

**Scoping and Preliminary  
Environmental and Social Risk Assessment Report**

**GS CIMENTOS CEMENT FACTORY AND LIMESTONE MINE,  
MOZAMBIQUE**

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## EXECUTIVE SUMMARY

### INTRODUCTION

The overall project consists of an integrated cement plant with a capacity of 1500 tons per day (tpd) of clinker for conversion to cement using limestone as the primary raw material. The limestone will be obtained from a quarry to be developed as part of the project in the Salamanga Formation, a proven limestone resource with two existing quarry operations in proximity to the proposed quarry site (80km south of Maputo), and will select one for exploitation. Approximately two truck loads per day of Gypsum will be brought in by road from Richards Bay. Other balancing additives like clay and silica are available within a 100 km radius of the site. The limestone reserves are suitable for 100 years of operation.

The proposed plant can be expanded to 3000 tpd capacity, as all the critical input requirements will be available. However, this environmental assessment only covers the base case of 1,500 tpd. The plant's location in the Beluluane Industrial Park (Boane Dist; Maputo Province) is based on market, raw material and fuel and power availability.

The dry process for manufacture of cement will be used. In this process mined limestone is fed into crushers for preparation of the raw meal. The raw meal is then fed into pre-heaters which will calcine the raw meal which is then fed into the kiln. The output from the kiln is clinker which is cooled to ambient temperatures in coolers. (Further details are provided in section 3.3). Ordinary Portland Cement (OPC) is will be produced from the plant in three grades (grades 32.5, 42.5 and 52.5), graded to South African Standards. Grades of 32.5 and 42.5 will be produced to stock and will be available to customers as an off-the-shelf item. Grade 52.5 will be produced as per the orders of customers. After the third year of operations, clinker capacity may be expanded and clinker may be sold in Mozambique and elsewhere.

The project will be developed by GS Cimentos SARL, a company registered in Mozambique. The cost is estimated at around USD 120 Million, with financial equity provided by the Sumaria Group and debt finance from Development Funding Institutes lead by the German Development Bank, DEG.

### STUDY AREA

The cement plant will be located at the Beluluane Industrial Park, District Boane, Maputo Province, Mozambique. This site is approximately 15km from Matola Port, a few hundred meters north east of the Mozal plant and immediately west of the Matola River. The site is 60ha in extent, being roughly 700m x 700m, with a smaller triangular portion to the east adjacent to the river.

It is important to note that the Beluluane Industrial Park (BIP) is located on a concession awarded by the Government of Mozambique which decrees that the land inside the park is regarded as private land and therefore no communities are allowed to settle in this area.

The site consists predominantly of degraded Miombo Savannah, as it has previously been used for subsistence agriculture. Most of the woody vegetation has therefore been cleared, and the area is dominated by relatively open grassland with scattered shrubs and small trees, many of which have grown from remaining root stock. There is evidence of some subsistence agriculture still undertaken within the park, however no signs of crops planted within the plant area has been identified on the numerous site visits.

GS Cimentos holds three prospecting licenses in the vicinity of Salamanga (license numbers 1169, 1170 and 1171), being 460, 440, 660ha in extent respectively. The exploration licenses were issued in July 2007 and are valid until 8 February 2011. Site 1169 is the northern-most of the three sites, located to the south of the village Bela Vista and west of the Maputo River. License area 1170 is the southern-most site, located immediately south to the village of Salamanga. Site 1171 is located immediately north-east of license area 1170, and both are located on the east side of the Maputo River. The sites are 80km from Maputo, and an unpaved road, the Maputo – Bela Vista – Salamanga – Ponta de Ouro road - runs through the zone, joined in the north by the Bela Vista –

Porto road. A rail network extends up to the Salamanga quarry area and passes along the southern boundary of the proposed plant site at Beluluane. The transportation of limestone from the quarry to the plant site will be via the existing rail network.

Other elements associated with the project include access to electricity as well as water. Grid power will be provided by Electricidade De Mozambique (EDM) from its nearest substation located at a distance of 2.4 kms from proposed plant site, for which a 66 KV line will be constructed by GSC. The power requirement is estimated at 15 MW. The estimated quantity of water required will be 1500 m<sup>3</sup>/day, which will be obtained from groundwater wells, established after carrying out studies to determine the water table and expected yield from the well field.

### NEED FOR A RISK ASSESSMENT

As part of the scoping study for the GS Cimentos project an environmental risk assessment was conducted in order to identify salient impacts and issues that will need to be addressed in the forthcoming environmental social and health impact assessment (ESHIA), which is required to secure environmental authorisation from the Mozambican authorities and funding from the Development Funding Institutes. Social and environmental impacts were assessed at the broader issues level (so called key issues), and a risk assessment scale was used to identify significant project related risks. This methodology provides the necessary information to facilitate decisions relating to the projects environmental and social implications.

The approach involved undertaking a brief reconnaissance level field survey to develop an understanding of the social and ecological setting and describe the affected environment. Based on the field survey, brief descriptions of the various affected areas were prepared. Public and community meetings were also held at two locations in the Salamanga area and in the BIP to identify issues and concerns raised by stakeholders. An internal workshop was then held to identify and assesses significant environmental impacts and risks.

An environmental significance scale, which evaluates the importance of a particular impact, was undertaken using a four-point impact significance scale applied to the identified project impacts. The difficulty of mitigating impacts (mitigation potential) was then assessed, and the relationship between impact significance and mitigation potential was used to assess the risk, based on the matrix below.

Mitigation Potential	Impact Significance			
	Low	Moderate	High	Very High
Very difficult	Medium Risk	Major Risk	Extreme Risk	Extreme Risk
Difficult	Minor Risk	Medium Risk	Major Risk	Extreme Risk
Achievable	Minor Risk	Minor Risk	Medium Risk	Major Risk
Easily achievable	Minor Risk	Minor Risk	Minor Risk	Medium Risk

The implications of these risk categories are as follows:

Risk	Description
Extreme	Significant mitigatory actions would be required to reduce these risks. In some cases it may not be possible to reduce these extreme risks meaning they are likely to prevent the option from being used (raised as red flags in this assessment).
Major	These risks are of a serious nature, and without effective mitigation measures would be major hindrances to the project. These would need to be monitored and managed, and in combination Major risks may necessitate the use of a different option to achieve the projects objectives.
Medium	These risks are of a less serious nature but still important, and need to be reduced to As Low As Reasonably Possible (ALARP) for the benefit of the environment or social network affected. In isolation these risks are generally insufficient to prevent the project from proceeding.
Minor	These risks are generally acceptable to the project and environment, and mitigation is desirable but not essential. Best practice, however, should be followed and the risks mitigated to prevent a cumulative effect of such impacts.

## RESULTS OF THE RISK ASSESSMENT

The following two tables present the result of this assessment for the Cement Plant site and Quarry sites respectively.

### Preliminary Environmental & Social Risk Assessment - Beluluane Industrial Park

Issue/ Impact	Significance Statement	Potential Significance	Mitigation Potential	Risk
<b>PS 1 - Social and Environmental Assessment and Management Systems</b>				
				N/A
<b>PS 2 - Labour and Working Conditions</b>				
In-migration of job seekers	The cement plant will be constructed in a regulated industrial park with existing procedures in place to prevent in-migration.	LOW	Difficult	MINOR
Employment benefits consider as (+ve) as well), as noted in others	Overall the benefit is considered HIGH, especially if expatriates are replaced with local staff might need to be trained. Negative impacts will be of LOW significance.	HIGH (+ve)	N/A	N/A
		LOW	Achievable	MINOR
Occupational Health & Safety	Generally impacts are considered to be of MODERATE significance.	MODERATE	Achievable	MINOR
Working Conditions	Generally impacts are considered to be of MODERATE significance.	MODERATE	Achievable	MINOR
<b>PS 3 - Pollution Prevention and Abatement</b>				
Waste Management (Solid and effluent)	A number of different waste streams (both solid waste and effluent) will be produced, and these have the potential to pollute the environment, especially ground and surface water.	MODERATE	Achievable	MINOR
Changes to Air Quality	At this stage, and in the absence of site specific data, the impacts of changes to air quality are considered HIGH before mitigation.	HIGH	Achievable	MEDIUM
Resource and Energy Consumption	Generally impacts are considered to be of MODERATE significance	MODERATE	Achievable	MINOR
<b>PS 4 - Community Health, Safety and Security</b>				
Increased safety risks to community	No communities live close to the site, and access will be restricted.	LOW	Easily achievable	MINOR
Traffic impacts	An accident event will result in impacts ranging from MODERATE to HIGH, depending on the level of injury, but the likelihood of this event occurring is considered unlikely.	MODERATE to HIGH	Difficult	MEDIUM
				MAJOR
Visual Impacts	It is not anticipated that the project will have moderate visual impacts due to its location within Beluluane Industrial Park and adjacent to the far larger Mozal Smelter and the fact that there	MODERATE	Difficult	MEDIUM

Issue/ Impact	Significance Statement	Potential Significance	Mitigation Potential	Risk
	are also additional planned industrial activities in BIP. However, this impact is still considered to be “real and substantive”.			
Economic Benefits	Economic benefits at the local level and contributions to GDP and other macro economic benefits have been identified.	HIGH	Difficult	N/A
<b>PS 5 - Land Acquisition and Involuntary Resettlement</b>				
Beluluane Industrial Park Compliancy to Resettlement	There appears to be full compliance with IFC PS 5 with respect to resettlement.	LOW	Easily Achievable	MINOR
Agriculture within the Beluluane Industrial Park	There do not appear to be any crops grown on the site, but if there were then local people are aware of the arrangement and that they will need to vacate the area.	LOW	Achievable	MINOR
<b>PS 6 - Biodiversity Conservation and Sustainable Natural Resource Management</b>				
Loss of vegetation	Due to the disturbed nature of the site any impacts on vegetation will be of low significance.	LOW	Achievable	MINOR
Potential Surface water run-off (Stormwater)	Disturbed areas are likely to be relatively small, and correctly constructed hard surfaces with suitable drains and water storage tanks associated with roofs, and absence of sensitive ecosystems reduce the significance.	MODERATE	Achievable	MINOR
Changes to groundwater due to abstraction	The significance of this impact is difficult to assess at this stage, and is conservatively assessed as being of high significance	HIGH	Achievable	MEDIUM
<b>Ps 7 - Indigenous People</b>				
This is not triggered as there are no groupings currently resident in this area that would fall within the definition of Indigenous (First) People.		N/A	N/A	N/A
<b>PS 8 - Cultural Heritage</b>				
Archaeological Artefacts	Any loss of cultural sites would be of significance.	MODERATE	Easily achievable.	MINOR

**Preliminary Environmental & Social Risk Assessment - Quarry Sites**

Issue/ Impact	Significance Statement	Potential Significance	Mitigation Potential	Risk
<b>PS 1 - Social and Environmental Assessment and Management Systems</b>				
Perceived lack of Government interest in the Project / EIA	These perceptions are difficult to assess, but could lead to some opposition to the project.	MODERATE	Achievable	MINOR
<b>PS 2 - Labour and Working Conditions</b>				
Employment Benefits (expectations)	Although only a limited number (<20) of unskilled labourers will be required, in the context of the study area where unemployment exceeds 90.	LOW	Achievable	MINOR
In-migration of Job seekers	The negative effects are tempered by the fact that few people will be directly employed at the quarry, and through the Environmental Impact Assessment process local people will become aware of this.	MODERATE	Difficult	MEDIUM
Occupational Health & Safety	Generally impacts are considered to be of moderate significance.	MODERATE	Achievable	MINOR
Working Conditions	Generally impacts are considered to be of MODERATE significance.	MODERATE	Achievable	MINOR
<b>PS 3 - Pollution Prevention and Abatement</b>				
Solid Waste Management	Limited solid waste will be generated.	MODERATE	Achievable	MINOR
Increased levels of dust	At this stage the impacts from dust are considered moderate before mitigation.	MODERATE	Difficult	MEDIUM
<b>PS 4 - Community Health, Safety and Security</b>				
Increased safety risks to community	As a quarry site has not been selected it is not known for certain if there are people living close to the site, but indications are that this will be likely as all quarry sites currently have people residing on them. Access will be restricted the impacts on adjacent people (dust, noise, hazards etc.).	HIGH	Difficult	MAJOR
Increase Vehicle Movement – sites 1170 & 71	An accident event is far more likely for sites 1170 & 71, and could result in impacts ranging from MODERATE to VERY HIGH, depending on the level of injury.	MODERATE to VERY HIGH	Difficult	MEDIUM
				EXTREME
Increase Vehicle Movement – sites 1169	For site 1169 an accident event involving a local person is unlikely as vehicle movements will be limited to within the quarry site.	MODERATE to HIGH	Achievable	MINOR
				MEDIUM

