, considering it as a negative, direct, local, temporary, likely, and potentially significant impact of variable magnitude.

On **water resources** if heavy rainfall occurs, it can be seen transporting land by action of water runoff, which may cause the introduction of solid flow that may reach the Incomati River. This impact can be considered negative, indirect, local, temporary, likely of reduced magnitude and significance.

There will be impacts at the ecology level of the project site. The animals may be disturbed due to noise and the presence of people and machines. This impact can be considered negative, indirect, local, temporary, likely of reduced magnitude and significance. The vegetation will be destroyed and the death of animals may occur considered that the impact is negative, direct, local, temporary, likely of reduced magnitude and significance.

As for the **noise**, this phase is characterized by the noise generated by machinery and equipment, but that should only occur during the day (between 7:00 and 18:00). Previsions shows that the particular sound environment shows nearby the sensitive receptors generates a negative impact, local, temporary and reversible and negligible.
With regard to socio-economics, the owners of the farms and the house which are currently in the project area should be compensated in a transparent and fair manner so that the project does not adversely affect their quality of life. Therefore it is expected that the impact of the relocation is less significant. The relative distance regarding the urban core also makes Ressano Garcia not to be expected to occur direct troublesome on populations. Also are expected significant positive impacts on employment.

Relatively to heritage, a permanent negative, indirect, local, and with reduced magnitude impact caused by involving visual changes of the chapel of Our Lady of the Assumption may occur.

Construction activities represent a negative, temporary, correct but reduced magnitude impact on the landscape.

Exploration Phase

This stage is the occurrence of unanticipated impacts, whether on the climate or in terms of geology, geotechnique and geomorphology.

In respect to the soil the accidental discharge of pollutants can be avoided by the adoption of appropriate environmental management practices of the work making the impact of soil contamination less significant. This impact is considered negative, direct, local, temporary, insecure and reduced magnitude and significance.

During the operation of the station discharge of untreated effluents, namely oils and cleaning water may occur which constitutes a negative impact on water resources. This practice should be prohibited, making the non-existent impact, and addressed in this PGA.

There shall exist negative impact on the ecology, since the death of birds may occur by collision with power line disturbance of wildlife due to the presence of structures, noise and workers. This impact is considered negative, indirect, local, permanent, and likely of reduced magnitude and significance.

With regard to noise, are expected significant and permanent adverse impacts among receptors who are located up to 500 m from the Station, so that mitigating measures should be adopted if the noise measurements to be carried out so indicate. This impact is considered negative, indirect, local, permanent, and likely of reduced magnitude and significance.

The change in air quality by emission of air pollutants is a major negative impact of the project. The provided concentrations of NO₂ do not exceed the legal limits, either Mozambique or the World Bank guidelines, but they are fairly high. Thus, it is proposed to conduct a measurement campaign in an area of 10 x 10 km around the Station covering Mozambican and South African territory. This impact is considered negative, indirect, local, permanent, and likely of reduced magnitude and significance.

In terms of socioeconomics, it may be expected an increase in noise levels in the environment that may exist in some isolated residences in the south of Ressano Garcia, especially at
night. This impact is negative, direct, local, permanent, and likely of reduced magnitude and significance.

As positive impacts are identified increased of energy capacity that are reflected in the consolidation of the industrial vocation of this area, the possible establishment of future companies, which will thus increase employment in the district. The increase in domestic energy capacity is regarded as a positive regional impact certain, direct, permanent, and of high magnitude and significance. Establishment of future industries and consequent increase of workmanship is considered an indirect, local, permanent, insecure and positive impact of reduced medium magnitude and significance.

For the landscape, the impact identified is negative and insignificant, since the number of observers from the station at the heritage level.

CUUMULATIVE AND BORDER IMPACTS

Cumulative impact means an impact, direct or indirect of the project to which are added other impacts, direct or indirect, or other past, present projects or reasonably foreseeable future actions. Cumulative impacts are not very important.

Border impacts of a project located in a particular territory are those which, having their origin in this project affects the territory of another country. In this case, are regarded as the Border impacts these may affect the South Africa territory with the exception of air quality, the project has no other negative Border impacts.

As positive border impact stabilization of the regional electricity grid network that contributes to fuel South Africa.

MITIGATION MEASURES

The Environmental Impact Study identified a number of mitigation measures in order to avoid, reduce or compensate for negative impacts. Many of these measures are part of an Environmental Management Plan (EMP), which is one of the chapters of the Environmental Impact and Guidelines for Compensation of families affected by the project. Following are some of the mitigation measures identified in the construction phase and operation phase:

Construction Phase

- Compensation of all families owning properties within the provided area for the project before the start of any construction activity;
- Avoid installing support building yards in sensitive areas;
- Minimize the dust suspension;
- Avoid affecting of areas indirectly associated with the work, specially environmental vegetation;
• Provide for a care system of possible doubts and complaints;
• Comply with legal requirements on pollutants emission affecting air, water and/or soil;
• Minimize the soil erosion, especially after and before Station and Cleaning of the land;
• Undertake cleaning of circulation roads whenever occurs debris falling;
• Temporarily store all wastes produced and send it to an appropriate destination;
• Implement appropriate procedures for prevention of accidental spills of polluting products or inflammables;
• Restrict the time for transport activities and the noisiest of the project construction and maintenance;
• Ensure the draining system conditions to avoid the soil crawling and consequent water quality degradation;
• Establish a balanced relationship
• Ensure the safety conditions of the workers;
• Collect all wastes and effluents produced in the activities associated with the project;

One of the major measures that ECOMOZ proposes to develop is the implementation of a sanitary landfill with suitable conditions for its use. It was verified during the EIA that waste is dumped in the project area in inappropriate locations for the purpose. The sanitary landfill would be licensed to and would be the responsibility of District Administration.

CONCLUSIONS

The Environmental Impact Study of Natural Gas Power Station in Ressano Garcia described the project, characterized the potentially affected environment and identified and evaluated projects – positive and negative – and the risks associated with the project and set that may prevent, reduce or compensate negative impacts.

The project presented a number of significant positive impacts:

• Macroeconomic benefits for Mozambique by added value to the natural gas currently exported to South Africa by reducing energy losses in the 100 kV line Komatipoort-Corumana currently supported by the Electricidade de Moçambique, EP
(EDM) and the taxes that the project will pay to the Government of Mozambique for power exploration;

- Project social benefits, by generating employment and construction of community sanitary landfill under the social projects and the multiplying effect on other activities of the local economy, helping to improve quality of life;

- By being a large industrial enterprise for Ressano Garcia, with the possibility of coming to encourage and attract other industrial and commercial investments.

As presently in the project area are 8 fields and a house used for agriculture and livestock the Proponent should compensate the owners in order not to impair their quality of life. These compensations must be clearly and fairly, following the proposed Guidelines attached to this report, in order to minimize the impact on affected families.

The project has some significant negative impacts on geology and geomorphology, soil, waters, ecology and landscape.

Estimates of the noise produced by the Power Station are within the limits recommended by the World Health Organization (in the absence of legal limits in Mozambique), may be slightly exceeded in nearby residences. Given the uncertainty associated with these calculations, it is proposed to carry out a monitoring program as the Station is in operation.

Atmospheric emissions are the main negative impact of the project. The simulation performed indicates that concentrations of nitrogen dioxide (NO₂), notwithstanding meeting the established legal limits whether by Mozambican legislation or Guidelines of the World Bank, are higher. As such, it is proposed a timely monitoring program of NO₂ and ozone (O₃), an area of 10 x 10 km with the Station in the center, before the entry into operation of the Power Station, being part of this area in the South African territory.

The final assessment of the impacts of the Power Station project in Ressano Garcia is clearly positive, being necessary to adopt a set of mitigating measures of negative impacts included in the Environmental Management Plan (EMP) submitted under the Environmental Impact Study. The impacts of noise and air quality during operation require monitoring programs.
1 INTRODUCTION

Ecomoz, Ltd. intends to build a Natural Gas Power Station in Ressano Garcia, Moamba district of Maputo province, to supply the Southern African Energy Group (SAPP - Southern African Power Pool). Commencing from an existing 110kV power line transmission that links the Corumana substation in Mozambique to the Komatipoort substation in the South African province of Mpumalanga.

The project will be in phase, the first phase corresponds to a 50 MW power output with plans for future expansion up to a total capacity of 150MW.

The project includes the construction of a branch connection to the 110 kV line mentioned above, as well as an extension of the existing pipeline.

The licensing of the project requires an environmental permit, preceded by Environmental Impact Assessment Process (EIA) regulated by Decree no 45/2004 of 29 September.

This document is the Environmental Impact Status (EIA), provided for in Article 12 of Decree n.º 45/2004.

The EIA was prepared by CONSULTEC – CONSULTORES ASSOCIADOS, LDA, independent consultant firm and contracted to conduct the EIA process of the said project. The EIA was coordinated by Alvaro Carmo Vaz, Civil Engineer with specialization in hydrology and water resources, with the technical collaboration of the following technicians: Júlio de Jesus (Environment Eng.), Madalena Dray (Environment Eng.), Joseph Sá Pereira (Environment Eng.), Rosa Oliveira e Silva (Environment Eng), David Malauene (Geographer), Carlos Nuno (Anthropologist, MSc), Inês Lourenço (Environment Eng), John Roberts (Biologist), Nuno Cruz de Carvalho (Landscape Architect), Paulo Pereira (Environment Eng.) and Sergio Brites (Geographer, MSc). The specialized impacts study on air quality was carried out by IDAD – Institute for Environment and Development, connected to the University of Aveiro, Portugal, by a team consisting of Miguel Coutinho (PhD) and Clara Ribeiro (MSc).

1.1. Structure of the Environmental Impact Study Report

The structure of the EIA (Box 1) complies with the provisions of the Regulation on the Procedure for EIA approved by Decree no 45/2004 of 29 September, and the General Directive for the Preparation of Environmental Impact Studies, approved by the Diploma Ministerial no 129/2006 of 1 June.

<table>
<thead>
<tr>
<th>Structure of the REIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Non Technical Summary</td>
</tr>
<tr>
<td>– EIA Report:</td>
</tr>
<tr>
<td>1. Introduction</td>
</tr>
<tr>
<td>2. Approach and Methodology of the EIA Process</td>
</tr>
</tbody>
</table>
3. Legal Framework
4. Description of activity
   - Definition of activity, Proponent identification, justification, alternatives, associated projects (road access, gas pipeline, transmission line pipeline)
   - Activity description, location, requirements for resources use, Emissions to produce
5. Delimitation of the influence area of activity and characterization of the environmental situation.
6. Impact Identification and evaluation and mitigation measures
7. Analysis of business risks and contingency plans in the event of a serious accident.
8. Environmental Management Plan
9. Knowledge gaps
10. Conclusions
   - Annexes to the EIA

1.1 Proponent Details

ECOMOZ, U DA
Rua Tenente General Oswaldo Tazama no 169, 1º Andar
Tel: +258 (21) 486 086
Fax: +258 (21) 486 087
Caixa Postal n. º 4207
Maputo
2. APPROACH AND METHODOLOGY OF THE EIA PROCESS

In Mozambique, the Environmental Impact Evaluation (EIA) is legal requirement under the Environment Act (Law no 20/97). The EIA process is regulated by the Regulation on EIA Process (Decree n.º 45/2004, dated 29 September) that defines the process of environmental impact evaluation and public participation that occurs during the process. The public participation process is detailed in the Guidelines for the process of Public Participation under EIA (Decree no 130/2006).

This chapter outlines the approach to the EIA and the process followed. The approach of the EIA complies with the relevant Mozambican legal environmental requirements and evaluates the impacts associated with the construction and operation phases of the power station to natural gas of Ressano Garcia (Phase I).

The Environmental Impact Assessment (EIA) is a process that aims to support decision-making on environmental licensing of an activity. The EIA process includes two main early stages, prior to the Environmental Impact Assessment: the definition of the EIA level required (process instruction); and the definition of the scope of the EIA (Scoping).

The EIA Regulation (art. 3) determines the project classification during the Process Instruction between three categories, identifying the appropriate level of environmental assessment required. Annex 1 of the Regulation indicates that Category A includes projects such as Energy Industry (Section 4.7), namely "a) hydropower, thermal power Stations, geothermal and nuclear.

Thus, following the process instruction undertaken within the EIA Process, MICOA through the Provincial Directorate of Maputo (Maputo-DPCA), classified the project as Category A (letter with reference no. º 1503/GD / DGA.161/DPCAM/08 of June 12, 2008), presented in Annex II, requiring a full Environmental Impact Assessment (EIA), preceded by delivering a Pre-feasibility Study and Scoping (EPDA), and Terms of Reference (see Annex 1), approved by DNAIA.

**Figure 1:** Assessment and Environmental Impact Projects Process category A.

**Phase 1: Phase of the Environmental Pre-feasibility Study and Scoping (EPDA)**

The Purpose of the Scoping phase was to identify the potential impacts that the project may have on the environment, highlighting the most important to be addressed in greater detail during the EIA.

The activities undertaken during the Environment Project Definition Phase:

- Meeting with the Proponent to acquire information on the Project;
- Compilation and an analysis of the existing information on the Project area;
- Elaboration of a preliminary list of concerned and affected parties (PI&As);

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
- Meeting with key PI&As in Ressano Garcia;
- Preparation to departure from the field through the data consultation available and compiled maps;
- Departure from the field for site reconnaissance and more detailed identification on environmental and social limitation, potential environmental and social impacts and potential mitigation measures.

Public participation was very important at this stage because it allowed identification of expectations and public concerns to be taken into account in the EIA process.

During the EPDA were identified as key aspects to detail in the EIA aspects related to air quality, noise, effects on land use and public health and safety (risk of accident). While focusing on the aforementioned aspects, which were objects of specialized studies, characterization of baseline in the study area and the impact assessment also comprised other environmental aspects considered relevant.

Depending on the approved Terms of Reference (ToR), the Situation Description Reference provides qualitative and quantitative data collected from secondary sources or from field surveys and includes:

- Territorial demarcation, to face up the possibility of occurrence of conflict with future uses in specific event of Performance Plan of the urbanized village of Ressano Garcia;
- Air quality due to emission to atmosphere of gases resulting from the combustion natural gas (fuel to generate energy, through the Generating Units to be installed).

**Phase 2: Environmental Impact Assessment Report (EIAR) and Environmental Management Plan (EMP)**

Phase 3 involves the integration of information from specialized studies in the EIA and associated EMP, according to the requirements of the Regulation on the Environmental Impact Assessment Procedure, Decree no 45/2004.

This EIA provides recommendations on the mitigation of negative impacts and the strengthening of the positive aspects. Mitigation measures have been translated at the EPM in clear and practical measures to local conditions and are based on best practice electrification sector, as specified by national and other international regulations and parameters.

**2.1 Stakeholder and Affected Consultation and Disclosure of Information during the EIA.**
The Public Participation Process (PPP) is an ongoing process in the EIA process. It is intended that this process is transparent and participatory, enabling Stakeholders and Affected Parties (PI&As) the Project compensation and identification of their expectations and concerns.

This EIA process comprised two periods of public consultation during scoping on 15 April and 6 June 2008 and during the preparation of the Environmental Impact Assessment report on 29 July, 2008.

This last meeting has been widely advertised in the media – Noticias Newspaper – and through invitations to governmental institutions and other parties identified as potentially interested.

The Report of public participation to this EIA is attachment 3 of this report.

During the EIA phase was held a survey action of existing infrastructure. This survey was conducted on 17 October, 2009 and was attended by Rose Silva (Consultec), David Malauene (Consultec), Longuissa Mumbisse (Traditional leader), Castigo Carlos Zimba (Traditional Leader), Samuel Nhatave (FRELIMO) and Paul Jamisse (Secretary of Bairro 4 de Outubro).

To perform the survey traditional leaders previously warned to affected people to take part in the site so that they could identify the existing infrastructures. A total of 8 farms, one of which included a 6 bedroom house with kitchen, latrine and ox-stall all of them within the project area were identified. Surveys to all owners were conducted to clearly identify the prejudiced property owners and preferences about the possibilities of compensation. Further inquiry was carried out to the owner of the house for being a major infrastructure. At the end of the survey was explained to those affected that it was just business and that survey prior to the commencement of construction activities will again be contacted for agreement between the owners and the project Proponent on appropriate compensation for each case.

Site visit of the project was preceded by a meeting with the Leader of the Ressano Garcia, Daniel Magabule, who introduced the participants recalled the Ressano Garcia Growth Plan and presented its map and gave great importance concern as the need the existence of social programs under the project. After performing the field survey all members of the team returned to the headquarters to report the results to the Leader of the Ressano Garcia. All agreed on the need to continue a transparent process to benefit the customer and the community.

Surveys were signed by the concerned parties by the traditional leader and later the leader of Ressano Garcia. The minutes of the meeting and the guidelines for compensation for the concerned parties by the project can be seen in Annex 5 of this report.

3.4 **LEGAL FRAMEWORK**

3.1 **General Framework**
The Constitution of the Republic of Mozambique defines the right of all citizens to a balanced environment and the obligation to protect it. In addition to and request to the State (i) the promotion of initiatives to ensure the ecological balance and preservation of the environment, and (ii) the implementation of policies to prevent and control pollution and integrate environmental objectives into all public politics to assure citizens the right to live in a balanced environment under sustainable development (Article 117).

The National Environment Policy, approved by Resolution No. 5/95 of 6 December 1995, establishes the foundation for all environmental legislation. In accordance with Article 2.1, the main objective of this policy is to ensure sustainable development in order to maintain an acceptable commitment between socioeconomic development and environmental protection. To achieve this goal this policy is to ensure, among others, the management of natural resources – and the environment in general – to be preserved and its functional capacity for present and future generations.

In general, the environment policy aims to ensure sustainable development in order to maintain an acceptable commitment between socioeconomic development and environmental protection.

In 1997 was approved the Environmental Act (Act No. 20/97, 1 October) in order to define the legal basis for the use and management of the environment, to ensure sustainable development of the country. This Act is applicable to all public and private activities that may directly or indirectly affect the environment.

Some relevant principles of environmental management contained in the National Environment Policy and the Environment Act include:

- Environmental management should aim at improving the life quality of citizens and the protection of biodiversity and ecosystems;
- Acknowledge and valuation of traditions and knowledge of the local community;
- The priority to preventive systems against degradation of the environment;
- A comprehensive and integrated view of the environment;
- The significance of public participation;
- The polluter principle - payer;
- The significance of international cooperation.