Issue/ Impact	Significance Statement	Potential Significance	Mitigation Potential	Risk
Visual Impacts	The remoteness of the quarry sites reduces the potential significance of visual intrusion, especially given that other quarries exist in the area, and the immediately neighbouring CIF project has already fully stripped land and intend to build an integrated, coal-fired cement plant, in addition to associated mining.	MODERATE	Difficult	MEDIUM
<b>PS 5 - Land Acquisition and Involuntary Resettlement</b>				
Loss of arable and grazing land	People have expressed concerns about the loss of productive land. And in all areas most of the land is used for grazing, with area 1169 being used more extensively. Subsistence agriculture occurs across all sites, and loss of this land will be of high significance to those households directly affected.	HIGH	Difficult	MAJOR
Strong resistance to resettlement	During the public consultation processes strong opposition to resettlement, especially at Licence Area 1169 was voiced. Consequently, impacts on PAP's arising from physical resettlement or economic displacement are likely to be perceived as very high.	VERY HIGH	Difficult	EXTREME
Major expectations of benefits from the project	It is unlikely that a relatively small quarry operation will be able to deliver major benefits, and because these (unrealistic) expectations will not be met the impact will be perceived as HIGH negative.	HIGH -ve	Difficult	MAJOR
<b>PS 6 - Biodiversity Conservation and Sustainable Natural Resource Management</b>				
Impacts on Surface water	This impact is potentially of high significance, as all sites are close to the Maputo River.	HIGH	Achievable	MEDIUM
Impacts on Groundwater	At this stage very little information on the groundwater could be obtained, but anecdotal evidence indicates that it is relatively shallow, and that people draw water from shallow wells. Wetlands and water loving grasslands (vleis) are common in all three licence areas.	HIGH	Achievable to Difficult	MEDIUM
Impacts on Vegetation and Biodiversity	Specific negative issues that will need to be addressed include further loss of "natural vegetation types"; loss of natural pathways/ecological corridors; loss of unknown, unidentified, rare or endangered plant species; and habitat fragmentation.	MODERATE	Difficult	MEDIUM

Issue/ Impact	Significance Statement	Potential Significance	Mitigation Potential	Risk
Impacts on Fauna and Conservation	here are a number of potential impacts on the local fauna in the study area, with birds and amphibians being of particular concern. Hunting and “habitat loss” have reduced the number of faunal species significantly, which increases the need to consider the impacts on remaining species during the EIA.	LOW	Difficult	MINOR
Changes to topography and Landform	Increased soil erosion and resultant siltation of the Maputo River, with concomitant effects on water quality could result in unmitigated impacts.	HIGH	Achievable	MEDIUM
<b>Ps 7 - Indigenous People</b>				
This is not triggered as there are no groupings currently resident in this area that would fall within the definition of Indigenous (First) People.		N/A	N/A	N/A
<b>PS 8 - Cultural Heritage</b>				
Archaeological Artefacts	The relocation of graves could potentially result in impacts of moderate significance, although it is not known at this stage whether graves occur in the areas to be mined, but this is considered likely.	MODERATE	Achievable	MINOR

## CONCLUSIONS

The preliminary Environmental and Social Risk Assessment is based on limited field work, and in the case of the quarry sites limited information on the exact area to be quarried. Consequently for most risks all three quarry sites were assessed together in the risk assessment.

The scoping and risk assessment report has not identified any fatal flaws that might prevent the project from proceeding. However, a number of significant risks associated with Performance Standard 5 – Involuntary Resettlement have been identified. The recommendation to deal with these risks is to initiate a resettlement action plan immediately and in parallel with the social impact assessment and EIA process, in order to better manage these risks. In our opinion a well executed RAP and stakeholder engagement process (SEP) will effectively manage these risks.

Risks associated with potential pollution and changes to surface and groundwater were also identified as major risks in the absence of any information on especially groundwater in the quarry sites.

Due to the resistance from communities living in quarry site 1169, it has been difficult to recommend which of the three sites should be developed by GCS as a quarry. Initial indications are that site 1169 would cause the least amount of social disruption as it has the least number of people live on or adjacent to that area. Consequently, visual impacts and impacts from dust are rated as moderate and not high. Impacts and risks associated with vehicle movements will also be lower for site 1169, as shorter distances will need to be covered. Loss of arable land is also less significant as fewer people utilize the site. However, site 1169 is more ecologically diverse than the remaining two sites, as they have been subject to significant population pressure and resource use. Overall there are 5 impacts of high significance at site 1169, whereas the other two sites have eight impacts of high significance. Provided a resettlement action plan is executed in parallel with

the EIA process, in order to manage the extreme risk related to resistance to resettlement, then site 1169 should be selected as the quarry site.

Whilst safety issues have been raised as major risks, the scoping phase did not reveal any issues linked to community health. However, a scoping level health impact assessment is recommended to align the EIA process with IFC Performance Standard 4. The management of operational phase impacts requires a specialist study on waste management as well as air quality.

### **RECOMMENDED APPROACH FOR THE ESHIA**

In our opinion the implementation of a sound EIA process supported by the nine specialist studies presented in chapter 9 will reveal that all significant risks can be effectively managed and mitigated to acceptable levels:

1. Vegetation and Ecological Assessment
2. Groundwater Assessment
3. Surface Water Assessment
4. Socio-economic Impact and Land Use Assessment
5. Cultural and Heritage Assessment
6. Resettlement Policy Framework
7. Scoping level Health Impact Assessment
8. Waste Management Study
9. Air Quality Impact Assessment

It is recommended that GCS determine exactly where the groundwater table is and provide estimates of groundwater recharge rates; and determine the extent to which quarry pit dewatering will be required. This information is necessary in order to assess the impacts on surface and groundwater (Specialist studies 2 and 3).

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# 1 INTRODUCTION

## 1.1 Project Concept

The overall project consists of an integrated cement plant with a capacity of 1500 tons per day (tpd) of clinker for conversion to cement using limestone as the primary raw material. The limestone will be obtained from a quarry to be developed as part of the project in the Salamanga Formation, a proven limestone resource with two existing quarry operations in proximity to the proposed quarry site. GCS hold three Exploration Licenses in the Salamanga area (80km south of Maputo), and will select one for exploitation. Gypsum will be brought in by road from Richards Bay. The amount required is quite small, approximately 2 truck loads per day. Other balancing additives like clay and silica are available within a 100 km radius of the site. The limestone reserves are suitable for 100 years of operation.

The proposed plant can be expanded to 3000 tpd capacity, as all the critical input requirements will be available to expand the plant. However, this environmental assessment only covers the base case of 1,500 tpd. The plant's location in the Beluluane Industrial Park (Boane Dist; Maputo Province) is based on market, raw material and fuel and power availability.

Technology suppliers are been considered from India/China and Europe. Equipment configuration will be designed to suit the local raw material and natural gas heat source. Mozambique has two gas reserves, which are currently exploited by SASOL, the South African Petrochemical giant. The required quantity of gas has been allocated by the Government of Mozambique for the project. Electricity will be supplied by the Government of Mozambique, from a substation located 14km from the site, supplied via a 66KV single circuit power line from the Electricidade de Mozambique (EDM) Substation to meet the required electrical demand, estimated at 15MW

The dry process for manufacture of cement will be used. In this process mined limestone is fed into crushers for preparation of the raw meal. The raw meal is then fed into pre-heaters which will calcine the raw meal which is then fed into the kiln. The output from the kiln is clinker which is cooled to ambient temperatures in coolers. Further details are provided in section 3.3 below. Ordinary Portland Cement (OPC) is will be produced from the plant in three grades (grades 32.5, 42.5 and 52.5), graded to South African Standards. Grades of 32.5 and 42.5 will be produced to stock and will be available to customers as an off-the-shelf item. Grade 52.5 will be produced as per the orders of customers. After the third year of operations, clinker capacity may be expanded and clinker may be sold in Mozambique and elsewhere.

The project will be developed by the Sumaria Group, one of the larger industrial groups in East Africa, with interests in Pharmaceuticals, Plastics, Agro Processing and FMCG products. The Sumaria Group is lead by Mr. Jayesh G Shah, who has been the group's Managing Director for last 25 years, and is has been active in Tanzania, Kenya, Mozambique, DR Congo and United Kingdom. It employs around 3000 people in four countries.

The project cost is estimated at around USD 120 Million, with financial equity provided by the Sumaria Group and debt finance from Development Funding Institutes lead by the German Development Bank, DEG.

## 1.2 The project team

The ESHIA is being completed by Coastal & Environmental Services (CES) based in Grahamstown, South Africa and EcoAfrica Environmental Consultants (Mozambique) Ltd., located at Avenida 25 de Setembro 1509, 4º andar, Maputo.

### **Dr A.M (Ted) Avis (Project Leader)**

Ted Avis is a leading expert in the field of Environmental Impact Assessments, having project-managed numerous large-scale ESHIAs to international standards (e.g. World Bank and International Finance Corporation). Dr Avis was principle consultant to Corridor Sands Limitada for the development of all environment aspects for the US\$1billion Corridor Sands Project. This involved the completion of five Environmental Impact Assessments, as well as Environmental Management Plans for the entire project. Dr Avis has also managed ESHIA studies of similar scope in Kenya and South Africa. Dr Avis was instrumental in developing a professional course in Environmental Impact Assessments, based on his past experience running an honours module in ESHIA practice at Rhodes University. He is a Visiting Fellow in the Environmental Science Department at Rhodes University, and a certified Environmental Assessment Practitioner. He has delivered papers and published in the field of ESHIA, SEA and ICZM and has been a principal of CES since its inception 18 years ago, and managing director for the past 10 years, during which time the company has grown rapidly.

### **Christina Mansfeld (Principal Environmental Consultant)**

Christina holds a MA (Masters in Environmental Management) from Stellenbosch University. She also has an undergraduate (BA) and honours degree (Hons GIS – Geographical Information Systems and Analysis) from Stellenbosch University. Christina is experienced in site inspections and auditing of management plans. Initial experience was earned in ensuring legal compliance in the mining industry; ensuring enforcement and viability of Environmental Management Plans (EMP's) and Environmental Impact Assessments (ESHIA's). She worked as a consultant to the Namibian Government, assisting in the drafting of new national environmental legislation. She was also in charge of the EA Unit ensuring compliancy. After Namibia she moved to South Africa to write a State of Environment report on Mining in the Western Cape Province, for the Western Cape Administration. She has diverse experience across many industries, in many countries, and working with Governments, International Organisation and Multi-national Corporations

### **Ricardo Pereira - Public Participation Process Social Impact Assessment**

Ricardo Costa Pereira has an honours degree in Environmental and Geographical Studies from the University of the Western Cape, South Africa. His honours dissertation investigated controversies surrounding the social, economical and political geography of the Green Point stadium for 2010. He contributed to the development of a Stakeholder Participation Course which informs both those responsible for stakeholder participation and stakeholders on how they can play a more active role in decision-making processes. He has also contributed to the "Environmental Issues of the 21st century" course to be offered at Cape Town University of Technology (CPUT). He has done research on Southern Angola's communities, coastal tourism and natural resources in Mozambique and his currently engaged in a tourism master plan for the Vilankulo District in Mozambique and management plans for two major national parks.

### **Ms Oriana Lemos – Public Participation Process**

Oriana has an Honours Degree in Environmental Engineering from Mozambique Technical University (UDM) in Maputo. Her Honours dissertation concerned the dispersion and deposition of industrial pollutants, using a modelation program named "The Air Pollution Model". She is currently based at the EcoAfrica office in Maputo, Mozambique where she has managed the stakeholder involvement and public participation while developing management plans for the Banhine and Zinave National Park and was actively involved in the social assessments and research for the Vilankulo District Tourism Master plan. She is also an administrator and course coordinator for the DLIST Agulhas and Somali Current Large Marine Ecosystem project. This project is a platform for communication between the public and decisions makers in 9 different countries in the western Indian Ocean.

## 2 THE ESIA PROCESS

### 2.1 Mozambique Legal Framework

A number of legislative and institutional frameworks have a bearing on the development and operation of cement production. The project has a dual identity being both a mining and a manufacturing project.

The following legislation is applicable:

- Constitution of the Republic of Mozambique
- Environment Act
- Environmental Impact Assessment Regulation
- Mining Act
- Mining Law Regulations
- Environmental Regulations for mining activities
- Waste Management Regulations
- Water Act
- Wildlife and Forestry Act
- Land Act
- Industrial Licensing Regulations

### 2.2 The Environmental Impact Assessment (ESHIA) Process in Mozambique

The Environmental Impact Assessment (ESHIA) Process, regulated by Decree No. 45/2004, is applicable to all public and private activities. Ministério Para a Coordenação da Acção Ambiental (MICOA), through the National Directorate of Environmental Impact Assessment (DNAIA) is the authority responsible for environmental assessment. The first step in the ESHIA process is environmental screening to define the extent and type of environmental assessment required for a given project. Factors to be considered in the screening include: Scale and type of project; Location and sensitivity of the site; Nature and magnitude of potential impacts. The information contained in this SEO will provide useful background for the screening phase.

The Mozambican ESHIA Regulation (Article 3) uses three project categories to identify the appropriate level of environmental assessment (EA), specifically:

- **Category A:** Activities listed in Annexure 1, are subject to a full ESHIA as defined by the regulations.
- **Category B:** Activities listed in Annexure 2, require a Simplified Environmental Assessment as defined by the regulations.
- **Category C:** Activities listed in Annexure 3, are subject to observing environmental best practice policy.

Due to the nature, scale and location of the proposed project it is anticipated that a Category A ESHIA will be required. Correspondence with Micoa dated 06 December 2010 (refer to appendix A) confirmed that the project falls into a Category A, but Micoa also require two separate EIA submissions, one for the Cement Plant and the other for the Quarry operations.

The Public Participation Process is compulsory for all Category A Projects. Article 14 of the ESHIA Regulations defines the Public Participation Process as an activity that involves public hearings and consultation. The Public Participation Process implies delivery of information regarding projects to all directly and indirectly affected and interested parties, responding to public requests for explanations on the project and the formulation of suggestions.

Public participation provides the opportunity for stakeholders to learn more about the proposed project and provide their opinions. These need to be incorporated into the ESHIA process and should be used to guide further phases and help mitigate potential conflict situations early on in the planning process.

There are effectively 7 main steps in the process.

### **Step 1: Pre-Evaluation (Application and Screening)**

All activities must be screened against Annexure I, II and III as defined in Article 3 of the Act in order to determine which process is to be undertaken.

Annex IV to the Environmental Impact assessment regulation (the AIA Form) requires completion of a Preliminary Environmental Information Form before the ESHIA process is started. This form is structured as follows, and must include the following details:

- Name of Activity
- Identity of Applicant
- Address, contact details
- Location – Street; Town; Locality; District; Province
- Type of area
- Zoning Information
- Description of Activity – Infrastructure; Associated Activities; Brief description of technology required for construction and operation; Type origin and quantity of labour; Type, origin and quantity of raw materials; Chemical Products to be used; Type, quantity and origin of water and electricity to be used; Other resources required; Land holding (legal status of physical area required); Alternative locations (reason for choosing the proposed location and identification of at least two alternative locations); Brief environmental description of the area and region; Supplementary information in the form of maps and diagrams.
- Date and signature of applicant.

The AIA form was submitted to MICOA on 30 November, and a copy is provided in Appendix A.

### **Step 2: Environmental Pre-feasibility Scoping Study and Terms of Reference**

An Environmental Pre-feasibility Study (EPDA) is obligatory for all Annexure I and II activities as defined by Article 10 of the ESHIA regulations.

The key objectives of the phase as defined by the ESHIA regulations are to:

- Determine any fatal flaws or environmental risks associated with the implementation of the activity.
- Determine the ambit of the ESHIA process and develop a Terms of Reference for this phase should no fatal flaws be identified.

An EPDA report should be produced and should, at the minimum include the following:

- A non-technical summary
- Details of the proponent and ESHIA study team
- Spatial extent of the proposed activity in terms of both direct and indirect influences
- A description of the activity and the different actions to be undertaken, with respect to possible alternatives at the planning, construction, exploration and when relevant decommissioning stages.
- Identification of important biophysical and socio-economic characteristics of the affected environment.
- Identification of any potential fatal flaw
- Identification of potential environmental issues or impacts

- Identification of aspects that need to be addressed in the ESHIA study phase.

The Terms of Reference (ToR) acts as a guide for undertaking the larger ESHIA study phase, and should include, at the minimum, the following:

#### **Step 4: Authority Review of the Environmental Pre-feasibility Study and Terms of Reference**

The EPDA and ToR report should be presented in Portuguese to MICOA for review. The authority may request additional information, and should provide comment and recommendations in terms of the ESHIA study within 30 days of receiving the report.

#### **Step 5: The Public Participation Process**

The Public Participation Process (PPP) involves consultation with the wider public. The process facilitates the dissemination of information and identification of indirectly and directly Interested & Affected Parties (I&APs).

The proponent is mandated to undertake the PPP throughout the ESHIA process. This includes providing sufficient advertising and allowing the opportunity for I&APs to participate in the process. The PPP should be undertaken based on any directives given by the relevant authority and should be summarised in a final public participation report.

In order to ensure proper consultation and the efficient dissemination of information, all reports produced for the ESHIA should be made available to the public. Public consultation concludes with the preparation of a public consultation report, which must be submitted as part of the ESHIA.

#### **Step 6: Environmental Impact Study and Environmental Management Plans (EMPs)**

The ESHIA study is the responsibility of the proponent and the ESHIA team, and must be undertaken in line with the Terms of Reference set out in the EPDA. The study should be summarised in an Environmental Impact Report (EIR).

In order to address the issues raised during the EPDA process, the ESHIA study must include specialist studies to provide a detailed and thorough examination of key environmental impacts. Once completed, these studies will be synthesized into the EIR as Annexure.

All specialist studies will include specific recommendations aimed at reducing negative impacts and maximizing positive impacts during the construction and operation of the proposed development. These recommendations will be synthesized into an Environmental Management Plan (EMP) for the construction (CEMP) and operational phases (OEMP).

#### **Step 7: Authority Review of the Environmental Impact Report**

The Environmental Impact Report and all associated Annexure as defined in Article 12 of the ESHIA regulations must be presented to the relevant authority (MICOA) for review. The review should be undertaken within 45 days of receiving the final reports. Upon completion of the review, the relevant authority will provide a final Record of Decision. Based on Article 19 of the ESHIA regulations this may be one of the following:

- Positive record of decision
- Total rejection of the activity based on the outcomes of the reports and the final environmental impact statement
- Partial rejection of the activity based on the outcomes of the reports and the final environmental impact statement

In providing an environmental license, the relevant authority may seek to place conditions of approval that are legally binding on the proponent. Furthermore the authority may request changes

to the project scope or additional ESHIA studies.

## 2.3 International guidelines and principles applicable to the proposed project

The Equator Principles and the requirements as set out by the International Finance Corporation's (IFC) Performance Standards and Sector Specific Guidelines will be used as the international standards to benchmark the GS Cimentos ESHIA. These are elaborated upon in sections 2.9.1 and 2.9.2 below.

### 2.3.1 The Equator Principles

The Equator Principles are a financial industry benchmark for determining, assessing and managing social and environmental risks to projects. There is close alignment between the Equator Principles and the IFC Guidelines, and by the end of 2003, 24 financial institutions had announced their commitment to the Equator Principles (Table 2.1). They represent a voluntary set of environmental and social guidelines for project finance lending. These will be adhered to during this ESHIA process.

**Table 2.1 - The Equator Principles (Adapted from [www.equator-principles.com](http://www.equator-principles.com))**

<p><b>Principle 1 - Review and Categorisation:</b> When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation .</p> <p><b>Principle 2 - Social and Environmental Assessment:</b> The borrower has conducted a Social and Environmental Assessment ("Assessment") process to address the relevant social and environmental impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.</p> <p><b>Principle 3 - Applicable Social and Environmental Standards:</b> The Assessment will refer to the then applicable IFC Performance Standards. The Assessment will establish the project's overall compliance with, or justified deviation from, the respective Performance Standards and EHS Guidelines. The Assessment process in both cases should address compliance with relevant host country laws, regulations and permits that pertain to social and environmental matters.</p> <p><b>Principle 4 - Action Plan and Management System:</b> The developer must prepare an Action Plan (which addresses the relevant findings, and draws on the conclusions of the Assessment. The action plan will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. Borrowers will build on, maintain or establish a Social and Environmental Management System.</p> <p><b>Principle 5 - Consultation and Disclosure:</b> The government, borrower or third party expert must consult with project affected communities in a structured and culturally appropriate manner and adequately incorporate affected communities' concerns.</p> <p><b>Principle 6 - Grievance Mechanism:</b> The borrower should, scaled to the risks and adverse impacts of the project, establish a grievance mechanism as part of the management system. This will allow the borrower to receive and facilitate resolution of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.</p> <p><b>Principle 7 - Independent Review:</b> An independent social or environmental expert not directly associated with the borrower will review the Assessment, action plans and consultation process documentation.</p> <p><b>Principle 8 - Covenants:</b> An important strength of the Principles is the incorporation of covenants linked to compliance of all relevant host country laws, accepted action plans and relevant standards.</p> <p><b>Principle 9 - Independent Monitoring and Reporting:</b> Ensure ongoing monitoring and reporting over the life of the loan. The proponent will require the appointment of an independent environmental and/or social expert, or retain qualified and experienced external experts to verify its monitoring information which would be shared with the funding agency.</p> <p><b>Principle 10 - Reporting:</b> Each funding agency adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.</p>
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### 2.3.2 International Finance Corporation Standards

The IFC have developed 8 Performance Standards (PS) that can be used to identify and manage risk in proposed developments. Table 2.2 below outlines these standards and their objectives. This ESHIA will be structured to meet the requirements of the IFC outlined in the IFC’s Guidance notes on performance standards on social and environmental sustainability (2007).