Article 9 of this law prohibits the production and deposit of any toxic substances or pollutants in the soil and subsoil, the release into water or atmosphere, of any toxic and polluting substances, as well as the practice of activities that accelerate erosion, desertification, deforestation or any other form of degradation of the environment outside legally established limits.

3. Activities framework for power generation and transmission

---

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
According to Article 98.1 of the Constitution of the Republic of Mozambique, 2004, the natural resources located in the territory of Mozambique are the exclusive property of the Republic of Mozambique. Pursuant to Article 102 of the same paper, the State promotes the evaluation of its natural resources and determines their use and operating conditions in accordance with the interests of the country.

The Oil Act determines the legal requirements for operations in the oil sector, defined as the operations related to the research, development, production, separation and treatment, storage, transportation and sales and delivery of petroleum products at an agreed point of supply, this includes natural gas processing operations and decommissioning of all operations.

The Ministry of Energy of Mozambique and the Regulatory Authority for Energy sector, are responsible for licensing activities in the sector.

Mozambique belongs to the Southern Africa Development Community (SADC –Southern African Development Community) and is part of the Energy Group of the Southern African Power Pool (SAPP –Southern African Power Pool), which aims to meet the energy needs of its member countries, ensuring that their production is based on renewable natural resources without unsustainable effects to the environment.

A series of Guidelines for the Energy sector was produced for members’ countries of the SAPP, by the Energy Sector Technical and Administrative Unit of the Environmental Management Commission. These guidelines are principles guiding the appropriate adoption of environmental policies into development projects, transparency of licensing procedures, the equitable distribution of energy by the population and fight against poverty.

At local level, the Law No. 21/97 regulates the activities of generation, transmission, distribution and supply of electric power. Decree No. 42/2005 establishes the standards for planning, construction, maintenance and operation of the distribution lines of electric power.

The public company responsible for distribution of electricity in the country, Electricidade de Moçambique, EP, and has its own specific guidelines for dealers to transport. Its T-S-03-001 Guide, applicable to general technical requirements, establishes quality standards for machinery, equipment and workers in the design and construction phases of Power Transmission Lines (LTE), higher voltage q 110hV. The T-S-11-001 Guide contains various environmental mitigation measures to be taken during the construction phases.

Issue of permits for the establishment. Operation and management of power stations do not invalidate the need for obtaining other permits required by law.

3.3 Environmental Impact Assessment
According to the Environment Act, the Environmental Impact Assessment is a tool which supports the Government of Mozambique in decision making and allocation of the environmental license for the project development. The environmental license must precede any other legal license required.

The responsible authority for the environmental licensing of various activities is the Ministry for Coordination of Environmental Action (MICOA), through the National Directorate of Environmental Impact Assessment (DNAIA).

The Environmental Impact Assessment Process is regulated by Decree No. 45/2004, while the Environmental Authority and the Environmental Inspection are respectively regulated by Decrees No. 32/2003 and 11/2006.

The Regulation on EIA Process (Decree No. 45/2004, of 29 September) sets the EIA process, defining the level of environmental assessment required for each category of the project, the content of the environmental studies, the review process and environmental licensing. This Regulation is complemented by General Directive of the Environmental Impact Assessment detailing the contents of the EIAs and the General Directive to the process of public participation in the EIA process.

Public participation is a mandatory activity for all projects classified as Category A, i.e. requiring a full environmental study. Article 14 of the Regulation on the EIA Procedures defines the public participation process as an activity that should include public hearings and consultations. This process involves provision of information on the project to all stakeholders and affected parties directly or indirectly, by an activity, the request for public awareness and training solutions. The Regulation on the EIA Procedure expects the publication by the MICOA of specific directives on the Public Participation process, which has not occurred to date.

Article 12 of that Regulation confirms that the Project Proponent is solely responsible for the EIA process and should contain at least the following components:

- EIA Non Technical Summary. With the main questions addressed, conclusions and proposals;
- The activity legal framework and its integration in the existing land use plans for the direct influence area of the activity;
- Activities description and the different actions therein in planning, construction, exploration stages and (if applicable), temporary activity for its deactivation;
- Geographic delimitation and representation, as well as the situation of the environmental reference of activity influence area;
- Description and confrontation of different alternatives and the foresight of future environmental situation, with and without mitigation measures;
- Identification and evaluation of impacts and identification of mitigation measures;
• Environmental Management Plan for the activity, which includes impact monitoring, environmental educational program and accident contingency plans;
• Identification of the multidisciplinary team that prepared the EIA;
• Public participation report in accordance with the provisions of paragraph 9 of Article 14.

The Regulation on Environmental Audit Process defines environmental auditing as a management tool and documented in a systematic and objective analysis to operate and organize the management and documentation control system, as well as environmental protection. The objective of environmental authorship is to analyze the performance of operational processes in accordance with the approved Environmental Management Plan and the environmental legal provisions.

Because of the need to establish legal mechanisms for the inspection of public and private activities that may directly or indirectly originate negative impacts on the environment, was recently created the Regulation on Environmental inspections (Decree No. 11/2006, of 15 July), with the aim of regulating the supervising, control, and inspecting activity of compliance with environmental protection standards at national level.

3.3 Other Environment Legal Findings

Atmospheric emissions and air quality
The law provides for the establishment of environmental standards through regulation (Article 10), which came about through the Decree No. 18/04 of 2 June – Regulated on Environmental Quality and Effluent Emission Standards (Decree No. 18/2004, 15 September) that sets the standards for emission of pollutants for Stationary sources and levels. This Regulation establishes the basic parameters that should characterize air quality.

For mobile sources, the Regulation sets maximum emission limits for different categories and vehicles, assuming certain fuel consumption, as shown in Annex II of this diploma (Table 3) table.

Table 1; maximum limits for air pollutants emissions allowed to mobile sources or motor vehicles.

<table>
<thead>
<tr>
<th>Type of vehicle</th>
<th>Assumed Saving (Km / litre)</th>
<th>Fuel</th>
<th>CO2</th>
<th>NOx</th>
<th>SQOVNM</th>
<th>CO</th>
<th>N2O</th>
<th>Particles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passengers’ vehicles</td>
<td>5.1</td>
<td>3,188</td>
<td>6.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vans diesel</td>
<td>4.3</td>
<td>3,188</td>
<td>7.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy Trucks diesel</td>
<td>2.2</td>
<td>3,188</td>
<td>42.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycles</td>
<td>12.8</td>
<td>3,188</td>
<td>32.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SQOVNM – non-volatile organic chemical methyl
Table 3 represents the air quality standards stipulated by Decree No. 18/2004, considered necessary in order to maintain the capacity for self-purification of air and does not occur significant negative impact on public health and ecological balance.

### Table 2: Standards for Air Quality

<table>
<thead>
<tr>
<th>Parameter (yg/m³)</th>
<th>Sample timeframe</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hour 1</td>
<td>Hour 8</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>Second</td>
</tr>
<tr>
<td>SO₂</td>
<td>800</td>
<td>-</td>
</tr>
<tr>
<td>NO₂</td>
<td>400</td>
<td>-</td>
</tr>
<tr>
<td>CO</td>
<td>40,000</td>
<td>-</td>
</tr>
<tr>
<td>O₃</td>
<td>160</td>
<td>-</td>
</tr>
<tr>
<td>PST</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pb</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

**Water resources and water quality**

GeStation of water resources in Mozambique is defined by the National Water Policy and by the Water Act (Act No. 16/91 of 31 August, 1991).

Article 54 of the Water Act provides for the establishment of quality standards for effluent, the receiving water bodies, technological systems and methods for water treatment, contaminating activities may be suspended until such measures are implemented. This also is in the Environment Act.

Decree No. 18/04 of 2 June ratifies the Regulations on Environmental Quality and Effluent Emission. This Regulation aims to ensure the control and effective monitoring of the environment and indicates parameters for the maintenance of water quality, as well as parameters emissions and industrial and domestic effluents.

The parameters for the quality of human consumption and water supply are set out in the Regulations for Water Quality for Human Consumption Diploma No. 180/2004 of 15 September. This Regulation shall apply to the distribution of drinking water for human consumption, including surface water and groundwater lines used for direct consumption or used to produce water for human consumption. The Ministry of Health is responsible for monitoring the quality of drinking water for human consumption.

### Table 3: Parameters of water quality for human consumption provided by public water sources, untreated

#### 4a-Microbiological parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Maximum levels</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coliformes Totais</td>
<td>NM*/100ml No. De Colonias/100ml</td>
<td></td>
</tr>
<tr>
<td>Coliformes Fecais</td>
<td>0-10</td>
<td>NMP*/100 No. de Colonias/100ml</td>
</tr>
<tr>
<td>Vibrio cholerae</td>
<td>Ausentes</td>
<td>1000ml</td>
</tr>
</tbody>
</table>
* (NMP): most likely number

### 4b-Organic and Physical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum levels</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>15</td>
<td>TCU</td>
</tr>
<tr>
<td>Odour</td>
<td>Inodorous</td>
<td></td>
</tr>
<tr>
<td>Conductivity</td>
<td>50-2000</td>
<td>Yhmo/cm</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-8.5</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>Tasteless</td>
<td></td>
</tr>
<tr>
<td>Total solids</td>
<td>1000</td>
<td>mg/I</td>
</tr>
<tr>
<td>Perturbations</td>
<td>5</td>
<td>NTU</td>
</tr>
</tbody>
</table>

### 4c-Chemical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum levels</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>1.5</td>
<td>mg/I</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.01</td>
<td>mg/I</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.005</td>
<td>mg/I</td>
</tr>
<tr>
<td>Barium</td>
<td>0.7</td>
<td>mg/I</td>
</tr>
<tr>
<td>Boron</td>
<td>0.3</td>
<td>mg/I</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.005</td>
<td>mg/I</td>
</tr>
<tr>
<td>Calcium</td>
<td>50</td>
<td>mg/I</td>
</tr>
<tr>
<td>Lead</td>
<td>0.01</td>
<td>mg/I</td>
</tr>
<tr>
<td>Cyanide</td>
<td>0.07</td>
<td>mg/I</td>
</tr>
<tr>
<td>Chlorates</td>
<td>250</td>
<td>mg/I</td>
</tr>
<tr>
<td>Copper</td>
<td>1.0</td>
<td>mg/I</td>
</tr>
<tr>
<td>Chromo</td>
<td>0.05</td>
<td>mg/I</td>
</tr>
<tr>
<td>Total hardness</td>
<td>500</td>
<td>mg/I</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.1</td>
<td>mg/I</td>
</tr>
<tr>
<td>Total iron</td>
<td>0.3</td>
<td>mg/I</td>
</tr>
<tr>
<td>Fluoride</td>
<td>1.5</td>
<td>mg/I</td>
</tr>
<tr>
<td>Organic material</td>
<td>2.5</td>
<td>mg/I</td>
</tr>
<tr>
<td>Magnesium</td>
<td>50</td>
<td>mg/I</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.1</td>
<td>mg/I</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.001</td>
<td>mg/I</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.07</td>
<td>mg/I</td>
</tr>
<tr>
<td>Nitrites</td>
<td>3.0</td>
<td>mg/I</td>
</tr>
<tr>
<td>Nitrates</td>
<td>50</td>
<td>mg/I</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.02</td>
<td>mg/I</td>
</tr>
<tr>
<td>Sodium</td>
<td>200</td>
<td>mg/I</td>
</tr>
<tr>
<td>Sulfates</td>
<td>250</td>
<td>mg/I</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.01</td>
<td>mg/I</td>
</tr>
<tr>
<td>Total solids</td>
<td>1000</td>
<td>mg/I</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.0</td>
<td>mg/I</td>
</tr>
<tr>
<td>Total pesticide</td>
<td>0.0005</td>
<td>mg/I</td>
</tr>
</tbody>
</table>
**Waste Management**

As mentioned earlier, the Environment Act prohibits the deposit of pollutants in soil or subsoil, and with its release into the atmosphere or into bodies of water above the established limits. In addition, the Water Act prohibits accumulation of solid waste, rubbish or any substance that contaminates or generates danger of contamination of water (Article 53).

The **Decree No. 13/2006**, of 15 June sets the legal framework for waste in Mozambique, as provided in Article 33 of the Environment Act and No. 1 of Article 204 of the Constitution of Mozambique. The purpose of this regulation is to establish rules concerning the production and deposit the soil and subsoil, the release to water or atmosphere, of any toxic and polluting substances, as well as the practice of polluting activities and its negative impacts on health and the environment.

**Noise emissions and sound environment**

The **National Land Policy** (Resolution of the Council of Ministers no. 10/95) provides that the State shall provide the land for each family to build or own a home, and is responsible for land use planning and tax authorities, although plans can be made by the private sector.

The Land Law no. 19/1997 provides the foundation that defines the rights of land use, including details on customary rights and procedures for the acquisition of securities of use and enjoyment of land by communities and individuals.

The Regulation of the Land Law (Decree 66/98) states that for the construction of public infrastructure such as transmission lines airborne or underwater energy involves the automatic creation of a partial protection zone (servitude) of 50m. The land use in this area and its benefits can only be obtained by purchasing a special license.

**Cultural Heritage**

The Law of cultural heritage (Law n. 10/88) was formulated to legally protect the tangible and intangible assets of the Mozambican cultural heritage. For the purposes of the Cultural Heritage Act is defined as "a set of tangible and intangible assets created or integrated by the Mozambican people along history, with relevance to the definition of Mozambican cultural identity".

The immovable cultural assets include: monuments, group of buildings of historical, artistic or scientific importance, places or sites (sites of archaeological, historical, aesthetic, ethnological or anthropological) and natural elements (physical and biological formations with particular interest from the point of view aesthetic or scientific).

**Biodiversity and Conservation Protection Areas**

The Land Law (Law no. 19/97) classifies the land in the public domain as protection zones total and partial. Pursuant to this law Art. 7, the total protection zones are designated as those reserved for nature conservation activity, and defense and national security. These include total
protection zones (Art.8) nature conservation areas, while partial protection zones include the bed of inland waters.

Article 10 of the Wildlife Forest Act, ratified by Law No 10/99 of 9 July, defines protection zones delimited territorial areas as representative of the national natural heritage, for the conservation of biodiversity and fragile ecosystems or animal species or vegetables. For species conservation Regulation of the Law of Forestry and Wildlife (Decree no. 12/2002) contains a list of protected species of animals which hunting is prohibited.

4.3 PROJECT DESCRIPTION

In this chapter shall be a detailed project description

4.1 Activity definition, Proponent identification, justification, alternative, associated projects.

4.1.1 Activity definition and Proponent identification

The activity consists of construction and operation of the Power Station Natural Gas in Ressano Garcia, designated in this draft as EIS.

The Proponent is a Mozambican company ECOMOZ. Ltd, with its head-office in Maputo.

4.1.2 Justification of the Project

The production capacity of energy in Southern Africa has reached a stage that can no longer meet demand, aspects that have been causing serious impacts in economic terms, throughout the region. The construction of large power systems to cope with this problem will take at least five years. In this context, it has to be found timely solutions to meet immediate demand.

The proposed project’s main objective is precisely to produce energy from natural gas and transports it to the regional network of the Energy Group of the Southern African Power Pool (SAPP - Southern African Power Pool), by injecting into the currently existing network between Komatipoort substation and Corumana substation.

As a secondary objective the injection energy of the 110kV line between the Komatipoort substation and Corumana substation in Mozambique, will reduce losses in this line. This line, although it is not used for technical reasons to balance the network needs to remain energized as it can be called any time to replace connections between South Africa and Mozambique to 275kV. Energizing 110kV line is currently losing 2.1 MWh per day. The introduction of this line will reduce energy losses, significantly benefiting the Electricidade de Moçambique, EP (EDM).
Gas processing for power production of the Mozambican borders will bring socio-economic benefits for the development of the surroundings of the project instationation site and economic benefits for the country.

This project will be the first major industrial enterprise in Ressano Garcia and given the strategic location of the border, it is believed that will boost and attract other industrial and commercial investments.

The social benefits of the project include the employment generation opportunities for the local population and the multiple effects on the activities of the local economy, which may contribute for improvement of life quality. The macroeconomic benefits for the country's economy consist of the value added within the national borders to the natural gas that is currently exported to South Africa, by significant reduction of energy losses in the 110kV line Komaitpoort-Corumana, supported by EDM besides the taxes that the project should pay to the Government of Mozambique for exporting electricity.

The project also includes construction of sanitary landfill with appropriate infra-structure for waste disposal under the social program for the Ressano Garcia village. This sanitary landfill will be managed by the Ressano Garcia local Administration and intends to reduce the disorganized waste disposal that currently occurs.

4. **Associate Projects**

There are associate projects as follow:

- Gas supply branch-line to the Station from the MGC pipeline;
- New 110kV air transmission line, which will ensure the connection of the energy produced in the current Station to the network between the existing Corumana substation and South Africa;
- Access road to the Station instationation site.

4.2 **Location and activity description**

4.2.1 **Project Location**

The power production Station concerned shall be located in the surroundings of the border town of Ressano Garcia, which location is considered ideal for the purpose of establishing a station for the production of natural gas energy for the following reasons:

- Near of the 110kV line (about 600m away);
- Near of the gas supply source through Pipeline of MATOLA GAS COMPANY (MGC) which constitutes a branch-line of the main pipeline, Sasol, which supplies gas to Matola and Maputo, the existence on site of a Pressure Reduction Station (PRS1 - Pressure Reduction Station);
- Near the border, reducing transmission costs;
- Ease of access, near to the national highway 4 (Maputo - Ressano Garcia) and the possibility of partial advantage of access to the pressure reduction Station (PRS1) of the MGC gas pipeline;
- If necessary in a future phase of expansion, near of main pipeline, Sasol, between Temane (Mozambique) and Secunda (South Africa) and the 275kV power line.

In the event of a future pipeline connecting to Sasol pipeline, this area is located roughly half way through the Temane - Secunda pipeline, about 930 km long, which means that, technically, it is advantageous to place a supply branch-line of the Station, for reasons connected with the pressure gradients that occur along major pipelines.

The proximity infrastructure referred, gas, electricity and road, avoiding the construction of new infrastructure. The lines referred to above, of 110 kV (Komatipoort-Corumana) and 275kV (Komatipoort-Infulene), are two of the most important interconnection networks of power transmission between Mozambique and South Africa.

**Figure 2: Location proposed for Station instationation**

Finally the proposed site for the location of Station is located only about 220m above sea level, which reduces the potential minimum interference in the efficiency of gas turbines, which is negatively affected by high altitudes.

In this context, there was identified and reserved for industrial use (for the project implementation) by the Provincial Government, an area of 30 ha, located near the Ressano Garcia village.

### 4.2.2 Project description

The Project consists of the construction of a Natural Gas Power Station which will occupy an area of approximately 5 ha. This area is located between the existing pipelines: a Sasol pipeline from South and the source of the MGC (see Figure 1). The distance to any of the two pipelines respects a safety distance of 200m.

The Center will consist of a set of 54 power generators (which engines are fueled by natural gas), each of which with a capacity of 1.1MW. It is assumed that the 54 generators worked simultaneously and the remaining 4 can be for maintenance. The total production capacity of the Station will be 50 MW.

**Figure 3: identical power Station to be installed**

The Units to be installed shall have a 11.0GJ consumption of natural gas per MWh of power supplied to the network.

Generating Units are identical to petrol or diesel engines used in cars or trucks ("internal combustion engine", using pistons to convert pressure into rotary motion), naturally larger, more engines designed to run on gas natural fuel.
The energy produced in the generating units will be sent to 11/110kV transformers, which will occupy an area of approximately 0.5 ha. This area will be fenced and waterproofed and septic tank for retention of oils will be built in the area of transformers, which will allow coping with any spills.

**Figure 4**: Drawing of the Power Station to be Built (50MW).

The supply of natural gas to Station will be made from the MGC pipeline, immediately outside the Pressure Reduction Station (PRS1). For that, an underground branch-line will be built (buried at least 1m deep) from this point until the new High Pressure Meter (High Pressure Customer Metering Station HPCMS-1).

This branch-line will be about 900 meters length and 6" diameter and is constructed with appropriate pipe (gas pipe, high pressure and corrosion protection) being dimensioned to allow future expansion. It will be built parallel to the existing MGC pipeline, and also being expected the new access road to be built between the two Stations (see Figure 5).

**Figure 5**: branch-line supplying gas to the production.

The HPMS1 is a Pressure Reducing Station, which aims to reduce the pressure at which gas is transported through the new branch-lines (43 bar) until the proper pressure to the Generating Units (6 bar). It will occupy an area of 10m x 6m and there will be installed a zone of restricted access.

The Station includes about 0.65 ha for the installation of infrastructure support in the form of *containers* suitable for the installation of administrative areas, warehouses and health facilities. This includes the construction of a water treatment basin draining from the Station.

Connection to networks of power from Station will be ensured by building a new transmission line of 110 kV with about 600m long, which will connect the existing transmission lines between Corumana and Komatipoort.

There will be constructed an access road to the site of the Station, the route of the road is between 4 de Outubro Secondary School and the Power Station with about 1400m in relatively flat terrain.

**Figure 6**: Path of the access road (green), the project area (red), gas supply branch-line (blue) and their topographical supply lines.

For the implementation of the Station there have been provided 120 construction workers (20% of skilled labor) and 30 workers for the electrical system (of which should only be foreigners) the construction process will run for three months and a half. During the operation the Station will have a team of 15 Mozambican workers (semi-skilled and unskilled), who will receive appropriate training in order to assist the supplier in the above tasks.

### 4.3 Requirements for the use of resources
In addition to natural gas, there is a reduced use of natural resources and materials.

During the construction phase there will be needed a reduced amounts of inert for road access. The equipment to be installed (including the branch-lines of the pipeline and air transmission line) will, in general, be imported.

During the operation stage, the only relevant consumption - beyond the natural gas itself - will be of lubricating oils.

4.4. Emissions to produce

4.4.1 Construction Phase.

Emissions from wastewater during its instruction phase will be void or irrelevant. The yard should be provided with regular removable replaced toilets and removed at the end of the work.

Air emissions include emissions from construction vehicles and equipment (primarily NOx and COVs), as well as dust motivated by work and movement of vehicles and machinery on unpaved areas and the shipping and handling of inert.

Construction activities will result in the emission of noise, some of which with impulsive characteristics.

4.4.2 Operation Phase

There will be no production of wastewater except toilet facilities connected to a septic tank. The waters from pluvial drainage will be subject to treatment in basin built for such purpose.

The main emissions for the environment are related to noise production and air emissions (NOx and CO), treated in sub-chapters 6.7 and 6.8 respectively.

4.5 Alternatives

Technological alternatives were initially considered for energy production, as well as alternatives related to depletion of atmospheric emissions of Generating Unit.

Two other alternatives were considered for the construction of access road to the Station. The first (alternative I) consists only of the asphalting of the existing access road to Pressure Reduction Station (PRS1) MGC gas pipeline (about 800m in hilly terrain) and construction of a road between PRS1 and Power Station (about 200m on mostly flat terrain). The second
(alternative II) is to build a road between the 4 de Outubro Secondary School and Power Station and approximately 1400m in relatively flat terrain.

The second alternative has been selected. During the construction phase, the selection of Alternative II seems to have major adverse effects among different parameters; however, the impacts will be compensated by the benefits that option offers during the operation phase.

After selection of the alternatives considered most appropriate, considering to minimize negative impacts, the project is presented in its final configuration without alternatives.

5. DESCRIPTION OF THE SITUATION OF REFERENCE

This chapter presents a brief description of the existing biophysical and socioeconomic environment, which may be affected by the project.

5.1 Climate

The climatic characterization is based on research carried out in studies of territories including the study area, including the Phase 2 reports of the Joint Incomati Basin Study (CONSULTEC / BKS ACRES, 2001) and the Profile of Moamba District, Maputo Province.

The Ressano Garcia Power Station project is part of the South of Mozambique at about 80Km from the Indian Ocean Coast, in a region where the climate is dry tropical type.

The average annual temperature is between 23 and 24° C. The highest values occur in January and lower in July.

In the south of Mozambique the quantitative average annual precipitation increases from the interior to the coast. In the Ressano Garcia pluviometric Station, the average annual precipitation (period 1957-1983) is 581mm (CONSULTEC / BKS ACRES 2001: Appendix 1). Precipitation has an impact especially from December to February.

There are therefore two different seasons: a hot wet season is from October to March and other fresh and driest season from April to September.

According to the Koppen classification, Ressano Garcia area has BSW climate, meaning dry steppe tropical climate with dry winters.

The prevailing winds are generally mild, occurring with a frequency of wind speed less than 12 km/hour around 80%. Note that, when approaching to the coast, the wind speeds tend to be higher.

5.2 Geology, Geotechnical and Geomorphology
The characterization of Geology and Relief relies on research studies conducted in territories including the study area, namely Phase 2 of the Joint Incomati Basin Study (CONSULTEC / BKS ACRES, 2001) and profile of Moamba District of Maputo province.

The study area belongs to the super large complex geological structure of the Karoo, which in morphological terms corresponds essentially to a vast plateau that extends mainly in the territory of South Africa.

In the context of the Karoo, the area belongs to the sequence of volcanic rocks designated series Stomberg.

This series corresponds to a relative narrow range, approximately north - south direction, which extends along the border of Mozambique with South Africa.

The rocks that make up this volcanic series are mainly rhyolites, basalts and volcanic tuffs.

The central part of the range considered, where is develops the boundary line corresponds to outcrops of rhyolites and ignimbrites formed in the Jurassic between 140 and 190 million years ago. This is geological substratum of the area surrounding Ressano Garcia and, more specifically, the area of project implementation and related infrastructure.

In the implementation area there is no anywhere/training with particular geological interest.

Based on probabilistic studies conducted by the Department of Mineral and Energy Affairs of South Africa, it may be noted that the region under study presents a seismic intensity of Grade IV on the Mercalli scale modified for a non-exceeding probability of 10% over 50 years.

For the above and the existing knowledge on the seismic behavior of the region, it is considered that the region has relatively low to moderate seismicity.

In geomorphologic terms the project is developed in a region of the Lebombo mountain chain that is associated in lithologic terms, the outcrops of rhyolites, more resistant to erosion.

This chain with general north-south orientation follows the boundary line also extending the territory of South Africa and Swaziland.

At a local level, the project is implemented in a relatively inter-fluvial flat area, with a slight bias towards the north, at about 220m altitude. The area lies at the top of tributary stream at the right bank of the Incomati River, located about 2km to the north.

To the north and northeast, the coast rundown towards the Incomati river valley, whose bottom is about 100 quota.
Approximately 600m to the southwest there is the elevation where the chapel of Our Lady of the Assumption is located, where it reaches a quota of about 280m.

Further south the relief elevate, reaching higher elevations which also happens north of the Incomati river valley. These most rugged and elevated areas are part of the Lebombo chain that is cut through the valley of that river in its entry into Mozambique.

5.3 Soils

Soil characterization is based on research carried out in studies on territories including the study area, namely the phase 2 reports of the Joint Incomati Basin Study (CONSULTEC / BKS ACRES, 2001), the Profile of the Moamba District, Maputo Province and the Development Plan for Water Resources of the Incomati River Basin - Plan for Development of Water Resources of the Incomati River Basin-PDRHBRI (SWECO, CONSULTEC, IMPACT, BKS ACRES, 2003).

Soils are brownish incipient soils derived from rhyolite substrate. We present thin and skeletal being characteristic of areas of low rainfall.

This is rhyolite lithosols or surface waste soils undistinguished. Include coarse sand and sometimes stones.

These are subject to considerable risk of erosion, especially in areas of steep slopes, which are also on rocky outcrops. This, however, does not occur in the intervention area.

These soils have high infiltration capacity and low water retention capacity. The infiltration capacity is determined by the geology of the underlying rock (SWECO, CONSULTEC, IMPACT, BKS ACRES, 2003). As stated these are dry soils.

The presence of small thickness and stones are the main limitations to its use. Soils are no vocation for agricultural use, being particularly suitable for forestry use.

5.4 Water Resource

Here is a brief characterization of the surface and underground water resources of the territory which includes the study area.

The characterization relies on the consultations of available studies, including Phase 2 reports of the Joint Incomati Basin Study (CONSULTEC / BKS ACRES, 2001), PDRHBRI (SWECO, CONSULTEC, IMPACT, BKS ACRES, 2003) and the website ARA Sul – Administração Regional de Águas do Sul.

5.4.1 Surface Waters
The project falls within the hydrographic basin of Incomati River. This river, the upstream called Komati, rises in the South African province of Mpumalanga and flows into the Indian Ocean in the north of Maputo, after 480 km of extension that runs through the territory of South Africa, Swaziland and Mozambique.

The Incomati Basin has an area of 46200 km², of which only 32% is located in Mozambique.

The project is located about 2km south of the right bank of the Incomati River, near the location where the river leaves the territory of South Africa and enters Mozambique.

After the border upstream even in South Africa, lies the confluence of the Komati and Crocodile river, and from that point the river is so called Incomati. According to information reported in PDRHBRI (SWECO, CONSULTEC, IMPACT, BKS ACRES, 2003), the average annual runoff observed in the Ressano Garcia Hydrometric Station, corresponds to the period 1953-98, and 1748 M m³.

This section is a little over 2 miles from the project site and drained area to the mountain is 21,544 km².

Minimum flow generally occurs in September/October, but reduced flows between May and November may also occur.

Note that, currently, the average flow in the Incomati River, entry into Mozambique, is considerably reduced compared to what would happen naturally due the intensive upstream in South Africa and Swaziland. Negotiations between the governments of these two countries and Mozambique allowed setting a minimum rate of 2 m³/s in Ressano Garcia.

Regarding the floods in recent years, should be highlighted in Ressano Garcia, the registration of a maximum flow of 11,000 m³/s in the floods of February/March 2000. Subsequently the maximum flow recorded was 5300 m³.

In Ressano Garcia the embedded character of the valley contributes to the occurrence of full episode does not associate to the phenomena of flood banks, which can become very relevant expression but downstream.

At the local level, the project is implemented in an inter-fluvial area along the two headlands indented but a small right bank tributary of the Incomanti river. This is a line of torrential water with about 2.1 km long which drains a basin of about of 2 km³.

The beginning of the access road, where converges the road linking Ressano Garcia to Maputo, is close to another tributary water line of Incomanti river, however, it is not interfered.

Regarding the likely trend in the absence of the project, we must highlight the planned construction Moamba dam in Incomanti River, about 20 kms southeast of Ressano Garcia. The
upstream of backwater of this future dam is located near the confluence of the water line that rises at the project site, lying about 100 quota.

In Ressano Garcia waters from the Incomati River are used for human consumption.

5.4.2 Groundwater

According to information stated in PDRHBRI (SWECO, CONSULTEC, IMPACT, BKS, ACRES, 2003), the geological formation of rhyolites, which is geological substratum in the implementation area associated aquiferous in Group C - area with local aquiferous of limited productivity or air without significant groundwater resources (intergranular or fissured). According to the same plan, the potential level of groundwater extraction from the short-term in the area corresponds to a flow rate less than 1 cubic meter per hour. Regarding to the reload, this is estimated to be between 15-30 mm/year. Combination of these aspects is concluded that the availability of groundwater in the area where the project is integrated is reduced.

5.4.3 Water Quality

In this section we present a brief characterization of surface and groundwater resources quality.

Actions likely to cause impacts on water quality are temporally restricted to the construction phase and spatially involving next to the Ressano Garcia Power Station, no impacts are expected during the operation phase if measures to prevent the discharge of effluents into the water are adopted. The characterization of the environmental situation was, therefore, oriented to serve as a reference for local possible impacts to occur during the construction phase and included a water need survey and pollution sources and a brief characterization of the current water quality.

The population of the study area, including Ressano Garcia, is supplied from a surface water captation in the Incomati River, located near the village, upstream area of the project.

According to PDRHBRI (SWECO / CONSULTEC / IMPACT / BKS ACRES, 2003), there are no development plans for the region or any indication about new water needs. The national water plan set a target of 40% of people served by drinking water supply in 2000, taking a more recent study in which a target of 65% of the population to be served in 2025 was adopted.

Other water needs identified is irrigation. Most of the water needs for irrigation in the Incomati River basin is from the regions downstream of the study area and outside of its influence particularly Manhiça.

Regarding pollution sources and according to PDRHBRI, the main pollutant sources are outside the study area, particularly in Manhica and Xinavene.
Concerning the current status of surface water quality the measurements available in PDRHBRI presented shows that no checks for significant pollution. The electrical conductivity is slightly above the limit of guidelines for water quality in domestic use, i.e. Incomati river water can be classified as insignificant or of low risk.

Groundwater has a good quality in Ressano Garcia region, with values of total dissolved solids (STD) below 500 mg/l, may be used for public supply.

5.5 Biotic Environment

The characterization of ecological aspects in the project area was based on a field visit conducted in April 2008, mapping analysis and consultation of available studies, including the PDRHBRI (SWECO / CONSULTEC / IMPACT / BKS ACRES, 2004) Final report, the Joint Incomati Basin Study, Phase 2 (CONSULTEC / IMPACT / BKS ACRES, 2001) and the Environmental Impact Assessment of the Sasol Natural Gas Project, between Mozambique and South Africa (IMPACT / Mark, Wood, Consultants 2001).

The project area is located about 3 km south of the Border conservation area of the great Limpopo, sharing between the republic of Mozambique and republic South Africa. This area includes the Limpopo National Park (Mozambique component) and Kruger National Park, Republic of South Africa.

The current vegetation, resulting from existing environmental conditions (soil from Basaltic, dry tropical climate), is the type of acacia treed savannah. This type of vegetation consists of grasslands with scattered trees and shrubs (Figure 7). The herbaceous layer dominated by this *Themeda triandra* and *Turbine oblongata*. In shrub and tree layers are common species *Acacia nigrescens*, *Boscia*, *albitruca*, *capassa Lonchocarpus*, *beardless Combretum*, *Ziziphus mucronata* and *Sclerocarya caffra*.

Various anthropogenic activities (armed conflict, hunting, agriculture, wildfires, construction of various infrastructures) have caused changes in vegetation, landscape and hence fauna of Ressano Garcia region.

**Figure 7: Characteristic Flora of the study area**

The vegetation described for the study area is well represented in the region, remaining homogeneous in a wide range.

No stations with unfavorable conservation status in the study area (according to Hatton classification, 1997).

Regarding the mammal’s fauna it is important to note that the large and medium-sized animals communities are very impoverished, currently being this fauna mainly composed by bats, small and medium-sized herbivores, rodents and small carnivores. In the dry season can be seen in
the area some large animals that migrate from the nearby nature reserves searching for food. These episodes usually occur from July to October but are of low frequency.

It is possible, taking into account its distribution and ecology, the presence in the study area if the following mammalian species with unfavorable conservation status, according to the Red Book of the Mammals of South Africa (Smithers, 1986): pangolin (Manis teminckii); Ratel (Mellivora capensis); Doninho-de-nuca-branca (albinucha Poecilogale) and Raficero de Sharpe (Raphicerus Sharpei). The Pangolin has Vulnerable conservation status (the rate that applied, probably the bird category "Endangered" if the threat factors continue to act), and the remaining species of "Rare" status (rate with small populations that are not at present endangered or vulnerable but are at risk).

Regarding the birds it is important to mention the possible presence in the study area of the following species with unfavorable conservation status, according to Brooke (1984): Águia-sem-rabo (Terathopius-ecaudatos); Abib-the-Senegal (Vanellus lugubris); Perdiz-do-mar (Glareola pratincola), Cegonha-branca (Cinconia cinconia) and Cegonha-Episcopal (Ciconia episocopus). All these species are rare status.

Finally, with regard to reptiles these have been identified by the local community three species the Mamba negra (Dendroaspis polyplepis), Jibóia (Boa constrictor) and spitting (Naja Moçambique). These species only Jibóia is protected by Mozambican legislation (Wildlife Act 12/2002).

It is not expected the presence of amphibian species with significant conservation value in the study area.

5.6 Sound Environment

Currently there is no national legislation defining the criteria for identification of noise sensitive receptors and sound sources responsible for the degradation of the sound environment.

There also no national legislation establishing a system of prevention and control of sound pollution in order to safeguard human health and well-being of populations.

Decree No. 18/2004, of 2 June states in Article 20 that the Ministry for Coordination of Environmental Action (MICOA) shall, by ministerial diploma establish the standards of noise, which to date has not yet occurred.

Given this absence of legislation, it was decided to follow the Environmental Noise Guidelines of the World Health Organization (WHO, 1999). This document is presented the basic concepts of environmental noise, the basic for performing acoustical measurements and maximum limits together with different environments with human activity aspects.
The indicator parameter of the noise level is \( L_{\text{Aeq}} \) - the continuous sound level equivalent, weighted A, in decibel [dB (A)], determined in a time interval. The limits set by the WHO for the different periods of the day are shown in Table 4.