**Table 2.2 - IFC Performance Standards**

<b>Performance Standard</b>	<b>Objectives</b>
Performance Standard 1: Social & Environmental Assessment and Management Systems	<ul style="list-style-type: none"> <li>• Identify and assess social and environment impacts, both adverse and beneficial, in the project’s area of influence</li> <li>• To avoid, or where avoidance is not possible, minimize, mitigate or compensate for adverse impacts on workers, affected communities, and the environment</li> <li>• To ensure that affected communities are appropriately engaged on issues that could potentially affect them</li> <li>• To promote improved social and environmental performance of companies through the effective use of management systems</li> </ul>
Performance Standard 2: Labour and Working Conditions	<ul style="list-style-type: none"> <li>• Establish, maintain, and improve the worker-management relationship.</li> <li>• Promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws.</li> <li>• Protect the workforce by addressing child labour and forced labour.</li> <li>• Promote safe and healthy working conditions.</li> <li>• Protect and promote the health of workers.</li> </ul>
Performance Standard 3: Pollution Prevention and Abatement	<ul style="list-style-type: none"> <li>• Avoid or minimise adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities</li> <li>• Promote the reduction of emissions that contribute to climate change</li> </ul>
Performance Standard 4: Community Health, Safety and Security	<ul style="list-style-type: none"> <li>• Avoid or minimize risks to and impacts on the health and safety of the local community during the project lifecycle from both routine and non-routine circumstances.</li> <li>• Ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimise risks to the community’s safety and security</li> </ul>
Performance Standard 5: Land Acquisition and Involuntary Resettlement	<ul style="list-style-type: none"> <li>• Avoid or at least minimise involuntary resettlement wherever feasible by exploring alternative project designs and layouts.</li> <li>• Mitigate adverse social and economic impacts from land requisition or restrictions on affected persons’ use of land by (i) providing compensation for loss of assets at replacement cost; and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected.</li> <li>• Improve or at least restore the livelihoods and standards of living of displaced persons.</li> <li>• Improve living conditions among displaced persons through provision of adequate housing with security of</li> </ul>

Performance Standard	Objectives
	tenure at resettlement sites.
Performance Standard 6: Biodiversity Conservation & Sustainable Natural Resource Management.	<ul style="list-style-type: none"> <li>• Protect and conserve biodiversity.</li> <li>• Promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.</li> </ul>
Performance Standard 7: Indigenous Peoples	<ul style="list-style-type: none"> <li>• Deals with indigenous peoples and does not apply to this project</li> </ul>
Performance Standard 8: Cultural Heritage	<ul style="list-style-type: none"> <li>• Protect cultural heritage from adverse impacts of project activities and support its preservation.</li> <li>• Promote the equitable sharing of benefits from the use of cultural heritage in business activities.</li> </ul>

### 2.3.3 IFC sector guidelines

The following international standards as defined by the International Finance Corporation and the World Bank are also applicable and will be complied with:

#### **IFC Environmental, Health and Safety (EHS) Guidelines: General EHS Guidelines (April 30, 2007).**

These guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These guidelines will be used together with the relevant Industry Sector EHS Guidelines listed below. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. The applicability of the EHS Guidelines will be refined and based on the hazards and risks established after completion of the ESHIA.

At This stage it is anticipated that the following general EHS guidelines will be relevant:

#### **1. Environmental**

- 1.1 Air Emissions and Ambient Air Quality
- 1.2 Energy Conservation
- 1.4 Water Conservation
- 1.6 Waste Management

#### **2. Occupational Health and Safety**

- 2.1 General Facility Design and Operation
- 2.2 Communication and Training
- 2.3 Physical Hazards
- 2.4 Chemical Hazards
- 2.7 Personal Protective Equipment (PPE)
- 2.9 Monitoring

#### **3. Community Health and Safety**

- 3.1 Water Quality and Availability
- 3.2 Structural Safety of Project Infrastructure
- 3.3 Life and Fire Safety (L&FS)
- 3.4 Traffic Safety
- 3.6 Disease Prevention
- 3.7 Emergency Preparedness and Response

#### **4. Construction and Decommissioning**

- 4.1 Environment
- 4.2 Occupational Health & Safety
- 4.3 Community Health & Safety

##### ***IFC Sector Specific Environmental Health, and Safety (EHS) Guidelines for Cement and lime manufacturing (April 30, 2007).***

The EHS Guidelines for cement and lime manufacturing include information relevant to cement and lime manufacturing projects. It deals with Industry specific impacts and Occupational Health & Safety. Community Health & Safety aspects are common to those dealt with in the General EHS guidelines.

##### ***IFC Sector Specific Environmental Health, and Safety (EHS) Guidelines for Construction Materials Extraction (April 30, 2007).***

Construction materials extraction activities such as aggregates, limestone, slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite are included in this guideline, which addresses both stand-alone projects and extraction activities supporting construction, civil works, and **cement projects**. Although they emphasize major and complex extraction schemes, the concepts are also applicable to small operations. The guidelines cover aspects related to the Environment, Occupational Health & Safety and Community Health & Safety.

### 3 PROJECT DESCRIPTION

#### 3.1 Cement Plant Site Location

The cement plant will be located at the Beluluane industrial park, District Boane, Maputo Province, Mozambique. This site is approximately 15km from Matola Port, a few hundred meters north east of the Mozal plant and immediately west of the Matola River. The site is 60ha in extent, being roughly 700m x 700m, with a smaller triangular portion to the east adjacent to the river (Figure 3.1).



**Figure 3.1 – Locations of the GS Cimentos plant in the Beluluane Industrial Park**

The site consists predominantly of degraded Miombo Savannah, as it has previously been used for subsistence agriculture. Most of the woody vegetation has therefore been cleared, and the area is dominated by relatively open grassland with scattered shrubs and small trees, many of which have grown from remaining root stock (Plate 3.1). There is evidence of some subsistence agriculture still undertaken within the park, however no signs of crops planted within the plant area has been identified on the numerous site visits. Due to the degraded nature of the site, it is unlikely that any significant ecological impacts will take place. However, a more detailed description of the site and a determination of the presence of any crops planted within the area will need to be determined during the ESHIA phase (Plate 3.1).



**Plate 3.1 – The vegetation at the plant site is degraded Miombo savannah, having being cleared for subsistence agriculture until fairly recently.**

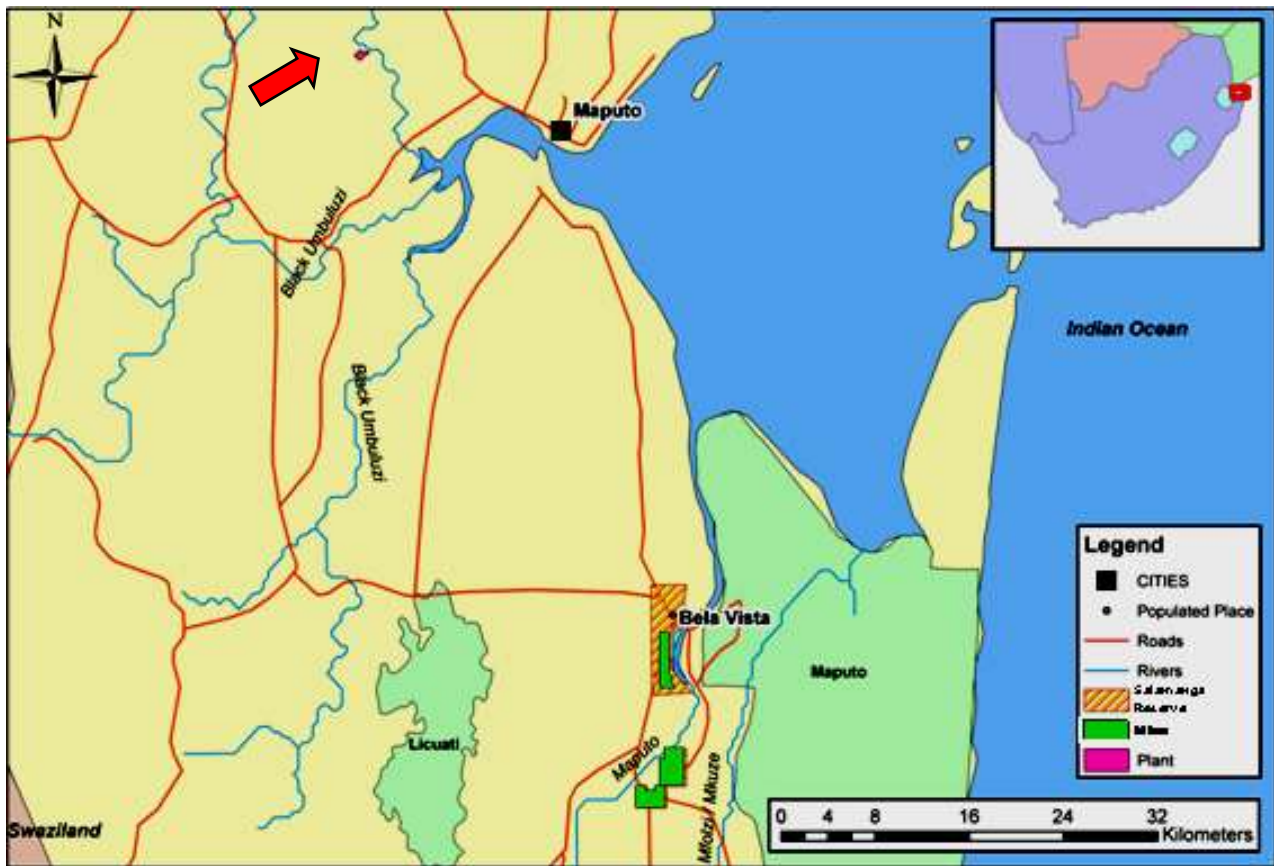
## **3.2 Quarry site locations**

GS Cimentos holds three prospecting licenses in the vicinity of Salamanga (license numbers 1169, 1170 and 1171), being 460, 440, 660 ha in extent respectively. These sites are located approximately 80km's south of Maputo (Figure 3.2). The exploration licenses were issued in July 2007 and are valid until 8 February 2011. Site 1169 is the northern-most of the three sites, located to the south of the village Bela Vista. License area 1170 is the southern-most site, located immediately south to the village of Salamanga. Site 1171 is located immediately north-east of license area 1170 (Figure 3.2). All sites are located close to the Maputo River, with license area 1169 located on the west bank and license areas 1170 and 1171 to the east of the river. A more detailed description of the sites can be found in chapter 4.

## **3.3 Specific project components**

### **3.3.1 Limestone mine**

The three exploration leases totalling 1560 hectares occur in the Salamanga mining area, and are part of the Salamanga Formation. There are three different licenses (Licence no 1169, 1170 and 1171 measuring 460 ha, 440 ha and 660 ha respectively - see Figure 3.2). They are 80km from Maputo, and an unpaved road, the Maputo – Bela Vista – Salamanga – Ponta de Ouro road - runs through the zone, joined in the north by the Bela Vista – Porto road. A rail network extends up to the Salamanga quarry area and passes along the southern boundary of the proposed plant site at Beluluane. The transportation of limestone from the quarry to the plant site will be via the existing rail network.



**Figure 3.2 – General location of the three potential quarry sites in the Salamanga area, 80km south of Maputo, and the plant site (see arrow to purple block in the north).**

The reserve totals approximately 1,500 Million Tonnes of limestone, but has not been proven as no detailed prospecting has taken place. However, data on the geological estimation has been provided by the National Directorate of Geology, Ministry of Mineral Resource, Mozambique for about a 15 km<sup>2</sup> area (7.5 km long and 2 km wide - Figure 3.3). This site, referred to loosely as the Salamanga area extends in a north-south orientation from Bela Vista in the north, and tapers to the south close to Salamanga village. The area lies between longitude from 32°39' to 32°41' East and from Latitude 26°19' to 26°24' south

### **3.3.2 Limestone Mining Process**

Mining operations will use a mechanized, open cast method utilizing heavy earth moving equipment in conjunction with loading and transportation arrangement. To enhance production in the mining blocks, benches will be kept long. The direction may be varied in due course based on experience gained, and to give a wider working periphery, longer faces and ensure proper alignment along haul roads.

This limestone deposit has an average limestone thickness of around 30 m with average overburden of around 7 to 10 m. However, interburden, interstitial clay and waste rock expected to be generated during the course of mining is likely to comprise about 10% of run of mine quantity. This means that 90% will be usable limestone and 10% rejects.

The overburden will be removed by means of dozer. Provision of haul roads and ramps, and the opening and development of faces are essential pre-production stages. Roads to the mining area, from mining faces to the proposed dump area and to the mine office complex and workshops will be developed. Haul roads from the topmost bench to benches at lower levels will be developed gradually.



**Figure 3.3 - Licence area 1169 is located west of the Maputo River, and Licence Areas 1170 and 1171 are further south and lie to the east of the river.**

The hardness of limestone is approximately 25 MPa, and this hardness indicates that the limestone is of a soft category and thus the appropriate mining equipment is a surface miner capable of mining limestone benches of up to 100 MPa hardness. The average product size of the Wirtgen surface miner, recommended for use, is 60-70 mm which is suitable to be directly fed without any intermediate crushing. Mined limestone is then fed to a ground level hopper for storing in over head silos. Rail wagons will then be loaded from the over head bins.