Table 4: Guideline values for noise in different sound environments

<table>
<thead>
<tr>
<th>Environment Type</th>
<th>Day period</th>
<th>No. of Hour Period</th>
<th>Maximum limit of ( L_{\text{Aeq}} ) [dB (A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential areas</td>
<td>Day and evening</td>
<td>16</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>8</td>
<td>45</td>
</tr>
</tbody>
</table>


The characterization of the sounds environment necessarily had to include the sensitive receptors and sound sources existing nearby the future Power Station.

The WHO Guide establishes the limits for different sound environments, and it is considered as environment only affected the external environment of the buildings (ambient noise).

In this manner are considered as sensitive receptors located in the residential buildings in Ressano Garcia, the chapel of Our Lady of Assumption and Escola Secundária 4 Outubro located next to EN4, which are presented in Table 5.

As sources of noise pollution, WHO indicates the industrial noise, noise of transport infrastructure (road, rail and air), the noise of construction areas and domestic noise.

At the study area were identified the following sound sources:

- EN4 (road traffic noise):
- Ressano Garcia (domestic noise).

Table 5: Characteristics of the identified sensitive receptors

<table>
<thead>
<tr>
<th>Receptor sensitive</th>
<th>Location opposite the project</th>
<th>Geographical coordinates</th>
<th>Main noise sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>South</td>
<td>East</td>
</tr>
<tr>
<td>1- residences over the</td>
<td>500 meters northwest</td>
<td>25° 27'19&quot;</td>
<td>31° 59'56&quot;</td>
</tr>
<tr>
<td>next</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2- chapel of Our Lady of</td>
<td>900 meters southwest</td>
<td>25° 27'59&quot;</td>
<td>31° 59'50&quot;</td>
</tr>
<tr>
<td>Assumption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3- School</td>
<td>1200 meters southwest</td>
<td>25° 28'08&quot;</td>
<td>31° 59'45&quot;</td>
</tr>
</tbody>
</table>

Given the types of noises identified, was considered to perform noise measurement near the construction site of the future Power Station which had as main sound source EN4.

The acoustic measurement took place on April 15, 2008 having been made with an integrating class 1 digital sound level meter (Datalogger TES - 1353). The microphone is equipped with a
projector wind to avoid spurious low frequency signals due to the wind. Any residual energy assumes secondary importance insofar all measurements were performed with mesh weighting A (frequency weighting) in fast and impulse (time weighted).

**Figure 8:** Sound level meter used for measuring environmental noise.

Table 6 shows the main characteristics of the measurement site considered. In Figure 9 shows the location of the point of acoustic measurement and sensitive receptors closest to the Power Station (marked in red). In the same figure is still noticeable the main sound source located to the west of the project area, EN4.

**Table 6: Characteristics of measurement site of environmental noise**

<table>
<thead>
<tr>
<th>Location opposite the Project</th>
<th>Geographic Coordinates</th>
<th>Main noise sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>220 meters west</td>
<td>25° 36'01&quot;</td>
<td>EN4</td>
</tr>
<tr>
<td></td>
<td>32° 00'01&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9:** Location of measurement point, the closest sensitive receptors of the Power Station (marked in red) and the main sound source (EN4).

In Table 7 there are results of measurements performed

**Table 7: Sound levels at the measurement site.**

Given the figures presented with a $L_{Aeq}$ below 45 dB(A), it was not considered necessary to perform a measurement at night time.

Given these values, the sound environment of the study area can only be regarded as slightly disturbed (values below 45 dB (A)), characteristic of areas without significant noise sources.

5.7 Air Quality

The characterization of the pollutants emission from a particular region goes through an exhaustive survey of emitting sources and quantifying their emission. Whenever possible, the determination of emissions from various sources should be taken for resources to actual measurements. Obviously for considered diffusing sources, such as forests, agricultural fields, farms and transport (road, maritime and air), direct and comprehensive emission measurement is not feasible. Therefore, for the systematization of such sources is usually resorted to the application of emission factors associated with the various emitting activities.

In addition to the problems mentioned above temporal variability of emissions from different sources emphasizes the focus of doubtfulness present in emission inventories currently
available. The characterization of emissions from a particular region emerges as a complex problem and ongoing need to update.

In the this study it was found that the industry in the Moamba District is not very developed, and in the study area (Ressano Garcia) there are no point sources to be considered for the study.

With respect to other emitting sources refers to only the current traffic EN4. However, not having data referring to this emitting source, no analysis of its contribution will be performed in terms of air pollutants to the region under study.

In assessing the impacts of single point source considered in the study of dispersion on a local scale is the Ressano Garcia Power Station. This source will be located to the southwest of the Ressano Garcia village in a point with coordinates 25 ° 27'30 "S and 32 ° 0'6" E. (Figure 2.9).

Figure 10: Location of the Ressano Garcia Power Station

5.8 Socio Economic Aspect

The approach of socio-economic factors under this environmental impact study is based on a profile of Moamba District (Ministry of State Administration, 2005 Preliminary statistical data relating to the third General Population Census, held in 2007, and the results of field visits to the project site and various consultations between April and October 2008.

The area planned for project implementation currently corresponds to an area without significant occupation, located southwest of the border of Ressano Garcia village, old population and which is one of the main villages in the Moamba district, Maputo Province.

The Moamba District is one of eight districts that constitute Maputo Province, and if we consider the preliminary results of the third General Population Census, held in 2007, with 56335 inhabitants, giving a population density of about 12.2 inhabitants/km², considerably below the average density of the province (48.3 inhabitants/km²), where predominate the demographic weight of Matola, as well as, Manhiça and Marracuene. However, it is noted the considerable population growth in the district over the previous census (1997), when it accounted 43 396 inhabitants.

The Ressano Garcia village is one of the main towns in the Moamba District given its location near the border with South Africa and the Inomati River, which since its foundation it was granted special importance by the railway of the Maputo Corridor and the National Road (EN) 4, which links Ressano Garcia to Maputo.

This village is the country-town of the Administrative Post with the same name, where it was estimated the presence of 12,600 inhabitants in 2005, giving it the highest population density of all the administrative posts of Moamba District, about 61 inhabitants/km², most of them
concentrated in the village or in its immediate surroundings. Ressano Garcia, with the proper village of Moamba is one of the few settlements with urban characteristics throughout the district.

Although the preliminary data of 2007 census do not appear to confirm that population estimates, indicating about 8,900 inhabitants in the Administrative Post of Ressano Garcia area, this does not affect the general characteristics informed.

Generally, the characteristics of this area does not differ significantly from the rest of the district, both in demographics terms (a young population, with about 32% of the population under 15 years and female predominance), either in economic plan, even that the greater presence of infrastructure, services and some industry, although incipient and relatively small-scale, help to complete the agricultural activity turned mostly for self-consumption and small-scale production that predominates here, though the Incomati valley is one of the areas with better characteristics for the farm throughout the region.

However, some aspects to point out. As 1997 Census, Ressano Garcia showed by far the lowest rate of illiteracy in the district (39.9%) and the highest percentage of speakers of Portuguese (68.8%). It is also here where almost half of the shops are found in the district (the trade covers about 15% of the active population of Moamba district, it is estimated to be the highest percentage in Ressano Garcia).

It should also be noted the existence of the new 4 de Outubro Secondary School facility, close the EN4, in the south of Our Lady of the Assumption wall, more than 1 km away from the project site.

Lately, the Ressano Garcia village has been growing through the spread of its surroundings especially to south in a disorderly manner and without relying on a structured growth, based mainly on the border near an urban center with some meaning, provided with good accessibility, in the event of spontaneous exploitation of small agricultural areas.

The expansion of built area, however, has not exceeded the existing pipeline to the south of the village beyond which precisely extends the terrain on which it intends to implement this project.

It is being considered the expansion of Ressano Garcia from a town-planning to be located close to EN4 in northern of Our Lady of the Assumption wall, an area much closer to the pipeline and west of the area planned for the Station facility. According to the Chief of the Post (Daniel Magabule, see minute in Annex 4) the expansion plan meets the limitations required by the servitudes of both the existing pipeline. The delivery date of this report had already begun the boundary of the territory in the areas closed to EN4. Also according to the Chief of Ressano Garcia Post, the future access road to Power Station is likely to be used as access into the expansion zone.
The presence of Sasol and the Matola Gas Company gas pipelines, the latter source of future supplies to the Station as well as high voltage electric power lines that exist here, grants particular characteristics to this site, especially industrial, which has also contributed to the less development of other types of land tenure in the project area.

These industrial infrastructures, linked to the energy sector, as well as the proximity to the border and the availability of access make this place very interesting for facilities for new industrial units in which the Power Station under consideration will be another boost.

Effectively, it was already reserved for the project implementation, near the Ressano Garcia village, by the Provincial Government, an area of 30ha for industrial use, of which the Station will occupy approximately 5ha, at this stage of project development.

The signs of human presence at the site of project implementation are scarce and consisting of a house of poor construction. This house consists of 6 bedrooms, and only one of them is covered and its external infrastructure to support a latrine, a kitchen and ox-stall. In addition the terrain that surrounds the house is owned by the same family farm. The house has an area of 10 x 12m and is set on a plot with an area of approximately 2.1 ha.

In addition to the house there are in the area of project implementation 8 other farms belonging to members of the Ressano Garcia village community. These farms occupy a minimum area of 800 m² and a maximum of 21,000 m², their locations can be seen in the figure below.

**Figure 11:** Location of farms and existing home in the project area.

We also identified two graves near the route of the new road to be constructed. These graves should not be affected by the project. Besides these structures belonging to the community, just to note the proximity of modern industrial infrastructure (PRS 1, the pipeline, the Power Transmission Lines).

### 5.9 Cultural Heritage

The approach of Cultural Heritage under this EIA is based on the profile of Moamba District (2005), the legal documents connected with the protection of cultural heritage of Mozambique and the results of the field visit conducted to the project site carried out in April 2008 under the AIA.

The space provided for the implementation of the Natural Gas Power Station in Ressano Garcia and power transmission lines associated is located a relatively flattened area southeastern border town of Ressano Garcia.

Although this location is near the road from Ressano Garcia to Maputo, its distance from the central core of that village and poor agro-ecological suitability of the land in the project area, as well as the removal of the main axis where historically verified human settlements, which
accompanied the Incomati River and the railroad Maputo – Ressano Garcia, did not encourage the establishment in the project area or locating buildings that could present nowadays, or historical interest or scientific, it is the traditional of colonial influences, in a way that will integrate the collection of Mozambican cultural heritage materials.

Also is unknown an archaeological area that could testify oldest occupations at this site.

In the absence of significant human settlements, it’s also believed that there is no place here, and elements of intangible heritage and the symbolic value of these spaces. Just a little further to the southeast of the area planned for this intervention, but outside its area of direct effect, we can identify an element with equity potential, the chapel of Our Lady of the Assumption, small building in brick, plastered and tumbling, a single nave, with a pediment surmounted by a cross, probably built in the twentieth century, which stands atop a hill that dominates the surrounding landscape (Figure 12).

**Figure 12:** Chapel of Our Lady of the Assumption.

This chapel, located about 900m to the southeast of the site planned for the Power Station, is not classified under the Law No. 10/88, 22 December, Law aimed at legal protection of tangible and intangible assets of cultural heritage, but it fits the type of monuments provided in paragraph 4 of Article 1 of this document, "historical buildings that bear witness to the coexistence in our territorial space of different cultures and civilizations, such as (...) Churches and Chapels".

Also the southeast and out of the land of the project there are two graves.

**Figure 13:** Graves found southeast of the project

5.10 Landscape

**The landscape** can be defined as "a part of the territory, as is learned by people, whose character results from the action and interaction of natural factors and/or human" (EC, 2000).

**Landscape unit** means not only "a limited topography or other elements within the area which all points are mutually seen" (Neuray, 1982), but also one where the landscape presents certain homogeneity in relation to the relief, geology, vegetation and humanization.

Impacts assessment on the landscape requires characterization of conditioners elements of landscape viewing in order to support the definition of landscape units, its scenic value and visual quality and its sensitivity and visual absorption.

**Scenic value (visual quality)** of a landscape is a perimeter enclosing some subjectivity, although it’s consensual to consider that landscape has much more value as the greater the diversity and contrast their present situations, the higher the balance between land use and their potential and greater number of possibilities for enjoyment (visual and physical) of this landscape.
Sensitivity (or visual vulnerability or fragility) of a landscape corresponds to the degree of employment caused by a change or introduction of a new element. This concept is opposed to the visual absorption capacity, which is the ability that a landscape has to integrate changes or modifications without diminishing its visual qualities (Bombim, 1991). This ability is related to the morphology (shape and type of relief, visually significant aspects such as cliffs, canyons, etc.), with the size and density of the vegetation, the chromatic contrast, the diversity of vegetation strata, the presence of built elements and landscape structuring and visualization.

Visualization corresponds to a greater or lesser ease with which a landscape is perceived and is directly related to the accessibility and distribution of potential observers and type of topography and land use, defining the dimension of visual basins. Landscapes with less access facility and fewer landscapes with less extension and deep view.

Study area for the impact assessment on the landscape corresponds to an area of about 2-3 km radius, limited to the west by the Lebombo mountain chain which forms the border with South Africa and north by the Incomati valley.

5.10.1 Definition of landscape units

The study area is characterized by a rough relief, corresponding to the Lebombo chain. Stand out elevation where the Chapel of Our Lady of the Assumption (elevation 280m) and the highest reliefs line (which reaches 402m at the apex of Macabula), divided by the Incomati river valley which is the line border between Mozambique and South Africa.

The project is located on land about 200m altitude.

North of the Incomati valley has its bottom at an altitude of about 100m.

The natural vegetation is an acacia treed savannah. This occupation extends over a vast area. Land use is limited to very specific agricultural occupations (farms), except for the following situations:

- Ressano Garcia village, with an old urban core in a structured orthogonal grid and a dispersal area of disordered structures with expansion to the south and southeast;
- The school located near the national road (EN) 4;
- Storage areas located to the west of EN4;
- Existing MGC pipeline Station.

Based on the topography and the human occupation it is defined the following landscape units (UP):
• UP 1 – Rough relief area. This UP is characterized by an extensive occupation of acacia treed savannah, occasionally interrupted by farming use. The water lines that cross are right bank tributaries of the Incomati River and its direction is north-south. In this UP is located just a few poor constructions.

• UP 2 - Wall of Our Lady of Assumption, the source of EN4, and in which is located a catholic chapel, where it holds an annual party. This chapel, the unique construction with and existing equity interest in the surrounding area to the station, is also by its location an important element as visual reference and landscape.

• UP 3 - Ressano Garcia Village, including the central zone and scattering area. The scattering area presents degraded and poorly structured, what influences its visual quality.

• UP 4 - the Lebombo mountain chain, corresponding to a higher relief with direction north-south and which ridge line marks the border between Mozambique and South Africa. This line of heights and punctually, the wall of Our Lady of Assumption, are the main visual limits of the space, forming an important visual barrier to the west, interrupted only by the Incomati valley along the Ressano Garcia.

• UP 5 - Incomati River Valley. This UP divides the earlier in Ressano Garcia area and initially has a West-east orientation, then inflicting southwest.

The Incomati valley, by disrupting natural barriers of the Lebombo chain is the natural way to railway and to EN 4, in what is currently known as the Maputo Corridor. The origin of the Ressano Garcia village is due to this facility for transposition of the border. More recently this natural corridor was used for infrastructure to transport energy linking South Africa: High Voltage line and the pipeline.

In UP, 1 it is possible to distinguish two subunits depending on their visibility or not from EN4: UP 1 - visible from EN4 and UP 1B - not visible from EN4.

5.10.2 Valuation of landscape units

Given the analysis in the previous section, it is presented in Table 8 a valuation summary of the landscape units and subunits.

<table>
<thead>
<tr>
<th>Landscape subunits</th>
<th>Scenical value/visual quality</th>
<th>Visual absorption</th>
<th>Visual sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP 1 – rough relief zone</td>
<td>Medium</td>
<td>Reduced</td>
<td>High</td>
</tr>
<tr>
<td>UP 1A – visible from EN4</td>
<td>Medium</td>
<td>Reduced</td>
<td>High</td>
</tr>
</tbody>
</table>

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
6.4 **Foreseeable evolution in the absence of the project**

The information collected identified two intervention purposes in the area surrounding the power Station project:

- The recommendation draft of the Ressano Garcia border with an implementation of a road access solution to the west of EN4, and infrastructure and building also to the west of EN4;
- A urbanization plan for the urban expansion of Ressano Garcia, which foresee the occupation of the east slope of the Our Lady of Assumption wall. In this area will be resettled families removed from the village center to make way for Single Border project above mentioned.

The two interventions are most likely implemented in a short timeframe and will significantly alter the landscape and land use in the village. The second intervention has several years and according to the Chief of Post the area has started to be delimited. Future access road is likely to be used for access within the expansion zone. Also according to the Chief of Post, and once Consultec had no access to the georeferenced Plan map, we assume that the purpose of industrial and commercial location for the area are not in conflict with the Urbanization Plan for the Expansion zone.

### 6. IMPACTS IDENTIFICATION AND ASSESSMENT AND MITIGATION MEASURES

This chapter proceeds to the impacts identification and assessment during the construction and operation, and identification of measures to prevent, reduce or compensate negative impacts – designated as mitigation measures.

This chapter is structured in fourteen subchapters being the first referring to the methodology of impact assessment and each of the other corresponds to a descriptor where are analyzed for the construction phase and operation.
At the end of the descriptors there is a subchapter of systematization of impacts by phase and finally the last two subchapters deal with cumulative impacts (6:13) and cross border impacts (6:14).

6.1 Methodology
This chapter will proceed to the identification, description, assessment and classification of environmental and social impacts from construction and operation phases of the project and the alternatives studied, with a view to their hierarchy, i.e., the identification of the most significant impacts.

This impacts assessment resulting from the existence of the project will deal with the impacts of natural resource use, emissions of pollutants, the creation of disturbance and the manner provided for the disposal of waste and effluents.

The identification of issues associated with the Ressano Garcia Power Station was based on:

- Issues raised during the Pre-feasibility Study and Definition of Scope and public consultations under scope of the EIA process;
- A detailed study of the existing literature as well as data collection in the field;
- Performs simulations on the scattering of atmospheric pollutants, based on data from equipment to be install and studies on the meteorological dynamic of the influence zone;
- Professional opinion from the experts’ team.

The impacts will be analyzed in each descriptor and in each descriptor will be analyzed separately each project phase, i.e., the construction phase and operation phase. For each of these phases will be organized in thematic groups, in order to facilitate discussion and analysis at the end of each impact, their recommended mitigation measures will be presented.

The different impacts identified will be classified according to the following classification criteria:

- **Nature**, showing if the impact is *positive* (+) or *negative* (-);
- **Incidence**, being classified in a given impact as *direct* if it results in any of the actions provided directly by the project, or *indirect*, if it results in any way, consequences induced by the project;
- **Probability of occurrence**, with a particular impact rated as *certain*, *very likely*, *likely*, *unlikely* or *indirect*;
- **Duration**, in reference to the timeframe within which a particular impact occurs during the project life and can be classified as *temporary* or *permanent*;
- **Extension** taking into account the spatial dimension affected by a particular impact. The criteria used in this report includes:
• **Prompt** - the modification is expressed exclusively where intervention occurs or in its immediate surroundings.

• **Location** - change have the potential to occur or to be expressed in an area larger than the immediate surroundings of where intervention occurs.

• **Regional** - change have the potential to occur or to be expressed by irradiation on a scale regional dimension.

• **National** - change has the potential to occur or to be expressed at national level;

• **Supra-national** – changes have the potential to occur or to be expressed at crossborder level.

• **Reversibility**, a given impact being classified as reversible if its effects terminate when terminating the action generating the impact or, inversely, if once performed the action generating impact, its effects remain over time;

• **Magnitude**, referring to the degree of change of environmental quality on a particular factor, being classified as low, medium or high;

By considering the other classification criteria mentioned above, it will result an overall rating of the significance of the impacts identified, this will be on the following scale: impact (negative or positive) - insignificant or very significant.

According to public participation and the EPDA, aspects and environmental impacts identified as most important are related to socio-economic aspects and changes in air quality. Accordingly, and as then proposed, this EIA was focused on these environmental factors having been investigated, with particular details, the expected impacts of the project on them.

Note that the remaining environmental factors were also taken into account in the EIA, in a manner deemed appropriate, i.e., with a degree of detail proportional to their relative importance, bearing in mind the project under review.

### 6.2 Climate

Potential climate impacts were considered irrelevant for both the construction phase and the operation as although it is expected the emission of pollutants that can contribute to global climate change, these only occur on a small scale.
Therefore it is considered this negative impact, indirect, certain, permanent, supranational, irreversible and of reduced magnitude.

6.3 Geology, Geotechnical and Geomorphology

6.3.1 Introduction

The impacts on geology and topography factors are, in general, irrelevant and restricted to the construction phase.

Actions likely to cause changes in the factors cited for the construction phase are as follows:

- performing earthworks to create flat platform for installation of provided equipment;
- construction of access road.

6.3.2 Construction Phase

Construction of the project involves the development of earthworks action (excavation and landfill), with the aim of obtaining flat platforms for installation of provided equipment.

The area allocated to the project is about 5 ha. However the main structures to be installed that will need flat ground occupy the following areas:

- generators: 1.6 ha (rectangle of 200x80 m);
- transformers: 0.5 ha. The actual transformers are placed on the concrete slabs;
- new high pressure meter (HPCMS 1): 0.006 ha (60 m²);
- support structures in containers: 0.65 ha.

Given that the implementation area is practically flat it is possible to make the leveling of surfaces with a new minimum earthmoving, excavation involving heights and modest landfills.

The work will be conducted in order to balance the balance of lands to minimize the need for use of borrow pits and avoid the existence of surplus lands.

The execution of excavations of reduced depth should allow the dismounting of light earthmoving equipment.

In areas of higher (south) elevation slight excavations will be carried out with excavated material placed in areas of lower (north) elevation.

However, it will be necessary to resort to "land loans" with specific features for different purposes:
• About 70 m³ of soft sandy soil for laying the pipeline extension to be built;
• About 50 m³ special "aggregate" (stone with about 10 mm) for seat of the generators and transformers area.

The volumes involved are very low, which may be obtained materials nearby.

The construction of the access road, about 1.4 km long and 5 m wide, almost does not introduce changes in morphology and much less in the geological substrate, provided that the branch to be built develops on flat ground, where there is an access road, although unpaved, of land.

Since the activity involves the dismounting of scarce volumes of material and is not affected anywhere with particular geological interest, it is considered irrelevant geological impact created.

Given the reduced expression of landfills and excavations provided, the associated geomorphologic impact is negative, direct, certain, permanent, local, reversible and of reduced magnitude and insignificant.

Mitigation Measures

• Earthmoving activities must take place only in areas strictly necessary;
• The excavations to be executed should be performed with lighter mechanical means, in order to avoid massive destabilization.

6. Operational phase

It should not be prevented geological and geomorphologic impacts at this stage.

6.2 Soils

6.4.1 Introduction

The impacts on soils are, in general, irrelevant and virtually restricted to the construction phase. Actions likely to cause changes in the factors mentioned in this phase are as follow:

• Deforestation Station operations and land cleaning in area to earthwork in order to install the equipments provided;
• Creation of access road;
• Installation of the pipeline between the pressure reduction Station (PRS 1) and the new high pressure meter (HPCMS 1);
• Construction of a new 110 kV line with 1000 m of the extension between the transformers and transmission line between Corumana and Komatipoort.
• Possible occurrence of accidental spillage of pollutants substances.


6.4.2 Construction Phase

Prior to execution of earthworks operations will require the deforestation and cleaning of land for the project intervention, corresponding to a total area of about 5 ha. There will also be need for deforestation along the track made available for the pipeline, transmission line and access road to be built.

The vegetation removal removes cohesion to the soil making it more vulnerable to phenomena of water erosion and subsequent transport by water from surface drainage. Such activities cause an increased risk of erosion of the soil.

With the possible exception of areas where landfills are established, the soils after discovered will be excavated, removed from the site and stored. The exposure of the deposited lands makes them vulnerable to transport by water from surface drainage. This risk is more evident in case of combining two situations: presence of slope (it should be noted that more evident slopes do not exist in the intervention area) and the occurrence of heavy rainfall (generally between December and February). This impact can be easily minimized if plastic covers are placed over the land.

Given the small thickness and quality of this soil there is not superficial fertile soil that needs different treatment.

At the opening of the trench pipeline the impact is minimal once the materials taken after placing the pipes to be spread back in situ and then compacted making irrelevant impact.

Another possible cause of the impact will be timely excavations in areas of placement of ditches of foundation for supporting power line connection.

In this case the impact is also irrelevant since the excavated soil is compacted and subsequently restored, as in the case of the pipeline installation.

Once the affected soils are low productive potential and very common occurrence in the region where they are located, it is considered that these impacts are negative but if appropriate mitigation measures are taken it can be considered of the reduced magnitude and significance. The impacts are still classified as direct, certain, temporary and reversible.

Following the activities of the project, impact on soil contamination can still occur. This impact relates to the potential accidental discharges of pollutants substances (oil, fuel or other toxic substances) irreversibly affecting the characteristics of a greater or lesser extension of soil.

This impact on soil contamination is considered negative, direct, likely, temporary, local, potentially significant that can take variable magnitude.

However it is an impact that can be avoided if proper adopted environmental management practices of work, as provided for in PGA. In the event, the magnitude and significance can also be minimized by adopting appropriate measures in the emergency plan for spilling contention (Chapter 7).
**Mitigation Measures**

With the aim of minimizing soil erosion, especially after deforestation operations and land cleaning, the following steps should be taken:

- Full restriction of deforestation actions and land cleaning to be made;
- Soil mobilization to avoid heavy rainfall season;
- Cover with canvas of most significant excavation areas and land deposits on case of occurrence of very heavy rainfall.

### 6.4.3 Operation Phase

At this stage the primary potential impact relates to the possibility of accidental discharges of pollutants causing contamination. As for construction phase, this impact can be classified as negative, direct, likely, temporary, local, potentially significant that can take variable magnitude.

**Mitigation Measures**

- Waterproof and put retention basins in sites of great potential occurrence of leaks or spills;
- Monitoring occurrence of spills and empty retention basins;
- Protect from rain local storage of pollutants substances.

### 6.5 Water Resources

#### 6.5.1 Introduction

The impacts on water resources are of little relevance and are restricted to the construction phase. If adopted measures to prevent the discharge of effluent into the water environment, no impacts are put in perspective on the quality of surface and ground waters.

Actions likely to cause changes in the quality of water resources during the construction phase are as follows:

- Earthmoving operations and creation of temporary storage that provide land which may flow into water lines;
- Creation of compacted or waterproofed surfaces where underground infiltrations occur.

#### 6.5.2 Construction Phase

During the construction phase, in case of heavy rainfall can occur through the action of water draining, land transportation from dumps and areas of denuded soil and stoked.
By developing the project in an area of headboards may be that the fluvial sediments dragged with torrential flow beds introducing solids flow, which can reach the Incomanti River where there is a permanent disposal. This increase of the solid flow will impact the increase in total dissolved solids.

In addition to the particles, can also be dragged other pollutants produced in fronts of the work such as heavy metals (such as cadmium, copper and zinc) and hydrocarbons (generated by combustion in the engines, losses of oil lubrication systems and unexpected oil and fuel spilling).

These impacts will occur in small stream tributary of the Incomati River and given its size does not expect changes in Incomati.

The referred impact is negative, indirect, likely, temporary, local, reversible and of magnitude between low and medium. The significance is considered low given, above all, the temporary and reversible nature.

Another impact to consider relates to the effect of compaction or waterproofing found in areas where waterproofing or semi-waterproofing pavements (especially added to the base area for transformers and generators, macadam pavement for access road) are created. In such cases there is a local reduction in waterproofing which is favorable in rainfall situations, an increase in water draining in detriment of infiltration into the soil and subsoil.

The referred impact is negative, direct, certain, permanent, local, reversible and of reduced magnitude. The significance is considered insignificant.

On groundwater resources, the low vulnerability of aquiferous removes the risk of significant water quality impacts.

**Mitigation Measures**

- The building yard and machinery should be located on a low-slope zone to avoid or minimize earthmoving, while protecting from a distance of 10 meters to the existing water line;
- Timely deforestation actions, destruction vegetation, cleaning and stripping of the soil must be limited to areas closely essentials for the execution of the work;
- Implementation of retention basin(s) in place(s) topographically suitable(s) will avoid or minimize the introduction of sediment in the tributary water line of the Incomanti River which is developed northern area of intervention;
- To avoid the introduction of particles in water environment, due to the bank slope of the landfill and excavations caused by surface water, its coating station must be performed after the end of these operations;
- If it is found to exist of excavation materials with contaminated evidences, these should be stored in places that prevent contamination of soil and underground
waters for infiltration or draining rainfall water, until these materials are routed to a suitable location;

- The storage zone of potentially polluting products should be drained into a retention basin isolated from the natural drainage network, in order to prevent accidental spills from contaminating soil or surface water;
- Installation of an appropriate system for collecting waste water produced in construction yards and routed to an appropriate place;
- At the end of the work it should be ensured that the intervened water lines are clean from substance and waste in order to nullify its full or partial obstruction, allowing the drainage to takes place naturally and water downstream quality is not affected.

### 6.5.3 Operation Phase

During the operational phase may occur impact on water resources quality resulting from improper discharge of effluents or the occurrence of leaks or spills of pollutants substances.

The effluent produced at this stage, particularly oils and cleaning water, results from the maintenance of the Power Station transformers, being provided in PGA (chapter 8) the prohibition of the discharge of untreated effluents in the environment. To ensure compliance with this measure it’s also proposed the delivery of all types of oils or substance that remain after an operator engaged in the treatment and/or recovery of this waste. The impact is considered to be non-existent if the measures provided in the PGA are taken.

For the event of leaks or spills depending on the type and amount of material spilled the impact in water resources may be more or less significant. All operators should be trained to act in case of spilling to minimize the damage. This impact is negative, direct, unlikely, temporary, local, reversible and of reduced magnitude. This impact is considered insignificant.

**Mitigation Measures**

- The Proponent may not perform discharges of untreated effluents in physical environment, should he respect the recommended practices in the PGA;
- Should be taken into account all specifications recommended by the supplier of existing hazardous substances in Power Station.

### 6.6 Biotic environment

#### 6.6.1 Introduction

Knowing that the boundary area of the project is already intervened by the presence of the Ressano Garcia village and by structures such as NE4, pipelines and power lines, the main impacts, possible or certain, of the project on the ecosystem of its influence area are:
• Disturbance and/or removal of existing animals;
• Destruction of vegetation.

6.6.2 Construction Phase

During the construction phase will be present in the field workers and heavy machinery for execution of works. According to the activities foreseen the level of environmental noise will increase and may therefore disturb existing animals and/or leads them to leave the place. This factor is becoming worse if in addition we take into account the destruction of vegetation, food for most of the animals. This impact is considered negative, direct and indirect, most likely, permanent, local, reversible and of medium to high magnitude. Given that in the project implementation site there is also rare species but the same may move away from the disturbed area, this impact is considered insignificant.

Mitigation Measures

• Perform the noisiest activities out of bird nesting period;
• Restore the vegetation cover as soon as possible.

6.6.3 Operation phase

During the operation phase it is expected to be emitted noise levels above existing and therefore have the same consequences as those occurring during the construction phase: disturbance and/or removal of animals. The existence of infrastructure and workers may also cause the same impact. Thus, this negative impacts are expected, direct, very likely, permanent, local, reversible but of reduced magnitude. Again and taking into account the existence of rare species but that the same may move to a similar nearby area, these impacts are considered insignificant.

Another component of the project that caused potentially impact on biota will be the 110 kV power line to be established (about 1km). Notwithstanding the area of the power station implementation being much reduced compared to the inhabitants of the area available for wildlife around, this line is likely to cause the death of birds by collision and/or electrocution. This impact is expected to be negative, direct, likely, permanent, local, reversible but of reduced magnitude. If taken proper measures to mitigate, this impact can be considered insignificant.

Mitigation Measure

• It should be avoided unnecessarily death of animals, including the species above mentioned and reproductive phase, opting for the removal or transfer from the project intervention area.
• Place limelight objects for visibility power line, such as balls, reflector or distraction signaling.
6.7 Sound Environment

6.7.1 Introduction

The methodology of sound environment impact assessment is the identification of activities causing impacts on noise environment and assessment of those impacts based on the prevision of the noise for the different levels and stages of the project in comparison with the values established by WHO (previously mentioned - Subchapter 5.6).

Sound levels caused by project activities are termed as particular noise.

6.7.3 Construction Phase

The construction phase is characterized by its temporary delimitation and by construction operations employing noisy machinery.

The noise generated by noisy machinery and equipment, such as excavators, trucks, auto-mixers, among others, may have elevated levels during operation but should only occur during the day (usually between 07h00 and 18h00).

Sound levels generated by the main construction activities are shown in Table 9.

<table>
<thead>
<tr>
<th>Activity</th>
<th>L_{Aeq} to 50 meters</th>
<th>L_{Aeq} to 500 meters</th>
<th>L_{Aeq} to 1000 meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthmoving and</td>
<td>72 to 75 dB (A)</td>
<td>52 to 55 dB (A)</td>
<td>46 to 49 dB (A)</td>
</tr>
<tr>
<td>excavation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete cover</td>
<td>73 to 81 dB (A)</td>
<td>53 to 61 dB (A)</td>
<td>47 to 55 dB (A)</td>
</tr>
<tr>
<td>Pneumatic hammer</td>
<td>80to 84 dB (A)</td>
<td>60 to 64 dB (A)</td>
<td>54 to 58 dB (A)</td>
</tr>
</tbody>
</table>

The previsions of the particular noise demonstrate that the construction noise may affect receptors located in a neighborhood about 500 m of fronts of work and are sensitive to noise. From this distance the values tend to be insignificant because this is a limited noise at certain times of the day.

However, the particular L_{Aeq} noise previsions shows that during construction activities, the sound environment close to identified receptors will be at existing sound levels, being the impact generated by construction activities classified as negative, although insignificant, direct, certain, Local, temporary and reversible. It is not expected a significant health influence and well-being of the population.

Mitigation Measures

- The construction activities especially the noisiest, should occur at daytime (between 07h00 and 18h00) of workdays hence avoiding the remaining periods.

7.7.3 Operation Phase

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
At this stage of the project the noise resulted from the normal operation of the Power Station and, assuming a system in continuous operation for 50 generators, will establish a permanent basis.

Note that the high-voltage lines included in the project, being at 110 kV, are unlikely to change the sound environment; therefore, are not considered in this impact assessment.

For the simulation of the propagation of noise from the generators to be installed at Station conditions are considered as of full operation, as the information provided by the supplier of such equipment.

Therefore, according to the specifications provided by Aggreko ("Equipment Data Sheet") for this equipment is established a maximum value for the sound power (LW), sound pressure level measured in predefined conditions regardless of the location of the equipment, environmental conditions and point distance measurement of 104 dB.

To avoid situations of discomfort or risk to hearing, the technical specifications of the equipment indicate a sound pressure at 1 meter distance to the equipment of 87 dB (A) and 80 dB (A) at 7 meters away. These were the basic values used to foresee the noise levels at sensitive receptors.

Table 10 presents the expectable sound levels along the identified receptors whereas the presence of 50 generators and simultaneously continuous operation.

<table>
<thead>
<tr>
<th>Sensitive receptor</th>
<th>Current level</th>
<th>Sound Power operation</th>
<th>Sound level during Plant</th>
<th>WHO Guide values</th>
<th>Defaulting guide values</th>
<th>WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night (a)</td>
<td>(without mitigation measures)</td>
<td>Day</td>
<td>Night (a)</td>
<td>Day</td>
</tr>
<tr>
<td>1 - closer houses</td>
<td>35 dB (A)</td>
<td>32 dB (A)</td>
<td>50 dB (A)</td>
<td>49 dB (A)</td>
<td>55 dB (A)</td>
<td>45 dB (A)</td>
</tr>
<tr>
<td>2- Chapel of the Lady of the Assumption</td>
<td>35 dB (A)</td>
<td>32 dB (A)</td>
<td>45 dB (A)</td>
<td>44 dB (A)</td>
<td>55 dB (A)</td>
<td>45 dB (A)</td>
</tr>
<tr>
<td>3 - School</td>
<td>35 dB (A)</td>
<td>32 dB (A)</td>
<td>42 dB (A)</td>
<td>42 dB (A)</td>
<td>55 dB (A)</td>
<td>45 dB (A)</td>
</tr>
</tbody>
</table>

The values presented expose the need for mitigation measures to prevent the occurrence of noise levels above the WHO guideline values during the night (between 23h00 and 07h00).
occurs along the existing houses north of the Natural Gas Power Station site, which are expected values 4 dB (A) above 45 dB (A).