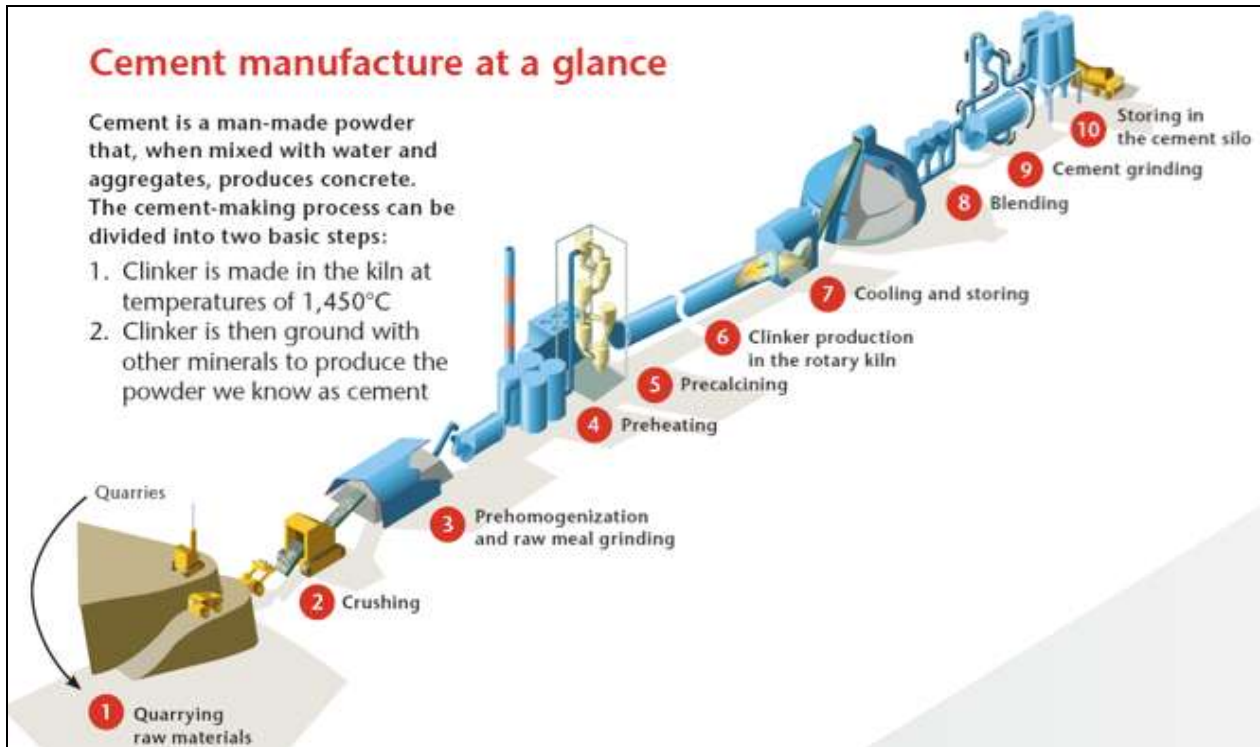


**Plate 3.1 - A The Wirtgen Surface Miner**

The Wirtgen Surface Miner fulfils the requirements for small material production, simple production and mining without blasting. It will cut the surface in parallel cuts, each approximately 2,4 m wide and max. 0,6 m deep. After having finished the first layer, the second layer underlying layer no. 1 will be cut. The Wirtgen Surface Miner can load the material directly onto trucks. Wirtgen Surface Miners cut, crush and load material in one pass with only one machine. The cutting depth can be adjusted exactly, so that also thin seams can be mined separately (Plate 3.1).

### 3.3.3 Cement plant

The proposed cement plant is based on dry process and precalciner technology. All the units in upstream and downstream of the kiln will be designed for an installed clinker production capacity of 1500 tpd. The main features of the process are given below, and presented in Figure 3.3.



**Figure 3.3 – The main stages of the cement production process**

The main steps of cement manufacture are:

1. Quarrying of raw materials
2. Crushing (if required)
3. Pre-homogenisation and raw meal grinding
4. Six stage preheating with Precalciner
5. Clinker production in the rotary kiln
6. Clinker cooler and storage
7. Blending
8. Closed circuit ball mill for cement grinding
9. 10 spout rotary packer with nos. of mechanised truck loader
10. Bulk loading of cement

**Step 1** - The quarrying of raw materials is described above. With the chosen surface miner, the resulting limestone is already in small pellets upon extraction and so no crusher will be needed. This uncrushed Limestone is unloaded through wagon tippers and transported to the stockpile area.

**Step 2** - Although currently the crushing of this material is not anticipated, should this need to take place it would occur prior to being stockpiled.

**Step 3** - Pre-blending (pre-homogenisation) of limestone follows, achieved in a longitudinal stockpile. Crushed limestone is stored in stockpiles in a large number of layers in a predetermined configuration packed by means of a stacker, and subsequently reclaimed and transported to mill hoppers. The raw materials are accurately proportioned by weigh feeders, and fed to the raw grinding mill where grinding is achieved with a Vertical Roller Mill. Mill venting is provided through a bag house and the drying of raw materials is accomplished by the hot gases from pre-heater and if required from a hot air generator. The raw mix for production of cement has to be uniform in composition before it is fed into the pre-heater. The ground raw meal is conveyed to blending-cum-storage silos of inverted cone design by airslides and bucket elevators. To reduce variation in the quality of raw meal a continuous blending silo will be used.

**Step 4** - In the **Cyclone Preheater System**, efficient heat transfer takes place to finely dispersed raw material particles when they come in contact with hot gases from the Kiln. The Preheater is a multi stage cyclone system connected with gas ducts and meal chutes. The raw meal is fed into 2nd stage /3rd stage cyclone gas ducts and is carried by hot gas streams into the cyclone. The material gets separated from gas in cyclones and then travels downward through meal chutes and is discharged into the next lower stage gas duct. In this way, material comes into contact with high temperature gases and gets preheated and partially calcined. A six stage preheater with pre-calciner will be used in the proposed plant for energy conservation purpose.

**Step 5** - The feed then travels down as **the kiln rotates**. The chemical reaction gets completed when the material enters into the burning zone where it gets sintered to form **cement clinker**. The temperature required for sintering the clinker is in the range of 1400°C -1450°C. Before discharging the clinker to cooler it gets cooled in cooling zone of kiln up to 1200 OC –1300 OC. The **kiln firing system** is based on Natural Gas. A specially designed Low NOx burner is preferred for firing into the kiln for lower Nox generation as compared to a conventional burner. For manufacturing the OPC, clinker is inter ground with small quantity of gypsum which acts as a set-retarder.

**Step 6** - **The cooler** cools the hot clinker which is discharged from Kiln at around 1200°C to 1300°C and cooled to 70°C to 80°C; part of the hot air recuperated from the hot clinker is used as secondary air for combustion of fuel in the Kiln. Due to better efficiency, the latest generation Pendulum type cooler from IKN with controlled airflow arrangements are proposed. Large size clinker pieces are crushed by clinker breaker before feeding to Deep Bucket Conveyor. The cooled clinker is then transported to a clinker stockpile in a covered **circular clinker storage** yard by a Deep Bucket Conveyor.

**Step 7** - The raw materials clinker and gypsum are stored in different stock yards from where they are transported to the respective hoppers to the feed cement mill with the help of belt conveyors. Here they are blended before being fed to the mill.

**Step 8** - Clinker with a predetermined quantity of gypsum is then fed to a **close circuit cement ball mill** with high efficiency dynamic separator. The ground cement is then transported with the help of air slides and bucket elevator to the cement storage silo.

**Step 9** - One **ten spout rotary packer** with two discharges is being considered for packing cement into the bags from the silo. Four mechanical truck loaders are considered for loading packed bags into trucks.

**Step 10** - In addition, cement will be extracted from the silo and filled in bulk tankers through the loading spout. These loading spouts will be provided with sensor arrangement by placing the bulk tankers above an electronic weigh bridge system, which will facilitate the loading of cement of predetermined quantity. These tankers will be finally weighed on the weighbridge at the main gate of the plant

### **3.3.4 Pollution Control Technology of the Cement Plant**

#### **1. Control of Dust Emission**

Bag dust collectors based on state-of-the-art reverse pulse jet technology have been considered to control dust emission in the plant. A total of 24 bag dust collectors are included in the design.

The following arrangements for control of pollution are considered:

- Installation of Reverse Air Type Bag House in Raw Mill department using latest fibre glass material coated with PTFE, Silicon and Graphite.
- Installation of ESP for de-dusting of Cooler exhaust air.
- Installation of Bag filters for all main core equipment.
- Installation of Bag Filters before all dust emitting stacks, material transfer points, material conveying systems e.g. Air Slides, Bucket Elevators, Belt Conveyors etc.
- Use of efficient low NO<sub>x</sub> burners to keep NO<sub>x</sub> emission low.
- Covering for all belt conveyors.
- Good house keeping measures.

#### **2. Control of Gaseous Emission**

The gaseous emission from a cement plant mainly comprise of the following:

- Generation of CO<sub>2</sub> due to calcination of the carbonates present in the raw materials and also burning of fuel.
- Generation of NO<sub>x</sub> which is mainly from the fuel (fuel NO<sub>x</sub>) and also due to formation of Oxides of Nitrogen from normal Oxygen and Nitrogen present in the air at high temperature (thermal NO<sub>x</sub>).
- Formation of SO<sub>2</sub> and SO<sub>3</sub> (SO<sub>x</sub>), which is produced mainly from the Sulphur present in the raw materials and fuel.

Various measures, which have been envisaged in order to control the gaseous emission from the cement project, are as follows.

- a) Control of CO<sub>2</sub> emission - although emission of CO<sub>2</sub> is inherent in cement manufacturing due to calcination of limestone and burning of fuel, it is proposed to reduce it by adopting process optimization techniques by using latest state-of-the-art instrumentation and a computerized control system which has been provided in this project. At a later stage, depending on the market expectations, it is recommended that the company should try to promote the use of blending cement which shall substantially contribute to the reduction of CO<sub>2</sub> generation and the corresponding green house affect.
- b) Control of NO<sub>x</sub> Emission – the project has adopted latest measures for control of NO<sub>x</sub> emission as mentioned below.
  - For the burning zone of the kiln, specially designed low NO<sub>x</sub> burners shall be used, which shall control the flame shape and temperature to minimize NO<sub>x</sub> generation in the burning zone.
  - Computerized kiln control system shall be utilized to maintain optimum process conditions with special control on the excess air quantity to maintain the NO<sub>x</sub> emission at minimum level.

The use of the above low NO<sub>x</sub> burner, staged combustion in the secondary firing region of the kiln inlet is expected to bring down NO<sub>x</sub> emission by about 50-60%

- c). SO<sub>x</sub> Emission – it is envisaged that the emission of SO<sub>x</sub> from this cement project shall be very low due to the use of natural gas as fuel with negligible Sulphur content.

Moreover, it is observed that there is a good balance between the Alkalies and SO<sub>3</sub> present in the raw materials and this shall result in most of the Sulphur getting converted to alkali sulphate, which shall get absorbed in the clinker and hence not be emitted as harmful gases.

- d) It is also important to note that the raw materials and fuel used do not contain any sulphides or pyrites and hence the possibility of SO<sub>2</sub> formation in the upper cyclones of the preheater tower is also quite remote.

### **3.3.5 Transport and linkages**

The limestone will be transported in rail wagons each with a capacity of 40 tonnes. The limestone is unloaded through wagon tippers and transported to the limestone crusher by a stacker and conveyor system. The wagon tippler has a capacity of 600 tonnes and runs at 15 tippings per hour.

### **3.3.6 Other project elements**

Grid power will be provided by Electricity De Mozambique from its nearest substation located at a distance of 2.4 kms from proposed plant site, for which a 66 KV line will be constructed by the cement project. The power requirement is estimated at 15 MW.