Along the remaining receptors, due to a distance greater than 500 meters, no acoustic levels are foreseen to cause negative impacts.

The effects in the population are related to disturbances in sleep, not being predictable situations of severe discomfort to human activities.

Other sound emission, as are the aerodynamic nature, can be built in mechanisms for noise generation, indirect or secondary. These only occur in cases of stronger winds, where the resulting noise levels are identical to the passage of wind generators in television antennas, tall trees or other similar structures which are present along the sensitive receptor. By their similarity and low noise level were considered not very relevant for this analysis.

In summary, during the operation of the Station are expected significant and permanent adverse impacts on noise environment along the receptors that are situated up to about 500 meters from Station. Given the location of receptors it’s only expected to allocate a small number of receptors and can be easily mitigated.

This review was based on a prevision of sound levels using a mathematical simulation and compared with limits set by an international body. For this reason, conclusions regarding the noise should be considered as informative and subject to confirmation with resort to a site monitoring during the project operation.

**Mitigation Measures**

Given the situation provided for this stage, no reason to define mitigation measures. It should be considered a monitoring program in order to verify the occurrence of discomfort situation on population of Ressano Garcia and which findings should allow defining and planning, if necessary, the appropriate mitigation measures.

This program should include:

- Performs measurements together with residences closest to Natural Gas Power Station in Ressano Garcia (1st receptor of this study -see subchapter 5.6);
- The parameter to monitor should be continuous sound level equivalent, weighted A, \( L_{Aeq} \), measures should be undertaken during the day (between 07h00 and 23h00) and evening (between 23h00 and 07h00);
- The first monitoring campaign should be performed during the first year of station operation and the remaining will be performed on a 2 years periodicity;
- Measurements will be performed using the class 1 integrating audiometer dully calibrated;
- Sampling shall have appropriate duration given the oscillation of sound stimulus, i.e. until the stabilization of evaluation parameter \( L_{Aeq} \) takes place;
• The results of monitoring campaigns should be analyzed in terms of the noise emission standards to be established in diploma ministerial or, alternatively, under the guide values set by WHO;

If the monitoring results prove defaulting situations of emission standards of the predetermined noise, it shall adopt acoustic conditioning measures of generators.

6.8.1 Air Quality

6.8.1 Introduction

Impacts assessment of on air quality from the operation of the Power Station of Ressano Garcia was performed using the atmospheric dispersion modeling.

This project corresponds to the implementation of a natural gas power station with a capacity of 50 MW, consisting of fifty groups of power generators with a unit capacity of 1 MW.

This chapter will analyze the potential impacts arising from the Station construction and operation.

6.8.2 Construction Phase

During the construction phase of the Station, the impacts on air quality will be insignificant and of local level. These impacts will be mainly caused by the truck traffic and dust emissions due to land excavation and earthmoving. The processes of excavation and earthmoving will give rise to the emission of particles which, by its coarse grain size, will be deposited in soil, at short distance from the site. The temporary increase of heavy traffic at the implementation site during this phase, will also contribute to increased emissions of pollutants, typical of this type of source (specifically NO\textsubscript{x} and VOCs) to the atmosphere. The emission of these pollutants can cause changes in air quality, the intensity of which will depend on the characteristics of the equipment and the type and duration of the work. It is however noted that these impacts will be temporary, extending only during the construction period. However, it is concluded that, during construction, will take place a range of actions that would alter the air quality in the influence zone of the project, which can cause discomfort, especially for workers and closer residents.

Therefore, it can be concluded that the impacts on air quality resulting from the construction phase will be negative, direct, certain, temporary, local, reversible and of reduced medium magnitude. It can then be concluded that the impacts are insignificant.

**Mitigation Measures**

Although impacts are insignificant, it should be taken into account the proper planning of the proposed works and its environmental monitoring.

The main environmental impacts in this field will rely on an increase of particles during the execution of the works, especially during drier seasons.
It may also be a degradation of air quality as a result of occasional traffic congestion due to temporary changes in the road network.

In this framework, the following general measures are recommended to:

- Adoption of a water sprinkling system, particularly through water-tank truck, on the traffic road on unpaved and on all soil significant areas that may be laid bare for long time;
- The transport of materials as surpluses from excavation, land loan, sand and gravel shall be made at in enclosed vehicles to minimize the emission particles;
- Maintenance of machinery and vehicles of transport in appropriate combustion conditions in order to minimize the emission of the atmosphere;
- Timely treatment of slope and all surfaces that may occur aeolian erosion phenomenon.

The implementation of measures to control dust is particularly important in areas close to residential areas. Despite the existence of inexpensive and expeditious techniques for monitoring dust, it is important to emphasize that comment made by the contractor and by the inspection is essential for the prevention and control of dust emissions.

6.8.3 Exploration phase

In order to meet the air quality impacts arising from the operation of the future Power Station of Ressano Garcia, were performed dispersing simulations taking into account the emissions expected and provided by the supplier of the equipment, Aggreko.

Emissions foreseen and emitting characteristics of the EC of Ressano Garcia are defined in Table 11: Emitting characteristics of the EC of Ressano Garcia by group.. It is noted that these emissions were applied to fifty energy generators groups and used in the dispersion model.

Table 11: characteristics emission of the EC of Ressano Garcia per group.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (m)</td>
<td>5</td>
</tr>
<tr>
<td>Diameter (m)</td>
<td>0.76</td>
</tr>
<tr>
<td>V (m.s(^{-1}))</td>
<td>10</td>
</tr>
<tr>
<td>Weather (k)</td>
<td>742</td>
</tr>
<tr>
<td>(\text{NO}_x) (mg.Nm(^{-3}), gas 15%O(_2))</td>
<td>320</td>
</tr>
<tr>
<td>(\text{CO}) (mg.Nm(^{-3}), gas 15%O(_2))</td>
<td>489</td>
</tr>
<tr>
<td>(\text{NO}_x) (g.s(^{-1}))</td>
<td>1.30</td>
</tr>
<tr>
<td>(\text{CO}) (g.s(^{-1}))</td>
<td>2.75</td>
</tr>
</tbody>
</table>

With regard to CO, simulations were not performed given that the emitting magnitude is the identical to \(\text{NO}_x\), but the air quality limit values are 2 orders of higher magnitude. The CO estimates performed by the model are of the same order of magnitude as \(\text{NO}_x\), which in
comparison with the limits for air quality (PE40 000 μg.m⁻³ hourly basis in Mozambique) is insignificant.

Considering the expected emissions for the EC of Ressano Garcia, were performed dispersing simulations for a year of weather data, which are presented in Table 12 the maximum simulated values for NO₂.

Note that for the laws of South Africa, the reference units of the guide values were transformed (ppp to μg.m⁻³) for a better understanding of the comparison.

**Table 12: Maximum values of simulated NO₂ and comparison with limit values and guide.**

<table>
<thead>
<tr>
<th>Limite value</th>
<th>Mozambique</th>
<th>South Africa</th>
<th>WBG</th>
<th>Maximum value simulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly value</td>
<td>400 yg.m⁻³ NO₂</td>
<td>392 yg.m⁻³ NO₂</td>
<td>-</td>
<td>195 yg.m⁻³ NO₂</td>
</tr>
<tr>
<td>Daily value</td>
<td>200 yg.m⁻³ NO₂</td>
<td>191 yg.m⁻³ NO₂</td>
<td>150 yg.m⁻³ NO₂</td>
<td>70 yg.m⁻³ NO₂</td>
</tr>
<tr>
<td>Annual Limit value</td>
<td>100 yg.m⁻³ NO₂</td>
<td>153 yg.m⁻³ NO₂</td>
<td>100 yg.m⁻³ NO₂</td>
<td>50 yg.m⁻³ NO₂</td>
</tr>
</tbody>
</table>

Analyzing Table 12 relating to estimated maximum concentrations of NO₂, it appears that the maximum simulated values are lower than the limit values and guide both of Mozambique and South Africa and the *World Bank Group*.

Note also that the maximum estimated levels for NO₂ are, mostly, about half compared with the limit values and guide.

In Table 13 it is shown the estimated maximum values for NOₓ and comparison with the guide values of South Africa.

**Table 13: Simulated Maximum values of NOₓ and compared with the guide values of South Africa.**

<table>
<thead>
<tr>
<th>Limit value</th>
<th>Maximum value simulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly Maximum value</td>
<td>800 ppb NOₓ</td>
</tr>
<tr>
<td>Daily Maximum value</td>
<td>400 ppb NOₓ</td>
</tr>
<tr>
<td>Annual Limit value</td>
<td>200 ppb NOₓ</td>
</tr>
</tbody>
</table>

With regard to NOₓ taking into account the guide values of South Africa is noted that the estimated concentrations are lower than those mentioned above, also in about half of its value, with the exception of the peak time values. In this case the maximum values estimated by the model (668 ppb NOₓ) are quite close to the threshold value (800 ppb NOₓ).
In figures 14, 15, 16, it is shown the distribution standards of hourly and daily measurements and the annual average for NO$_2$.

**Figure 14:** Isolines of concentration levels of hourly averages of NO$_2$ (μg.m$^{-3}$).
**Figure 15:** Isolines of concentration levels of daily averages of NO$_2$ (μg.m$^{-3}$).
**Figure 16:** Isolines of concentration levels of the annual average NO$_2$ (μg.m$^{-3}$).

Analyzing the spatial distribution of the hourly averages (Figure 14), it is noted that peak concentrations of NO$_2$ are located next to the central area of station implementation, slightly North of the unit. Ressano Garcia village will be affected by higher levels 150 times μg.m$^{-3}$ of NO$_2$.

With regard to the daily averages it is noted that the higher levels (above 60 μg.m$^{-3}$ NO$_2$) are located to the West of the station implementation area reaching the nearest village (Ressano Garcia).

With regard to the annual average, the distribution standard of the maximum concentrations is located further West of the station. Ressano Garcia will be reached by annual average concentrations of 20 μg.m$^{-3}$.

Although the maximum levels simulated in any fully meet the limit values of Mozambique, South Africa and the *World Bank group*, it’s considers the high levels achieved, highlighting the peak (hourly averages) and proximity to Ressano Garcia.

The World Health Organization (WHO) recommends in its document "*Air Quality Guidelines for Europe*", the time value of 200 μg.m$^{-3}$, noting that levels of 400 μg.m$^{-3}$, can cause minor effects on pulmonary functions to persons with asthma (WHO, 2000).

European legislation is based on a time value of 200 μg.m$^{-3}$ NO$_2$, which should cannot be exceeded in more than 18 times a year with the limit of protection to human health value.

Thus, is necessary to analyze the maximum hourly values simulated by the model (195 μg.m$^{-3}$ NO$_2$) with some concern.

It should also be taken into account that the extension of the station ridge is higher reaching almost the entire domain with maximum hourly values of 50 times μg.m$^{-3}$ NO$_2$.

Thus, in an area where there is no industry and the levels of NO$_2$ are assumed to be low, the increase caused by the operation of the EC Ressano Garcia should be considered higher.

Taking into account the previously performed analysis it can be concluded that the impacts on air quality resulting from the functioning of the EC of Ressano Garcia will be negative, direct, certain, regional, reversible and of medium magnitude.
It is considered that the impact on air quality is significant.

Cumulative impacts are not analyzed provided that there is no information about the industrial growth of that area.

**Mitigation Measures**

With regard to the station operation it should be noted the effective control of the process and there should be special attention to emissions of NO$_2$. It is suggested:

- Implementation of a regular program of timely monitoring and air quality with the use of passive samplers, enabling the monitoring of air quality levels. For more information about the passive samplers’ technology please find on: [http://www.radiello.it/english/index en.html](http://www.radiello.it/english/index en.html).

- This campaign should be carried out before and after the entry into operation of the station of Ressano Garcia, in 10x10 km area with the station of the center, including in pollutant to be analyzed NO$_2$ and ozone (O$_3$). Simultaneous monitoring of ozone – pollutants that were not simulated due the lack of database – is important given its close association to NO$_2$ due the photochemistry cycle involving the two compounds.

### 6.9 Socio-Economic Aspects

#### 6.9.2 Introduction

In order to carry out the construction of the Station will need to relocate the existing benefits on the ground to occupy by the project, thus creating impacts on families who develop their livelihood activities in that space.

In addition to the above impacts, the main aspect to highlight, resulting from the construction and future operation of the Natural Gas Power Station and power transmission line will be virtually not predict the occurrence of significant adverse impacts on socio-economic factors in the region.

#### 6.9.3 Construction Phase

Project implementation in the area provided appears to be incompatible with the current use of the soil by the local community. Given the fact that the proposed location is the best in terms of land use (existence of diverse energy infrastructure: pipeline, transmission lines and power station pressure reduction of a pipeline), engineering and availability space at district level and the greatest alternative involves the removal of the community to other similar areas nearby as the ecological characteristics are similar to all project area.

Thus, the implementation of the project involves the relocation of a house that although it is not currently used as the main residence of the aggregate owner but used for agriculture and
cattle breeding. This house of 6 bedrooms, a kitchen and outdoor latrine, an ox-stall with about 40 goats and a farm. Besides this farm there are other 7 belonging to the same number of households. In the farms of the community are a total of 50 fruit trees and two to spare, the absence (in October 2008) perennial or non-perennial crops.

As described in subchapter 2.1 under this impact assessment (see Annex 4) of the families, farm land and existing structures was performed (farms, fruit trees and graves) that comes subsequently to fairly compensate the affected parties. A detailed description of the affected families and benefits as well as recommended for your compensation measures are in Appendix 5.

Were also identified two graves near the proposed route for the access road to the Station. These graves were to be unaffected if necessary since the route of the road can turn slightly to this end.

No impacts on the graves.

The impact on existing infrastructure is considered insignificant since all those affected should appropriately compensated. It is the negative, direct, certain, permanent, local, reversible and low magnitude impact nature. Not expected impacts in terms of loss of social reactions neighborhood since all affected families live and develop their social activities in the village center.

The relative distance in relation to the urban core of Ressano Garcia makes it not to expected to occur on direct discomfort on the populations during the construction phase (noise, dust, increased risk for use of vehicles and people because there are places with houses and where there is a greater presence of human activities are relatively distant from the work areas and so not expected to impact significance during this phase given the assessment in the chapters dedicated to factors of air quality and noise.

In this stage are also expected significant positive impacts on employment.
It is expected that the civil works employ 120 workers even for a short time (about 2 months) and workers from the electrical part (6 weeks duration) employ about 30 workers. These parts will be qualified: 20% in construction and 50% in the electrical section.

The concentration of temporary workers, part of which coming from other places can have negative impacts on public health and on possible sources of social conflict. Creation of opportunities for local laborer is a direct, very sure, temporary, reversible site, and positive impact of low magnitude. It is considered a minor impact.

Noise that will be felt as a result of construction activities is likely to have an impact on the welfare of neighboring communities and the limit on their health.
So we can classify this as a negative impact, direct, likely, local, reversible, but with low magnitude. This impact is considered insignificant.

**Mitigation Measures**

---

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
Measures to prevent or reduce the negative powers are as follows:

- Implementation of a compensation program for the affected parties before commencing construction activities. This program should have approval from the local administration of Ressano Garcia as well as local leaders present in the community and it should follow attached guidelines (Annex 5).
- Notify the most affected population (directly or indirectly) for the execution of the contract, the main features of the project and the good practice of health and safety.
- To be aware of a system care for potential doubts and complains.
- Establish a balanced relationship with the local community through the creation of a liaison group with the community.
- Prioritize local population, in a strict collaboration with administrative and traditional authorities in the recruitment of workers. This recruitment will be conducted in a fair and transparent manner and adequate training for workers.
- Ensure the safety conditions for workers.
- Ensure timely replacement before commencement of Station works, the cultivated land that may be directly affected by the works.

**6.9.3 Operation Phase**

At the operation stage with the full Station operation, it may be expected an increase in noise levels to the same meaning up to 500m away, which could affect some existing houses in south of Ressano Garcia, especially during the night, which can resort to the need for implementing measures to minimize this impact, aspect discussed in this subchapter (5.6), it is considered reducible under this environmental factor. This impact is negative, direct, likely, local, reversible and of reduced magnitude.

As stated in the chapter devoted to the characterization of the situation of this territory concerning to socioeconomics (subchapter 4.8), the expansion of the surrounding residential area of Ressano Garcia is spontaneous features and has – if guided to the South Village an estate plan is planned for EN4 and north of the Our Lady of the Assumption wall.

Given the progressive industrial characterization of this area, south of pipeline must be taken proper safety precautions and given the proximity of these sites, which would imply an increase of risk and discomfort to future populations, as noise and air pollution, and limit the possibility of future installation and industrial and storage units in this location.

Positive impacts could reach greater significance, with the improvement of the most important energy capacity. However it should be noted that the electricity produced will not supply the...
local population will be used to export to South Africa. The impact on the energetic capacity is positive, direct, permanent, supranational, reversible and of high medium magnitude.

It can still be considered indirect impacts resulting from the project implementation.

- The consolidation of industrial vocation of this area with real importance for structuring the socioeconomic region excessively dependent on primary sector and local natural resources.
- The importance that it can have while a factor of spatial organizer of territorial delimitation emphasizing the future industrial facilities and storage services.
- And supporting industrial activity which can benefit from good access near the border and a village with urban look.

These impacts can be characterized as indirect positive, very likely, permanent extension of regional, national and supra-national, reversible and of medium magnitude. Therefore it is considered a significant impact.

At the stage of operation of the Station, the effects on employment and local revenues will be more durable and structuring than the construction phase, as are anticipated to be employed 8-10 employees for the operation, maintenance and development of geStation supported by about 15 other workers, semi-skilled and unskilled for the tasks in Station.

Employment of skilled local manpower may have advantages at various levels, to allow better integration of the project on local socio-economic environment, avoiding major movements of workers and contributing to workers' skills leaving here and knowledge that residents here will have about the project, this will enhance the availability of skilled manpower in the event of future recruitment for this Station and other industrial projects that will be established. This impact is expected to be insignificant and will have the following characteristics: positive, direct, certain, permanent, local, reversible and of reduced magnitude.