The estimated quantity of water required will be 1500 m<sup>3</sup>/day, which will be obtained from groundwater wells, established after carrying out studies to determine the water table and expected yield from the wellfield.

## **3.4 Project alternatives**

An alternative to the type of plant proposed above would be a wet process plant for cement manufacturing. The Wet process for manufacturing of cement was discontinued in 1970s', as the energy consumption is 50% higher than Dry Process.

Currently GS Cimentos has mining rights to three locations, but Licence Area 1169 is the preferred site, due to the size of the very shallow deposit, the good grade available, the proximity to existing transport links and minimum human settlement. The other two areas also have good grade deposits and could potentially be utilised should, during the EIA phase, flaws are identified. However they are not seen as the priority choice.

## 4 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

### 4.1 Physical Environment

#### 4.1.1 Climate

The project area falls within a tropical savannah climate that borders on a humid subtropical climate. It is a relatively dry area, averaging 761 mm of precipitation per year. There is a relatively short rainy season lasting from November through March. For Mozambique this area also features noticeably warmer and cooler seasons, with its warmest month (January) on average about 8 °C warmer than its coolest month (July).

**Table 4.1: Climate averages for Project Area**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C	30	31	29	28	27	25	24	26	27	28	28	29	28
Average low °C	22	22	21	19	16	13	13	14	16	18	19	21	18
Average Rain Days	7	6	6	3	3	1	2	1	2	6	7	4	48
Precipitation mm	130	125	125	53	28	20	13	13	28	48	81	97	761

Source: BBC Weather

#### 4.1.2 Geology, soils and landscape features

There are three types of limestone/dolomite resources in Mozambique: sedimentary, metamorphic and igneous. Sedimentary limestone occurs extensively in the Cretaceous and Tertiary basin of Mozambique. The Eocene limestones of Salamanga, south of Maputo, are used specifically in the cement industry.

The stratigraphy of the Salamanga formation includes the Carbonate series (TTim), Sandy mantle (Qp), Quaternary sediments with clay (Qar), and Alluvial Maputo River sediments (Qal). The **carbonate series of sediments** (TTim) belongs, according to the published geological map, to the Salamanga Formation, equivalent in age to the Eocene. It differs in the regional morphology from adjacent lithostratigraphic units by typical small funnel-like depressions. The series forms a narrow (about 2 km) zone extending north-south. It is bounded in the west by a **sandy mantle** (Qp), and by **alluvial sediments** (Qal) of the Maputo River in the east. Carbonate beds are locally exposed in a zone of outcrops only on the left side of the Maputo valley, along the low scarp bordering the alluvial plain. Where not exposed, these rocks are covered with Quaternary deposits which vary in thickness (in boreholes) between 1.50, and 13.55 m and are thin in the scarp and along it on the left valley side.

The carbonate series is composed of limestone, various sandy limestones and carbonate limestone rapidly alternating in both horizontal and vertical directions. The deposit thickness is variable, measured in boreholes from 8.35m to 55.60m, or about 30 metres on average. The carbonate complex is conformably underlain by vari-grained greenish glauconitic sandstones.

#### 4.1.3 Groundwater and surface water resources

Mozambique has 104 identified river basins that drain the central African highland plateau into the Indian Ocean. The majority of the rivers have a highly seasonal, torrential flow regime, with high waters during 3-4 months and low flows for the remainder of the year, corresponding to the distinct wet and dry seasons.

The southern basin until Save are mostly formed the terminal reaches of the international rivers, such as the Maputo, Umbeluzi, Incomati, Limpopo and Save. They are characterized by low runoff coefficients, deep saline intrusion in the mouths (reaching up to 50 km inland) wide and shallow rivers valleys with low storand consequent high evaporation losses and large flood-plane areas. The Maputo Basin crosses an area of very rich bio-diversity, having been recognized as such by UNEP and included as one of the world's conservation areas.

Groundwater potential is considerable and lies in the alluvial formations of the various rivers. Well yields in the Zambezi and Incomati basins are up to 70 000 m<sup>3</sup>/day.

The surface water are the country's main water resource. Mean annual runoff is estimate at 216,000 milion cubic metres (Mm<sup>3</sup>), of which only 100,000 Mm<sup>3</sup> originates in rainfall inside Mozambique. The remainder originates in countries upstream, which is why this figure has been falling with the increased use of water in these countries.

In terms of the geography distribution, five regions have been identified, bringing together contiguous river basins which are administered by the Regional Water Administration (ARAs), set up by the water law. In relation to the project area which is located in the Save river basin itself.

The mine license areas lie adjacent to the Maputo River, and are indicative of the Mozambique profile. Groundwater is abundant and was found to be very shallow on site.

## 4.2 Biological Environment - Flora and Fauna

### 4.2.1 Regional Vegetation

The location of the quarry sites to the south of Maputo falls outside the Miombo vegetation type which dominates much of Mozambique. Although there are no recent vegetation maps for Mozambique, information has been drawn from the 1967 vegetation map prepared by Wild and Fernandes (1967), as well as a more recent analysis of the savannah ecosystems of southern Africa prepared as part of the Safari 2000 vegetation mapping exercise (Rutherford et. al, 2005). The latter is available online, but on closer analysis the 2005 dataset is based entirely on the original vegetation map prepared by Wild and Fernandes. Both sources of information were used to extract the following descriptions.

The three quarry sites fall within vegetation Formation 34, the *Albizia-Azelia-Sclerocarya* vegetation type (Figure 4.1). This vegetation type occurs south of the Limpopo River predominantly on sandy substrates and reddish, orange or grey soils. In depressions poorly drained soils with black organic matter form plant communities dominated by wetland species. The vegetation consists mainly of secondary woodland and patches of secondary savannah with primarily fruit bearing trees remaining, as these are of value to local communities. Almost all the flora is probably secondary, but the original vegetation would have been woodland or semi-closed forests. Through land use activities (especially agriculture and frequent burning) much of this vegetation is now disturbed, resulting in the more open savannah with scattered trees characteristic of the area (Plate 4.1). However, relatively dense vegetation still occurs on slightly elevated ridges and along the riparian areas of the Maputo River. This is particularly noticeable in license area 1169. In lower lying areas much of the woody vegetation has been cleared and the area is dominated by a grassy sward, primarily used for grazing cattle. These areas are referred to as treeless secondary savannahs by Wild and Fernandes (1967), and are abundant in the area.

Near the water courses and in this instance particularly close to the Maputo River are low lying lands with grey or black, clayey, poorly drained soils with black organic matter, referred to as mashongos. These areas are characterized by the presence of *Acacia xanthophloea* (Fever tree) and other associated woody species of the genera *Acacia* and *Albizia*. As the soils become heavier and more frequently inundated with water, the woody vegetation is replaced by the grasslands mentioned above. Grasses such as *Panicum maximum*, *Digitaria eriantha* and

*Eragrostis ciliaris* typically dominate the grasslands together with the useful grazing species *Cynodon dactylon*.

In permanently inundated areas, such as occurs towards the eastern extent of Area 1169, and in areas proximate to the Maputo river, species typical of wetlands occur (Plate 4.4). These areas might include *Raphia* palms although none were noted on site, together with Fig trees (*Ficus verruculosa*), reeds and sedges such as *Cyperus papyrus* and *Typha latifolia*.



**Plate 4.1 – Open savannah dominated by scattered trees and shrubs and grasslands dominated the study area.**

Further east towards the coastline and east of the study site and Maputo River, the more recent landform of coastal dunes is dominated by Formation 43, *Syzigium-garcinia-dialium*. Since this area will not be directly affected by the quarry operations, only a very brief description is provided. Wild and Fernandes (1967) refer to this as semi-deciduous tree savanna (South Eastern Sub-littoral). They note that it is confined to Mozambique and the south eastern region on recent sand dunes. It includes patches of savanna-woodland and thicket, with open patches of grasslands and in lower lying, poorly drained zones hygrophilous (water loving) grasslands. Swamps and inland lakes are also common, containing many typical wetland species. The vegetation is generally in good condition as it has not been significantly impacted through land use since much of it falls within the Maputo Elephant reserve.

The extreme littoral edge of the above vegetation type is described as Coastal Thicket and Forest (Formation 14b- Littoral Thicket and Forest of Recent Dunes). This vegetation type is typical coastal thicket and scrub on recent dunes and young soil, being abundant both north and south of the study area.

Immediately to the west of the three license areas is a distinct patch of dry, semi-deciduous forest classified as Lowland-Sublittoral Forest by Wild and Fernandes (1967). It occurs on ancient dunes and differs from the thicket and forest on more recent dunes as it forms a dense, impenetrable, dry semi-deciduous forest with three distinct layers. This vegetation type will be unaffected by the quarry operations, as the rail route traverses north of this area.

In the lower lying river valley where much of the rail route crosses in a north-south orientation a tree savanna dominated by Thorn trees is found. The woody component is dominated by various *Acacia* species, but species of *Albizia* and *Afzelia* are also common. This vegetation type is wide spread in Mozambique, being associated with low lying drainage areas. It is wide spread immediately north of the site and dominates the areas of the Shangaan and Limpopo Rivers. The area traversed by the road and railway line essentially represents the southern extend of this vegetation type.

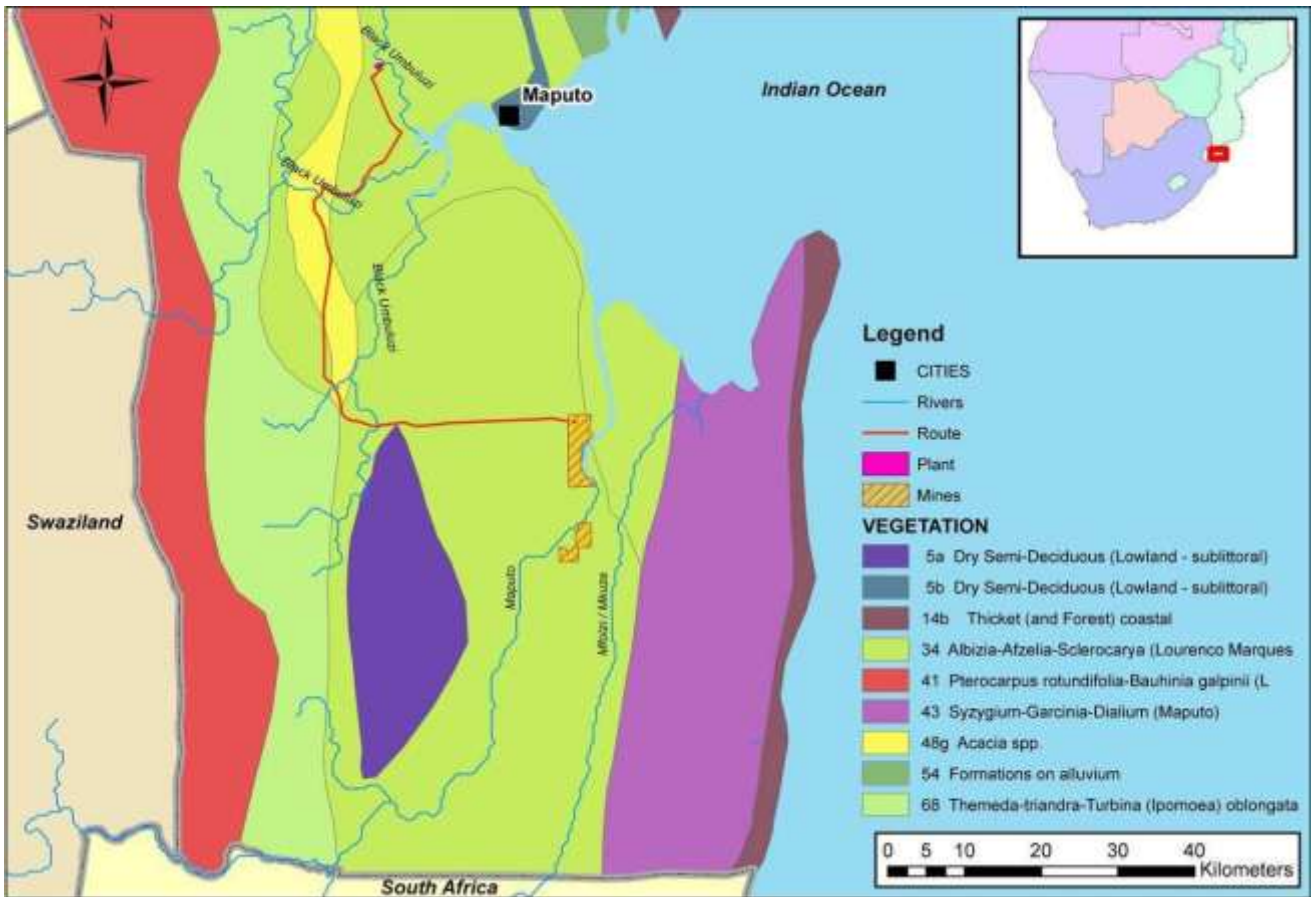


Figure 4.1 - Regional vegetation map of southern Africa, based on surveys by Wild and Fernandes (1967) and updates by Rutherford et al (2005).



Plate 4.2 – Savannah woodland on slightly elevated ridge lines running parallel to lower lying drainage areas in License area 1169.

## 4.2.2 Fauna

No assessment of fauna was undertaken at the scoping stage, but due to population pressures and current land use it is anticipated that most antelopes of medium and large size are locally extinct. People have reported seeing smaller antelope such as Duiker, although these sightings are rare. Smaller mammals such as Ground Squirrels and various species of rodents are likely to occur in the area.

Preliminary observations suggest that a relatively large number of bird species are likely to inhabit the area, especially due to the presence of the Maputo River, the riparian woodlands along the river as well as various habitats including the open grassland, secondary savannah and the wetlands. A more detailed survey will be required during the ESHIA phase.

## 4.2.3 Site Specific description of the vegetation

**License Area 1169** is the largest of the three license areas. The topography is gently undulating, with linear low-lying drainage features covered in open grassland and interspersed with linear strips of savannah woodland of Formation 24 described in Section 4.2.1 above. The edge of the savannah and grassland is characterized by the presence of the Fever tree, and confirms the descriptions in the literature presented above. The woodland vegetation is a fairly dense thicket of approximately 8 meters high, with Fever tree reaching 15m. There is a relatively dense ground layer of less than one meter dominated by primarily herbaceous vegetation under the dense thicket, and grasses in more open areas.

The open grasslands in the drainage areas are surrounded by thicket savannah woodland. The grass sward is low, due to heavy grazing pressure and probably also frequent fires to increase the number of grasses and reduce the density of herbaceous (and unpalatable) vegetation. Grasses are palatable (e.g. *Cynodon dactylon*) and the carrying capacity is likely to be relatively high (Plate 4.3). These grasslands occur on lower lying, moisture soils that are flooded in the wet season.



**Plate 4.3 – Open grassland dominate the drainage lines between ridge lines.**

Fairly extensive wetlands extend north and south (the site is orientated almost north south) and in proximity to the Maputo River on the eastern edge of the site there is permanent standing water with reed beds. These wetlands are approximately 50 – 100mm wide, and give way closer to the river to a narrow strip of woody riparian vegetation, beyond which is the river (Plate 4.4).



**Plate 4.4 – Wetland adjacent to the woody riparian vegetation (in the background) which defines the edge of the Maputo River occurs along the eastern boundary of the site.**

**License Area 1171** is also dominated by the savanna woodland of Formation 24 described in Section 4.2.1 above, but it is more extensive with only one noticeable drainage line. Fever trees remain a conspicuous part of the riparian vegetation, suggesting a relatively shallow water table (Plate 4.5).



**Plate 4.5 – Savanna woodland in License area 1170, also characterized by Fever Trees.**

The site is utilized extensively by local people, and there were signs of charcoal manufacturing, which was possibly commercial as trees had been cut using a chain saw (Plate 4.6).



**Plate 4.6 - A covered charcoal pit on the left, and cut tree on the right felled to produce charcoal.**

A consequence of this utilization is that most of the woody vegetation of Formation 24 – Savannah Woodland has been cleared, and hence a very open vegetation type best described as open grassland with scattered trees dominates much of the area. There are smaller patches of more dense woody vegetation in places, especially in the south western portion of the site, but most of the northern, eastern and southern areas are open grassland (degraded savannah woodland). A drainage line with grasses as described for area 1169 drains from south to north within the site, and discharges into the Maputo River.

According to geologist Elephants cross through this area occasionally from the Maputo Elephant Park.

**License Area 1170** is located immediately behind and almost surrounds Salimanga town. Google images indicate a large number of pathways traverse the area, and hence the vegetation is similar to that of area 1171, namely open vegetation best described as open grassland with scattered trees (Plate 4.7). Small patches of woody vegetation with fever trees and thicket on higher lying areas occur, but for the most part the site consists of open grassland. There is a wetland in the lower lying depression to the north-west of the site, where it is located close to the river.



**Plate 4.7 – Open grassland with patches of degraded savannah woodland dominates area 1170.**

#### **4.2.4 Biodiversity and Conservation**

The landforms and vegetation types south of Maputo are interesting from a biodiversity perspective since the vegetation is restricted to the southern areas of Mozambique and falls outside the far more extensive Miombo woodlands further north. In addition, landscape level diversity is relatively high with five distinct vegetation types occurring from the Swaziland border east to the coastline. These include a tree and shrub savannah with patches of forest along the Swaziland border, which gives way on more recent soils to a grassland described by Wild and Fernandes as an Extra Tropical Lowland Grassland with scattered trees and shrubs. This vegetation type occurs in low altitude areas and is dominated by palatable grasses making it suitable for grazing stock. Further east is the Dry Semi-deciduous Lowland Forest described earlier, which falls within the Licuati protected area. The other formations described above also contribute to the high biodiversity in the region.

Thus, landscape biodiversity (Gamma diversity) is relatively high, although much of the area has been degraded through the current land use practice of slash and burn agriculture. In 1967 Wild and Fernandes described the woodland and savannah woodlands as being degraded and further loss of especially woody vegetation has taken place. This reduces the biodiversity and conservation value of the vegetation within the study area. However, the vegetation further west has been protected in the Maputo Elephant Reserve and these vegetation types are in good condition and of high conservation value. The Reserve was established in 1932 with the objective to protect the elephant population in the area, and in 1960 it was listed by the Decree Law No. 40040 of 20 January 1955. Today it is part of the Lubombo Transfrontier Conservation Area, an international conservation project joining areas of Mozambique, South Africa, and Swaziland. This conservation value is enhanced by the presence of a significant number of inland lakes and swamps which provide excellent habitat for birds and other mammals. The quarry sites are located a relatively short distance from the protected area, (a few km's) but it is anticipated that there will be no impacts on the Maputo Elephant reserve. However, this issue will require further investigation in the EIA report.

## **5 DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT**

### **5.1 Introduction**

GS Cimentos (GCS) proposes a cement factory located in the Industrial Park of Beluluane and the three associated quarry sites which are located in Salamanga in the district of Matutuine.

It is important to note that the Industrial Park of Beluluane is located on a concession awarded by the Government of Mozambique which decrees that the land inside the park is regarded as private land and therefore no communities are allowed to settle in this area.

This process began in 2004 and since then communities have been constantly reminded and made aware of the special conditions which apply to this area. Moreover in the 64 hectares that have been awarded to GSC there are currently no communities living or practising agriculture in the area. It is therefore safe to assume that social impacts concerning the factory can be, to a certain degree, excluded given the fact that not a single person's livelihood will be directly affected by the construction of the factory. Given the above, the main socio-economic description will be based on the quarry sites and their effects on the surrounding communities, with the factory site mentioned only where required.

### **5.2 Levels of governance**

#### **5.2.1 Provincial level**

Both the proposed factory and three quarry sites are located in the Province of Maputo.

#### **5.2.2 Local administration**

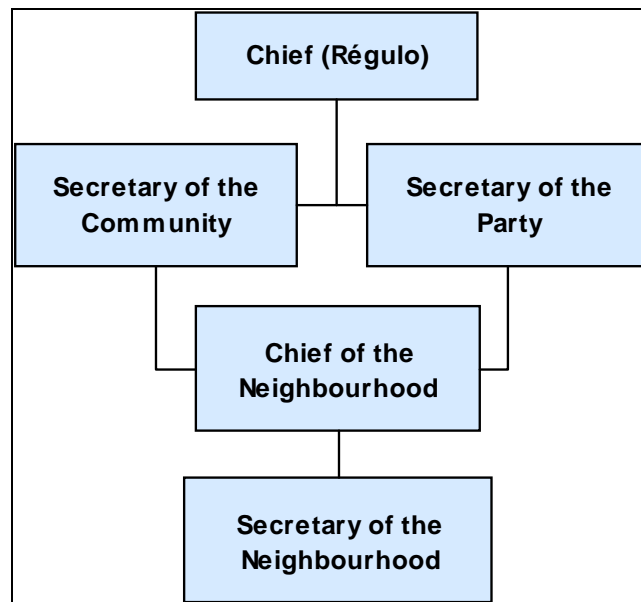
There are three different levels of governmental local administration, starting at the district level, followed by locality and finally neighbourhood level.

As previously mentioned the factory site is located in the Industrial Park of Beluluane. This park is situated in the District of Boane, Locality of Beluluane and community of Beluluane.

The quarry sites are all located in the District of Matutuine. However Quarry site 1170 and 1171 are located in the Locality of Salamanga and cover a number of different neighbourhoods. Quarry site number 1169 is located in the Belavista Administration and the main neighbourhood is Mudissa.

#### **5.2.3 Community administration**

As in the most part of Mozambique community administration is structured as shown in Figure 5.1.



**Figure 5.1 - Simplified Community Structure**

Due to the fact that quarry sites number 1170 & 1171 are located very close to each other the community administration overlaps at both sites. For these two quarry sites the communities fall under the Régulo of Majajane. The various neighbourhoods each have their own chiefs. The following neighbourhoods are found within quarry sites number 1170 & 1171:

1. Ngovoza
2. Fábrica de Cal
3. Xidzuquini
4. Majajane
5. Machia
6. Chia
7. Massoane

At quarry site 1169, located further north, a different community administration structure applies. Here the communities fall under the Régulo of Mudissa.

## 5.3 Livelihood strategies

### 5.3.1 Agriculture

This description of agriculture is not relevant to the factory site as at the moment there is no agricultural activity in the area as it has been allocated for industrial development.

However, the quarry sites are located in rural areas, and agriculture remains the main livelihood strategy for the people that live in this area. It is important to note that most of the agriculture in all quarry sites is of a subsistence nature, and therefore is a livelihood dependency factor for the various communities. Generally Cassava is the dominant field crop, with other crops including maize, groundnut and Njugo bean.

The impact of establishing a limestone mine in the area will need to be carefully studied and mitigated as it will clearly have negative effects with regards to the loss of cultivation land as well as loss of grazing land.

### **5.3.2 Livestock**

As mentioned the establishment of the quarry sites will cause the loss of some grazing land but field observations suggest that there is very little livestock in the area. Sites 1170 and 1171 had no livestock present as these areas did not allow for cattle as they are highly populated and therefore most of the inhabitants only have goats and chickens.

However in quarry site 1169 at least four farmers were noted to have livestock in the area. This area, being less populated, allows for the grazing of the livestock. The numbers of the herds which were seen surpassed 20 heads (Plate 5.1).



**Plate 5.1 – A fenced area used to kraal livestock at night.**

### **5.3.3 Natural resource use**

The use of natural resources is very similar at all quarry sites. The communities in the area rely heavily on the river as their water source. This water serves for all purposes from drinking to bathing to watering animals and irrigation. However, due to high concentrations of effluent in the river, it is necessary that the water be “treated” with caustic soda or boiled.

### **5.3.4 Other**

Due to the fact that all communities are closely located to a major city hub (Maputo) it is important to note that although situated in a rural environment the communities of all the quarry sites already rely greatly on the use of materials that one would generally only consider in an urban context. e.g. cell phones, taxis etc.