**Mitigation Measures**

- Prioritize local population in direct collaboration with the administrative and traditional authorities in the recruitment of workers. This recruitment should be conducted in a fair and transparent manner, providing the appropriate training for workers.
- Ensure health and safety of workers.

6.10 Cultural Heritage
As follows from the characterization of the environmental situation in the intervention area (subchapter 5.9), were not identified the cultural heritage element that may be directly
affected by construction or operation of the Power Station of Ressano Garcia or the associated power line.

Only it will be considered the possible occurrence of an indirect negative impact, local, of permanent duration and of reduced magnitude of visual changes caused by surrounding the Chapel of Our Lady of the Assumption, because of the presence of elements of the Power Station. This impact, however, is classified as insignificant because it did not affect the physical stability or spatial perception of the chapel, only manifesting, as has been said, by the future presence of a foreign element in the visual horizon of the chapel, which is situated atop a hill dominating the landscape.

The distance to the chapel of Our Lady of the Assumption also helps to mitigate this impact, considering there is no need for application of mitigation measures.

However, and although there are no known evidence that this is an area of archaeological potential, given that the project includes earthmoving, such as earthwork in the Station area, construction of a new access road, an extension of gas and a small change of power line, interventions that entail some intervention in the basement, albeit on a small scale, will be necessary to ensure the identification of any possible archaeological find during construction, to ensure their preservation and assess the need for adjustment of the work and archaeological research that may be required in this situation. The responsibility for recording and reporting any findings that might occur should be supervision of work, should be noted the eventual appearance of bones, remains of tools or evidence of buried structures such findings should be reported to provincial authorities responsible for heritage culture so that they can be evaluated by experts in time.

6.11 Landscape

6.11.1 Introduction

The impacts of the project on the landscape are caused by construction activities and the presence of Station and infrastructure that are not buried (road access and air transmission line to 110 kV).

6.11.2 Construction Phase

Construction activities (construction yard, presence of machinery, and personal, and dust emissions) represent a negative but temporary and low magnitude impact. As such it can be classified as insignificant.

Mitigation Measures

- This impact can be minimized through the compliance of the environmental management measures to the construction yard (see Environmental Management Plan - Chapter 8), reducing disorganized look that sometimes
6.11.3 Operation Phase

Regarding Power Station is located in the landscape Subunit UP1B, not visible from the EN 4. This subunit has a scenic value and average visual quality, especially due to the extensive nature of the vegetation cover, and medium absorptive capacity as well. Indeed, the Station will have a very small number of observers, because it is not visible from EN4 or the Ressano Garcia village. Its observation from the Chapel of Our Lady of the Assumption will also be sporadic, as this chapel is used infrequently.

Its neighborhood to the PRS -1 Station of the MGC pipeline also contributes to dilute the negative impact of the presence of the new facility.

The reduced extension of the access road 91.4 km in length) and airline (about 1000 m, with a very small number of posts (it’s foreseen up to 5), leads to its visual impact can be classified as insignificant.

**Mitigation Measures**

The main mitigation measures of negative impacts on the landscape are:

- Maintenance of the road access slopes in order to avoid possible erosion phenomenon;
- Adequate maintenance of physical space of the Power Station.

### 6.12 Matrix impacts synthesis

**Table 14: Matrix impacts synthesis for the construction phase**

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Impact</th>
<th>Nature 1</th>
<th>Incidenc e 2</th>
<th>Likely to occur 3</th>
<th>Durati on 4</th>
<th>Extensio n 5</th>
<th>Reversibilit y 6</th>
<th>Magnitur e 7</th>
<th>Overa ll rating 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>Greenhouse effect</td>
<td>-</td>
<td>Direct</td>
<td>certain</td>
<td>Permanent</td>
<td>Supra national</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignficant</td>
</tr>
<tr>
<td>Geology</td>
<td>Geotechnical</td>
<td>-</td>
<td>Direct</td>
<td>certain</td>
<td>Permanent</td>
<td>local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignficant</td>
</tr>
<tr>
<td>Geomorpholo gy</td>
<td>Lang topology change</td>
<td>-</td>
<td>Direct</td>
<td>certain</td>
<td>temp orary</td>
<td>local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignficant</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil erosion change</td>
<td>-</td>
<td>Indirect</td>
<td>certain</td>
<td>temp orary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignficant</td>
</tr>
<tr>
<td></td>
<td>Soil contaminati on</td>
<td>-</td>
<td>Direct</td>
<td>likely</td>
<td>temp orary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignficant</td>
</tr>
<tr>
<td>Water</td>
<td>Water quality</td>
<td>-</td>
<td>Direct</td>
<td>Likely</td>
<td>temp orary</td>
<td>Local and</td>
<td>Reversible</td>
<td>Reduced to</td>
<td>Insignficant</td>
</tr>
</tbody>
</table>

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
<table>
<thead>
<tr>
<th>Subject</th>
<th>Change</th>
<th>Direct</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biologic environment</td>
<td>change</td>
<td>Direct</td>
<td>Reversible to medium</td>
</tr>
<tr>
<td>Vegetal coverage</td>
<td>change</td>
<td>Direct</td>
<td>Reversible</td>
</tr>
<tr>
<td>Sound environment</td>
<td>change</td>
<td>Direct</td>
<td>Reversible to medium</td>
</tr>
<tr>
<td>Air quality</td>
<td>change</td>
<td>Direct</td>
<td>Reversible to medium</td>
</tr>
<tr>
<td>Socioeconomic aspect</td>
<td>change</td>
<td>Direct</td>
<td>Reversible</td>
</tr>
<tr>
<td>Existing infrastructure</td>
<td>change</td>
<td>Direct</td>
<td>Irreversible</td>
</tr>
<tr>
<td>Wellfare for neighborhood</td>
<td>change</td>
<td>Indirect</td>
<td>Reversible to medium</td>
</tr>
<tr>
<td>Cultural heritage</td>
<td>change</td>
<td>Direct</td>
<td>Insensitive and irrelevant</td>
</tr>
<tr>
<td>Landscape aesthetics</td>
<td>change</td>
<td>Direct</td>
<td>Insensitive</td>
</tr>
</tbody>
</table>

1. Positive (+) or negative (-).
2. Direct (D) or indirect (I).
3. Certain (C) Very Likely (MP), likely (P), unlikely (PP), uncertain (I).
4. Temporary (T) or Permanent (P)
5. Timely (P), location (L), Regional (R), National (N) or supra-national (SN)
6. Reversible (R) or Irreversible (I)
7. Reduced (R), Medium (M) or High (E).
8. Insignificant (PS), Significant (S) or Very Significant (MS).
Table 15: Matrix impacts synthesis of the operating phase

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Impact</th>
<th>Nature 1</th>
<th>Incidence 2</th>
<th>Likely to occur 3</th>
<th>Duration 4</th>
<th>Extensio n 5</th>
<th>Reversibilit y 6</th>
<th>Magnitude 7</th>
<th>Overall rating 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>Greenhouse effect</td>
<td>-</td>
<td>Direct</td>
<td>Certain</td>
<td>Permanent</td>
<td>Supranational</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Soil</td>
<td>Soil contamination</td>
<td>-</td>
<td>Direct</td>
<td>Likely</td>
<td>Temporary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Water resources</td>
<td>Water quality change</td>
<td>-</td>
<td>Direct</td>
<td>Likely</td>
<td>Temporary</td>
<td>Local and regional</td>
<td>Reversible</td>
<td>Reduced to medium</td>
<td>Insignific ant and irrelevant</td>
</tr>
<tr>
<td>Biologic environment</td>
<td>Birds</td>
<td>-</td>
<td>Indirect</td>
<td>Likely</td>
<td>Permanent</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Sound environment</td>
<td>Noise level change</td>
<td>-</td>
<td>Direct</td>
<td>Certain</td>
<td>Temporary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Air quality</td>
<td>Air quality change</td>
<td>-</td>
<td>Direct</td>
<td>Certain</td>
<td>Temporary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Socioeconomic aspect</td>
<td>Local work opportunity</td>
<td>+</td>
<td>Direct</td>
<td>Certain</td>
<td>Temporary</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td></td>
<td>Energy capacity</td>
<td>+</td>
<td>Direct</td>
<td>Certain</td>
<td>Permanent</td>
<td>Local</td>
<td>Irreversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td></td>
<td>Commercial/industrial interest</td>
<td>+</td>
<td>Direct</td>
<td>Certain</td>
<td>Permanent</td>
<td>Supranational</td>
<td>Reversible</td>
<td>Reduced</td>
<td>significant</td>
</tr>
<tr>
<td></td>
<td>Well fare for neighbourho od families</td>
<td>-</td>
<td>Indirect</td>
<td>Certain</td>
<td>Permanent</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
<tr>
<td>Cultural heritage</td>
<td>Archaeological interest</td>
<td>-</td>
<td>Direct</td>
<td>Unlikely</td>
<td>Permanent</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant and irrelevant</td>
</tr>
<tr>
<td>Landscape</td>
<td>aesthetics</td>
<td>-</td>
<td>Direct</td>
<td>Certain</td>
<td>Permanent</td>
<td>Local</td>
<td>Reversible</td>
<td>Reduced</td>
<td>insignific ant</td>
</tr>
</tbody>
</table>
6.13 Cumulative impacts

Cumulative impact means an impact, direct or indirect, of the project to which are added other impacts, direct or indirect, other projects or past, present or reasonably foreseeable future actions.

In table presents a summary of the identified cumulative impacts during the operation phase, ordered according to their analysis in this chapter of the EIA. During the construction phase no cumulative impacts were identified.

**Table 16: Cumulative impacts of the Power Station project of Ressano Garcia, during the operation phase**

<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Identified impacts</th>
<th>Other existing projects or foreseen</th>
<th>Sense and Meaning of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomorphology</td>
<td>Landfill and excavations</td>
<td>✓ Pressure Reduction Station (PRS1) of MGC pipeline ✓ Future industrial and storage development</td>
<td>Negative insignificant</td>
</tr>
<tr>
<td>Ecology</td>
<td>Habitat affectation Fauna discomfort</td>
<td>✓ Future industrial and storage development</td>
<td>Negative insignificant</td>
</tr>
<tr>
<td>Noise</td>
<td>Noise level Rail and road traffic</td>
<td>✓ Future industrial and storage development</td>
<td>Negative Significant</td>
</tr>
<tr>
<td>Socioeconomy</td>
<td>Job creation</td>
<td>✓ Future industrial and storage development</td>
<td>positive insignificant</td>
</tr>
<tr>
<td>Landscape</td>
<td>Presence of industrial structures</td>
<td>✓ Power transmission lines ✓ Pipeline and PRS1 ✓ Future industrial and storage development</td>
<td>Negative insignificant</td>
</tr>
</tbody>
</table>
6.1 Border Impacts

Border impacts of a project located in a particular territory are those that having originated from that project affect the territory of another jurisdiction, in general other country. In this case, it is considered as the border impacts that may affect the territory of South Africa.

With regard to air quality, the estimated values of the concentrations of NOx are within legal limits in force in Mozambique and in South Africa but are higher and may represent a significant impact. As such, it was suggested a program for monitoring air quality in an area of 10 x 10 km, being part of this area in the territory of South Africa.

The project has no other negative border impacts.

7.1 BUSINESS RISK ANALYSIS AND EMERGENCY PLANS IN CASE OF SERIOUS ACCIDENT

This chapter aims to identify the risks associated with construction activities and operation of the Power Station of Ressano Garcia and define the actions to be taken in case of accident, defining their respective responsibilities.

The possible risk situations may be associated with activities involving handling of gases and/or flammable substances. However, if met all safety procedures as well as environmental specifications of PGA (chapter 8) reduces the possible accidents.

Yet there may be environmental risks associated with leakage or spillage of pollutants such as fuels, oils or lubricants. These risks are also minimized without complied with Environmental Specifications listed in PGA (chapter 8).

Possible hazardous conditions may be specifically associated with:

a. Risk of gas leakage and/or explosion
   The risk of gas leakage may be associated with new connections of gas pipes either the pipeline or interconnection between generators. In the case of major leaks occur, and since the gas can be inodorous and so be unnoticed and therefore, their combination with flames may result in explosions that may be small or large depending on the amount of gas involved. The risk activities are associated with both the construction phase and the operation phase, and to minimize these risks a security plan and strict maintenance should be implemented.

b. Fire risk
   The fire risk during the construction phase may be associated with the handling of flammable substances such as petroleum products, or welding activities. This risk is likely to worsen and that it is a station gas-powered and for that reason there will always be flammable substances. It is foreseen that this risk can be reduced if proper precautionary measures provided for in the Good Practice handling flammable products and construction are applied.
7.1 Emergency plan in case of a serious accident

Although the risks may significantly reduce the security measures and all Environmental Specifications it is necessary that response strategies in case of accidents and these should be planned and implemented correctly if needed.

The main objectives of the response strategy for the construction activities are:

- Ensure the employees safety directly involved in the activities of construction and ensure security and protection of natural area where the project lies;
- Minimize the possibility of spills through the adoption of precautionary measures;
- Reduce the possibility of the leakage of fuel, lubricating oils in cases in which are risks of contamination of the waters and soils;
- Contain the leakage through the building of tanks and retention basins in work areas;
- Drain fluids from cleaning areas and fuel, lubricants and oils supply to machines and vehicles, with decants basin which subsequently separate and deposit them in sites suitable for this purpose.
- In the event of occurrence of activities that result in larger-scale inflammable product leaks there should be coordination between police, firefighters and local authorities to ensure rapid intervention to hold the leakage.
- Keep strict maintenance of equipment according to the specifications of the supplier.

The strategy to choose will depend on its applicability, availability of leakage and the appropriateness of each of these options.

The response strategy that will be taken in the event of occurrence of a leak of hydrocarbons for example, will depend on a number of factors such as:

- The extension and characteristics of leakage;
- The environment in which the leak occurred;
- In its claimed effect to the environment;
- Other factors of the incident and meteorological conditions, and
- Maintenance of the activities equilibrium of environmental sensitivities in the evolution and route of leak.

Regardless of any responses strategy to implement should be applied the principle of Best Practices/ Available Technologies without imposing Excessive Costs.

For small operational spills from equipment, this should be immediately solved by removing the affected soil. Any incident should be reported to the competent authorities. Among the answer
choices, absorbent materials and retention walls may be used. Workers should be trained on the proper way to use the equipment and respond immediately after the spill is detected.

ECOMOZ must contain a contingency plan for their internal activities and follow the principles set out in the National Contingency Plan Oil Spill of Mozambique.

7.2 Prevention

Prevention measures are considered most important for contingencies of accidents and environmental hazards. Some preventive measures recommended in the EIA and EMP includes the following:

a. Correct Handling Products - The Contractor shall take into account the environmental quality standards and emission of effluent specified in Decree 18/2004.

b. Appropriate storage of toxic product - it is strictly prohibited the workers of the contractor to store any substance sensitive of contaminating soil (such as oils) or solid waste.

c. Appropriate storage of solid waste – solid waste generated by the contractor will be stored in an approved location OCA and local authorities - as described in the terms of the Contractor contract.

d. Fire plan - The Contractor shall follow the measures established in the PGA and provide firefighting equipment and adequate quantities in order to retain fire promptly.

e. Supply of vehicles and equipment in an appropriate place - supply of vehicles and equipment involved in the work should be done in a suitable place for that purpose, furnished with retention basins or other mechanisms of leaks or spills retention.

7. Communications, duties and responsibilities during construction activities / installation

Regulatory agencies
The MICOA is responsible for monitoring, inspection and review before, during and after the implementation of the project (according to Decree 45/2004). MICOA Government agencies are also responsible for handling and management of waste, emissions and wastewater.

Local Authorities are responsibility for ensuring safety on the road and through the monitoring and enforcement of the regulations in force in Mozambique.

Fire National Institute, is responsible for intervention in case of fires or other accidents, to minimize the loss of life and infrastructure.

Roles and Responsibilities
ECOMOZ, is responsible for managing the construction of the power station of Ressano Garcia, promote integration, participation and empowerment to PI&A. As a general responsibility for
conducting the project, ECOMOZ shall ensure that all construction activities are performed safely and in accordance with the measures proposed in the EMP for projects and Contingency Plan.

To this purpose ECOMOZ shall conduct several inspections performed by an independent consultant, and provide reports to enable monitoring and evaluating contractor performance and compliance of safety measures during the construction phase.

ECOMOZ shall submit a report to MICOA at the end of the construction phase.

In case of leakage or fire ECOMOZ should bear responsibility for the disclosure of all incidents to MICOA and other PI&A, the civil alert authorities and other companies or organizations, if needed.

The Contractor shall be qualified to implement the recommendations made in the EIA and EMP. The Contractor shall comply with the requirements of the EMP and be expected to demonstrate the commitments on the PGA recommended at all levels in their own governance structure. The Contractor shall have its supporting equipment and emergency planning and response in case of a leak or fire incidents and ready for immediate use.

The Contractor shall be responsible for all environmental, health and safety during operations and train their employees to ensure they are fully qualified and enough to respond in the event of an emergency experience. The Contractor shall conduct regular environmental, health and safety inspections and provide reports of work to ECOMOZ so that it can assess its performance measures and targets imposed by the EIA and EMP.

7.4 Communication

In the event of occurrence of leakage and/or fire, the Contractor and/or ECOMOZ should properly respond all the details of the incident to the local authority. The Contractor and ECOMOZ shall designate people responsible for communication with related institutions.

8. Environmental Management Plan (EMP)

8.1 Introduction

This Environmental Management Plan (EMP) includes the measures required to prevent and minimize the pollution (liquid effluents and wastes), as well as the negative social impacts of the construction phase. The EMP also includes generic measures that match best practice project management in order to contribute to good environmental and social performance of the same.

In order to facilitate the implementation of the EMP responsibilities and forms of enforcement measures are defined.
The PGA can be adapted to the reality of the project, including new measures however considered relevant.

The EMP should be a dynamic updating whenever significant changes occur in assumptions or methodologies of the project document.

8.2. Objectives
The PGA presents itself as a dynamic document supporting the achievement of the following objectives:

- ensure compliance with applicable measures to mitigate negative impacts, strengthen positive impacts and best management practices of the project, contributing to good environmental and social performance of the same;
- ensure compliance with legal requirements applicable;
- Facilitate the process of project environmental monitoring through the definition of responsibility and control procedures, ensuring that requirements are met the good performance of the project.

8.3. Organizational Structure and Management
The project environmental management is under responsibility of the Proponent (ECOMOZ) and the Contractor. Some management measures require the cooperation of the administrative post of Ressano Garcia and the Ministry for Coordination of Environmental Affairs (MICOA), within its legal powers.

It relies on ECOMOZ, as project Proponent:

- To contact an independent Environmental Audit with capacity to oversee the proper implementation of the EMP by the contractor and liaise with local authorities and communities
- To promote dialogue among the various entities involved, as well as the general public, including responding to any complaints and contacts recorded in the Office of Public Service (GAP);
- To monitor and evaluate the implementation of the EMP, ensuring regular communication with the Contractor, by regular visits to the work, reviewing and commenting on documents produced under the project monitoring;
- To perform the proper resettlement of people and/or agricultural infra-structures/field affected should fully compensate all houses, farms or other disturbed overall infrastructure
- Indicate to the contractor, along with the Environmental Audit, places for temporary and permanent collection of waste (building materials, toxic, polluting products);
- inform and sensitize all stakeholders in the operation phase of the project to the importance of proper implementation of the mitigation measures set out in the EMP, including a campaign to raise awareness about safety and health (particularly HIV/AIDS);
It is under the responsibility of the Environmental Fiscal/Inspector:

- Know the contents of the EMP;
- Ensure proper implementation of existing legislation;
- Coordinate with the contractor on the recruitment of local staff;
- Inform, in coordination with the proponent, the population directly or indirectly affected by the activities of the work on the main features of the project, also including awareness campaigns on safety in work and public health (particularly HIV/AIDS);
- Indicate to the Contractor, together with the proponent, the temporary and permanent collection places of waste (construction materials, toxic products, polluting products);
- Coordinate with the proponent, the Provincial Directorate of Environmental Coordination of Maputo (DPCA - Maputo) and the administrative authority of Ressano Garcia aspects related to intervention areas of the executive bodies.

The Contractor is responsible for:

- Indicating the project environmental monitoring team and submit it for approval by the proponent;
- Applying measures set in the EMP, as well as others that may be deemed necessary by the proponent to ensure good environmental performance of the project;
- Implementing a system of environmental records (column "operational control" of the table 17) consisting of documents to monitor the project progress, contacts with authorities and other stakeholders, the implementation of measures to minimize the occurrence of any difficulties or accidents and how they were overcome;
- Ensuring proper implementation of existing legislation;
- Informing and sensitize all stakeholders in the work of the importance of proper implementation of the mitigation measures set out in the EMP, including a campaign to raise awareness of work safety and public health (particularly HIV / AIDS);
- Ensuring open and regular communication with the proponent, reporting difficulties in implementing the EMP and learn of any recommendations for improving environmental performance of the project.

8.4 Environmental specifications

Table 17 defines procedures of application (operationalization activities) and verification (operational control) of the measures to minimize the identified negative impacts and maximize positive impacts. It also defines the entities responsible for implementing the measures and the place to which they relate. The table also includes the project phase, this statement corresponds to the timing of implementation of the measures.

The measures are numbered in order to facilitate its operational control, according to the following naming:
- GEN(measure related to generality of environmental factors);
- QAR(measure related to the environmental factor, Air Quality);
- AS(measure related to the environmental factor, Sound Environment);
- GGS(measure related to the environmental factors, Geology, Geomorphology and Soils);
- H (measure related to the Environmental factor, Hydrology);
- E (measure related to the Environmental factor, Ecology);
- IF (measure related to the Environmental factor, Socioeconomic);
- PC (measure related to the Environmental factor, Cultural Heritage)

Certain measures may be related to more than one environmental factor, but not be sufficiently comprehensive to be included in the naming GEN.

In these cases, we chose to indicate the measure with the naming of the most important environmental factor in order to avoid repetition across the table.

Note that the measures set out in the following table should be supplemented and adjusted to specific situations of the project work, adjustments of the project in work and unforeseen situations, resulting or not from complaints.

[Table 17]

8.5 Program of awareness and environmental training

The training will be directed at all stakeholders in this enterprise/company during project operating phase. It will also include managers, as to draw attention to the importance of carrying out various activities with environmental conscience, in a preventive perspective.

These actions should include reference to:

- The global EMP;
- The main environmental impacts associated with project development;
- The procedures to be applied, their responsibilities and associated documents of control;
- The possible environmental consequences of not complying with the EMP procedures;
- The care to prevent risks associated with the contraction and spread of HIV / AIDS and other
- Sexually communicable diseases;
- The prevention against cholera and malaria.
In order to keep this information, the Contractor shall create and maintain for its employees environmental information posters on HIV / AIDS and other sexually transmitted diseases, as well as posters on environmental information. The Environmental Fiscal/Inspector should monitor and assist in the preparation of all training activities.

To be most effective, these actions should be performed before the start of the contract/enterprise and on monthly basis, in a preventive perspective, and also during the operation phase, in order to ensure that all stakeholders in the project are aware of EMP procedures. Training can also be held whenever environmental accidents, a change of procedures and working methods in the phases of construction or operation, new equipment or personnel, or whenever significant changes in legislation and regulations applicable occur.

If possible, the awareness and environmental training should be conducted in the language of the workers.

A list of attendance should be filled up in these awareness-raising and environmental training, to be kept by the Contractor;

8.6 Competence and logistics

The contractor and the proponent, respectively, during the construction and operation phases, must have appropriately qualified teams to implement the EMP.

They should also have proper equipment to respond to emergencies and accidents, which should be easily accessible for immediate use and in good working condition.

Emergency contact (Table 18) should also be available, being located in a visible place and easily accessible.

Table 18 – Emergency Contacts

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Phone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICOA – Ministry for Coordination of Environmental Action</td>
<td>21492403</td>
</tr>
<tr>
<td>Ecomoz</td>
<td>21759141</td>
</tr>
<tr>
<td>Provincial Directorate for Coordination of Environment in Maputo (DPCA – Maputo)</td>
<td>21721842</td>
</tr>
<tr>
<td>Fire Brigade Service of Maputo</td>
<td>21322222/800198198</td>
</tr>
</tbody>
</table>
Both officials/institutions responsible for the project must provide their employees with the proper training to develop their activities under the project and respond to emergencies.

In relation to emergency response, some training sessions should be provided, which may be linked with the awareness and training sessions on the EMP (GEN1 Measure as the Table 17). Training for response to emergency situations should be organized by level of response required of all hierarchical levels of stakeholders in the project.

8.7 Management and monitoring

8.7.1 Monitoring of EMP

The monitoring, verification and evaluation of the implementation of environmental specifications defined in Chapter 8.4 allow monitoring of the EMG, and therefore, of the environmental performance of the project, in its phases of construction and operation.

In the construction phase, from the three entities referred to in section 8.3, the Contractor shall be primarily responsible for monitoring the implementation of environmental specifications outlined in the EMP. Thus, the Contractor shall:

- Daily inspect the work fronts and yard;
- Register the compliance (or not) of the environmental specifications in its Operational Control Form, including the photographic record of the most significant occurrences describing any accidents or problems that have arisen;
- Act, as soon as possible, to correct any incidents or aspects which do not conform with the provisions of EMP, seeking assistance from the Environmental Fiscal/Inspector, if necessary and always with the authorization of the Proponent;
- Collect all the documentation associated with the implementation of the EMP, as stated in Table 17.

- A copy of the information provided in awareness and training for workers;
- Record of attendance at training and awareness;
- Proof that these entities are licensed to supply combustible or toxic materials;
- Registration of waste management, according to paragraph h), no.1, Article 9 - Decree 13/2006 of 15th June;
- Copy of review of vehicles and equipment;
- A copy of public enlightenment;
- Attendance at meetings for clarification of the population;
- Form of register of complaints, which shall include the date, the complaint itself and the whole process of response to this situation;
- Copy of information relating to public health risks;

Natural Gas Power Plant Project of Ressano Garcia – Phase 1
Environmental Impact Assessment Report, October 2008
• Compile the records of operational control and documentation referred to in the preceding paragraph, for example in a file, and evaluate the information contained in these documents elaborating a monthly progress report;

• A weekly update the proponent on the development of the application of the EMP, through meetings or a verbal report;

• Provide to the Proponent with progress reports and, in conjunction with the Environmental Fiscal/Inspector, compile a final report summarizing the activities of construction, possible accidents and solving methodology.

The Environmental Fiscal/Inspector shall:

• Monitor the EMP implementation and suggest its update whenever it is considered relevant;

• Check workers' knowledge about the measures included in the EMP and monitor training;

• Liaise with communications and the existing local authorities, to ensure knowledge of the concerns and resolve any complaints related to the project;

• Accompany/follow the Contractor on materials and techniques whenever requested;

• Report to the Proponent all the possible failure of the EMP;

• Monitor the Proponent and the local and national authorities in visits to project areas;

• Monitor the proper rehabilitation of the project area, particularly the hilly areas;

• Review and approve the Progress Reports made by the Contractor;

• Participate actively in preparation of the final report, together with the Contractor, to be delivered to MICOA.

The Proponent shall:

- learn about the progress of the EMP implementation, being available to contact the Contractor and receive update of the process of EMP implementation and Progress Reports;

- Inspect the EMP implementation process independently and at lower frequency than the Contractor, updating themselves on the possible need for adjustment of the procedures;

- articulate contact between the Contractor and other entities, such as the administrative authority of Ressano Garcia, so as to speed up the implementation of certain environmental specifications;

- review, approve and deliver a Final Report to MICOA that contain the summary of construction activities, which included possible accidents and solving methodology.

In the operation phase, the Proponent will have primary responsibility for monitoring the implementation of the EMP measures. At this stage, the Proponent shall:
- Carry out inspections, at appropriate intervals, of activities of the project operation phase, assessing its suitability for the EMP;

- Register compliance (or not) of the environmental specifications in its Operational Control Form, including photographic record of the most significant occurrences and describing any accidents or problems that have arisen;

- Act, as soon as possible, to correct any incidents which are not in conformity with the provisions of EMP, seeking help from entities such as the administrative authority of Ressano Garcia, if necessary;

- Collect all the documentation associated with the application of the EMP:
  
  - A copy of the information provided in awareness and training for workers;
  - Record of attendance at training and awareness;
  - Proof that these entities are licensed to supply combustible and toxic materials;
  - Registration of waste management, according to h), n-1, Article 9 - Decree 13/2006 of 15 June;
  - Copy of review of documents on vehicles and equipment;
  - Copy of information relating to public health risks;
  - Compile Operational Control Forms/sheets and documentation referred to in the preceding paragraph, for example in a file, and evaluate the information contained in these documents elaborating a monthly progress report, including possible future guidelines;
  - Prepare brief annual reports that summarize the evolution of the operation phase, including discussion of any environmental accidents however recorded and the procedure applied for its resolution.

8.7.2 Monitoring plan

In order to facilitate operational control of the measures included in Table 17, the following table presents parameters to be evaluated (indicators) for each of the measures. The evaluation of these parameters will conclude on the appropriate application (compliance) or inadequate application (non-compliance) measures.

<table>
<thead>
<tr>
<th>Perioicity</th>
<th>Measure (Table 17)</th>
<th>Indicator</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the start of work</td>
<td>GEN2</td>
<td>Noise levels, presence of dust (affectation of population)</td>
<td>Confirmation that the yards and fixed equipment are not located in populated areas, schools, places of worship or areas</td>
</tr>
<tr>
<td>Periodicity</td>
<td>Measure (Table 17)</td>
<td>Indicator</td>
<td>Methodology</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Before the start of work</td>
<td>SE4</td>
<td>Relationship with the local community</td>
<td>Checking of recruitment conditions Direct observation of conducting training sessions</td>
</tr>
<tr>
<td>Before the start of construction</td>
<td>SE7</td>
<td>Relationship with the local community</td>
<td>Direct observation of the areas to be affected and of replacement areas Verification of the occurrence of claims</td>
</tr>
<tr>
<td>Before the start of the work Daily</td>
<td>GEN6</td>
<td>Solid Waste</td>
<td>Checking the conditions of storage of the waste produced, including: - Presence of delineated areas by type of waste; - Use of airtight containers for dangerous products; - Signs of storage areas; - Presence of impermeable and covered areas for handling hazardous substances; - Existence of spots that could indicate the occurrence of leakage; - Need to replace the waste storage container.</td>
</tr>
<tr>
<td>Before the start of the work Daily</td>
<td>SE2</td>
<td>Relationship with the local community</td>
<td>Verification of the occurrence of complaints/claims and their settlement</td>
</tr>
<tr>
<td>Before the start of the work Daily</td>
<td>SE3</td>
<td>Relationship with the local community</td>
<td>Direct observation of the relationship with the local community</td>
</tr>
<tr>
<td>Periodicity</td>
<td>Measure (Table 17)</td>
<td>Indicator</td>
<td>Methodology</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Before the start of the work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>SE6</td>
<td>Health conditions</td>
<td>Direct observation of the availability of water, toilet paper and washbasin to the workers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Verification of the information provided on public health risks</td>
</tr>
<tr>
<td>Before the start of the work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td>GEN3</td>
<td>Combustible or toxic materials</td>
<td>Verification of the source of combustible or toxic materials</td>
</tr>
<tr>
<td>Before the start of the work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td>SE1</td>
<td>Relationship with the local community</td>
<td>Verification of information provided to clarify the population</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Verification of the occurrence of complaints/claims</td>
</tr>
<tr>
<td>Before the start of work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortnightly</td>
<td>GEN10</td>
<td>Spills</td>
<td>Verification of the effectiveness of measures to contain spillage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Direct observation of patches of dangerous substances</td>
</tr>
<tr>
<td>Before the start of work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly</td>
<td>GEN11</td>
<td>Access Network s</td>
<td>Direct observation of the paths chosen for the access networks associated</td>
</tr>
<tr>
<td>Before the start of work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the start of operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>phrase</td>
<td>GEN1</td>
<td>Training and environmental awareness</td>
<td>Checking of list of attendance at training and awareness and information provided in these actions</td>
</tr>
<tr>
<td>Periodicity</td>
<td>Measure (Table 17)</td>
<td>Indicator</td>
<td>Methodology</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Daily</td>
<td>GEN4</td>
<td>Solid Waste</td>
<td>Direct observation of the existence of waste on traffic routes</td>
</tr>
<tr>
<td>Daily</td>
<td>GEN5</td>
<td>Solid waste and effluents</td>
<td>Direct observation of the existence of waste or discharge of effluent in the area of the project. Checking the conditions of use of chemical sanitories</td>
</tr>
<tr>
<td>Daily</td>
<td>GEN7</td>
<td>Solid Waste</td>
<td>Checking the suitability of the destination of solid waste and effluents</td>
</tr>
<tr>
<td>Daily</td>
<td>GEN8</td>
<td>Soils, water and air Contamination</td>
<td>Verification of implementation of security measures</td>
</tr>
<tr>
<td>Daily</td>
<td>GEN12</td>
<td>Aesthetic Solid Waste</td>
<td>Checking on the conditions of organization and cleaning</td>
</tr>
<tr>
<td>Daily</td>
<td>AS1</td>
<td>Working hours</td>
<td>Direct observation of the time of realization of the noisiest activities</td>
</tr>
<tr>
<td>Daily</td>
<td>E1</td>
<td>Copies trees and shrubs</td>
<td>Direct observation of the allocation of specimens of trees and shrubs</td>
</tr>
<tr>
<td>Daily</td>
<td>SE5</td>
<td>Safety conditions</td>
<td>Direct observation of the yard fence, the availability and use of personal safety equipment, removing combustible materials from worksites and the</td>
</tr>
<tr>
<td>Periodicity</td>
<td>Measure (Table 17)</td>
<td>Indicator</td>
<td>Methodology</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>presence of safety signs</td>
<td>Checking of the availability and use the first aid kit and combating emergencies and accidents. Verifications of the absence of people carrying firearms or under the influence of drugs or alcohol.</td>
</tr>
<tr>
<td>Daily (dry season) Weekly(rain season)</td>
<td>QAR1</td>
<td>Dust</td>
<td>Direct observation of the presence of dust and their effects on buildings, crops and vegetation</td>
</tr>
<tr>
<td>Daily (dry season) Weekly(rain season)</td>
<td>GGS1</td>
<td>Soil Erosion</td>
<td>Direct observation of the existence of ravines</td>
</tr>
<tr>
<td>Daily (dry season) Weekly(rain season)</td>
<td>H1</td>
<td>Drainage</td>
<td>Observation of water flow conditions</td>
</tr>
<tr>
<td>Weekly</td>
<td>GEN9</td>
<td>Spills</td>
<td>Direct observation of patches of dangerous substances</td>
</tr>
<tr>
<td>Weekly</td>
<td>GGS2</td>
<td>Soil Plant species</td>
<td>Assessment of the use of the topsoil and replanting of native species Verification of the conditions of decompression and aeration of the soil</td>
</tr>
<tr>
<td>Periodicity</td>
<td>Measure (Table 17)</td>
<td>Indicator</td>
<td>Methodology</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------</td>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Monthly</td>
<td>QAR2</td>
<td>Atmospheric Poluents</td>
<td>Conducting reviews of vehicles and equipment assigned to the project (with special focus on the longer life)</td>
</tr>
<tr>
<td>In the event of spillage</td>
<td>GEN13</td>
<td>Spills</td>
<td>Production of the report on the occurrence of Spillage</td>
</tr>
</tbody>
</table>

With respect to air quality is also worth mentioning that in the area surrounding the central deployment there are currently no monitoring data.

Thus, it is suggested to implement a timely air quality monitoring program with the use of passive samplers, which allow the monitoring of air quality levels.

Such monitoring should be carried out before and after the commissioning of the Central Ressano Garcia, in an area of 10x10 km with a central downtown, including analyzing the pollutants NO2 and O3.

8.7.3 Compliance with EMP

It is considered that those responsible for EMP implementation do not comply with it if:

- there is evidence of non-compliance with environmental requirements or corrective action in time of incidents, in the area affected by the project or its surroundings;
- Environmental damage result due to negligence;
- Corrective instructions were not incorporated or otherwise, duly justified, to improve the environmental performance of the project.

8.7.4 Tolerance
The development of the project should be guided by tolerance to environmental issues, this is to say that, they must be incorporated from the beginning and continuously into all activities of the construction phase and operation of the project, ensuring the development of the project with environmental awareness.

In this context, it is required to the accountable officials for both phases to obey the environmental management of the project, using specifications that allow good environmental performance of the project, as well as control on how these procedures are applied.