## **5.4 Physical infrastructure, Social Infrastructure and Services**

### **5.4.1 Transport**

With regards to the factory site, the transport infrastructure is well developed with roads that are properly maintained and leading to and from the industrial park. There is also a working railway system which GSC plans to make use of in order to carry the limestone from the sites to the factory.

Quarry site number 1169 has easier access than sites 1170 & 1171. The road from Catembe and Boane, although in a very poor state and for the most part still a clay-sand road, has seen some improvement due to the other projects which are emerging in the area e.g. Chinese owned cement factory.

In order to get to site 1170 & 1171, which are located about 12km from site 1169 (Belavista) the road is in an extremely poor state and when it rains it becomes almost inaccessible (Plate 5.2)

Lastly public transportation to the city (Maputo) only operates from Belavista, and therefore the people living in quarry sites 1170 and 1171 are required to travel the 15km that separates the sites either by walking or by getting a lift from someone that is travelling along the road.



**Plate 5.2 - The road from Catembe and Boane is in a very poor state**

#### **5.4.2 Health**

Health facilities in the area is extremely poor and patients that require a little more complex medical attention such as minor surgeries (e.g. appendicitis) are required to travel to Maputo by public transport as no ambulances serve this route.

There is currently a rural hospital in Belavista (close to quarry site 1169) which, due to the malaria awareness project carried out in 2007, is well equipped to deal with this disease. In actual fact the surrounding communities (and those within all quarry sites) are all aware of the existence and dangers of malaria and some even have the necessary means (mosquito nets, insecticides) to protect against it.

#### **5.4.3 Education**

Education remains a major problem throughout the country and it is no different in the Salamanga region. Belavista has a Primary School, outside of which the public meeting was held, and a Secondary School. However both schools are in an extremely dilapidated state.

Moreover the inhabitants of Salamanga (quarry site 1170 & 1171) only have a Primary School, from which the local administration offices operate. In order for children to attend the Secondary School they are required to walk for about 15 km so that they may attend the secondary school in Belavista.

An educational Institute being built in Salamanga is the Salamanga Polytechnic Institute. It will be ready next year (2011) and will offer courses in Tourism, Agriculture and livestock.

#### **5.4.4 Gender**

Due to the closeness to the South African border at Ponta do Ouro (+/- 100 km) many of the men in the community have chosen to travel and sometimes even cross the border in search of work opportunities. This has left behind communities which are gendered imbalanced and dominated by

women and elderly men.

#### **5.4.5 Disabled people**

During the conducted surveys and interviews there was no mention of disabled people. However this may change once the detailed surveys are carried out.

#### **5.4.6 NGO's and government development programmes**

The Mozal complex (aluminium factory) has created a community development centre (*Associacao Mozal para o Desenvolvimento da Comunidade*) in the industrial park which is currently engaged in a number of projects ranging from education, health and social awareness.

With regards to the quarry sites there is no major presence of NGO's other than a rehabilitation facility called *Healing Wings* located just off quarry site number 1169.

In terms of government development programmes INGC (The National Disaster Management Institute) has been present in the areas and is carrying out some work with the various communities on various issues. At the time of the field trips, seminars were being held regarding crop growth.

### **5.5 Land tenure and compensation for loss of access to land**

Access to land in the area is socially transferred by inheritance, and most families have access to enough land to serve their needs for food production and use of natural resources. It very uncommon to find communities in this area with formal land use titles to their land. Instead, most occupy and use the land securely based on the legal recognition of their customary rights. When addressing this aspect of land ownership and possible resettlement, the process requires consultation with the local administration, which represents the communities. Further details as per resettlement and compensation will then be addressed via the local administration to those affected communities.

It will be important to get a reasonably accurate indication of the number of households that may require resettlement at the 3 quarry sites, as this will inform decisions regarding a preferred site. This will only be possible after a detailed survey of the sites, but at this stage it is concluded that quarry sites number 1170 and 1171 are heavily populated in comparison to quarry site number 1169.

In the Salamanga area (quarries 1170 and 1171) initial signs of urban development are evident, with a village centre which has about 4 shops, more than 10 eating establishment and private houses, mostly all made with concrete buildings and installed power lines. This growth is not only restricted to the village centre, and inside the quarry sites (1170 and 1171) at least 10 houses made of concrete were noted (Plate 5.3)



**Plate 5.3 – A typical permanent house constructed of concrete (site 1171)**

In comparison, quarry site number 1169 has far fewer people living in it, and from a preliminary survey it is concluded that there are at least 30 households in the entire area of which at least 10% are made of concrete. Detailed survey will provide more accurate numbers.

However, it is important to note that people living in the various communities and more specifically in site number 1169 are resistant to moving and being resettled, and do not wish to lose their land. This was noted during the public consultation as there was great reluctance to even speak to the consultants at the public meetings, and once the consultation process began it was made very clear that the communities living in quarry site number 1169 have no interest in moving anywhere else due to the fact that they are well located, being close to the river and they have already invested money and effort into their agricultural land.

## **5.6 Project Labor Recruitment**

GSC plans on having a total of around 250 workers between the factory and quarry sites, of which, about 165 will be employees and 100 will be subcontracted. It is expected that initially this number will include around 30-35 expats, but over time the expectations are that most many of these will be replaced by locals, resulting in approximately 5-15 expats by year 5 of operations.

## **6 STAKEHOLDER AND COMMUNITY ENGAGEMENT PROCESS**

### **6.1 Introduction**

The Stakeholder and Community engagement process is a crucial process for any project of this type, and is essential for a Category A project. It is vital that all interested and affected parties (IAP's) are not only aware of the project and its negative implications, but also understand the project and its potential benefits to their communities and surrounding environment. Failure to do so could cause disputes and disagreements between communities and government authorities and the disruption of established structures such as community administration.

### **6.2 Regulations and requirements for stakeholder engagement**

#### **6.2.1 *International guidelines***

According to International Guidelines the process of community engagement is an on-going process involving disclosure of information. The Engagement process includes consultation with all parties that may be affected by risks or adverse impacts from a project. The relevant stakeholders are not limited to the local communities, but also include Organisations (such as NGO's and NPO's), authorities (such as those responsible for the Elephant Reserve), and other interested parties. The purpose of community engagement is to build and maintain over time a constructive relationship with these communities, and consultation should begin at an early stage in the EIA process, be based on the prior disclosure of relevant and adequate information, including draft documents and plans, and focus on the social and environmental risks and adverse impacts, and the proposed measures and actions to address these.

In essence the consultation process must ensure free, prior and informed consultation with stakeholders and facilitate their informed participation (IFC, 2007).

The nature and frequency of community engagement are a reflection of the project's risks to and adverse impacts on the affected communities. Community engagement will be free of external manipulation, interference, coercion and intimidation, and conducted on the basis of timely, relevant, understandable and accessible information.

#### **6.2.2 *Mozambique legislation***

Both the Constitution and Environment Law establish the rights of citizens to have information about and to participate in decision-making about activities which may affect the environment. A Stakeholder Engagement process identifies and consults with interested and affected parties (Partes Interessadas e Afectadas – PI&As)

Stakeholder engagement is required for Category A and is optional (based on instructions from MICOA to the applicant) for Category B activities. For a detailed treatment of the requirements and contents of a Stakeholder Engagement process the reader should refer to MICOA's Directive for the Stakeholder Engagement Process published as Ministerial Diploma 130/2006 of 19 July.

However to summarise the directive, MICOA established that a Stakeholder Engagement process must be carried out whenever the proposed activity implies the permanent or temporary relocation of people or communities, and the relocation of goods or assets or restrictions on the use of or access to natural resources.

The Stakeholder Engagement phase of the EIA is expected to identify the PI&As/IAPs, disseminate information to them, manage a dialogue with the proponent of the activity, assimilate

and take into account public comments received and feedback the outcomes of the dialogue and inputs so as to demonstrate how these have been taken into account in the design of the activity.

Stakeholder Engagement is an integral part of the EIA and should not end with the issuing of the environmental license but should continue during the construction and operational phases of the planned activity.

The process of Stakeholder Engagement includes public consultation and a public enquiry which must be carried out in compliance with directives issued by MICOA. Stakeholder Engagement is divided into two phases, the first one running between the application for pre-assessment of the activity and the submission of the EIA report to MICOA, and the second running between the review of the EIA by MICOA and the issuing of the environmental license. The first phase is the responsibility of the applicant and the second is MICOA's responsibility

### **6.3 Objectives of the stakeholder engagement**

#### ➤ Information gathering:

Consultation with all stakeholders' is required prior to project approval to ensure that there are no fatal flaws or issues that may impede the project from being carried out. Vital information that may assist in proper project planning must be gathered.

#### ➤ Stakeholder Engagement

Following from the above, information provided by stakeholders will assist in understanding the impact of proposals on different sectors which are affected by the project. Stakeholder engagement will also help identify unintended consequences of the project and requirements that may be necessary for project implementation.

#### ➤ Provision of information and management of stakeholder expectations

Effective and on-going stakeholder engagement should reduce uncertainty around the direction of the project as it evolves under the consultation process.

### **6.4 The Stakeholder Engagement Plan (SEP)**

#### **6.4.1 Stakeholder identification and analysis**

Stakeholders have been identified in two different groups:

- Factory site stakeholders
- Quarry sites stakeholders.

The second group was sub divided in three separate groups according to the three quarry sites.

#### **6.4.2 Stakeholder engagement activities to date**

A Background Information Document (BID) was prepared and circulated to stakeholders to inform them of the project (Appendix B), and pamphlets we circulated to inform them of the public meetings that were to be held at the Beluluane Industrial Park and at Salamanga (Appendix C). The minutes of these meetings are presented in Appendix D.

The Factory Site Stakeholder group met in a meeting at the Beluluane Industrial Park offices on 15th of November 2010 and for a second time on the 26th of November 2010. These meetings were attended by representatives from Beluluane Industrial Park, the local authority and GS Cimentos.

The Quarry sites stakeholders groups were met on individual basis from the 15th to the 17th of November and then again on the 21st of November. Two general meetings (advertised by way of brochures distributed locally - see Appendix C) took place on 25th of November - one at the Primary School of Salamanga and the second one at the Primary School of Mudissa (Plate 6.1).



**Plate 6.1 – Public meeting held on 25th of November at the Primary School of Salamanga (which is also the local government administration office).**

### **6.4.3 Future stakeholder engagement activities**

The stakeholder groups will be met once again when during the scoping phase so that the preliminary EPDA/Scoping report provided to MICOA can be presented and discussed. In order to ensure a compliance of the stakeholder engagement activities the following plans has been drawn up:

<b>Period</b>	<b>Action</b>	<b>Purpose</b>
Scoping phase	Stakeholder Identification	Identify all interested and affected parties
Scoping phase	Stakeholder consultation	Introduction of the various stakeholders and identification of primary issues
EPDA phase	Stakeholder public meetings	Discussion and presentation of project and its potential impacts, as presented in the Draft EPDA.
EIA Phase	Stakeholder public meetings	Presentation of the Draft EIA and discussion of positive and negative impacts.
Micoa Phase	Stakeholder public meetings/hearings (if required)	Presentation of the EIA by MICOA and discussions on the issuing of the environmental license.

## 7 PRELIMINARY ENVIRONMENTAL & SOCIAL RISK ASSESSMENT - BELULUANE INDUSTRIAL PARK

### 7.1 Risk Assessment Methodology

The approach to assess risks at this scoping phase is based on recent sustainability appraisals and risk assessments conducted by CES. The first step is to identify key issues, then assess the environmental significance of these issues, and finally consider the potential to mitigate issues. The degree of difficulty to mitigate is interpreted in terms of effectiveness, practicality and cost effectiveness. Thus, both Impact Assessment and a Risk Assessment scales are used to identify significant environmental impacts and project related risks. Thereafter a risk matrix is applied to arrive at a final risk rating.

The **environmental significance** scale evaluates the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. This evaluation relies heavily on the values of the person making the judgement. For this reason, impacts of especially a social nature need to reflect the values of the affected society. A four-point impact significance scale will then be applied to the project impacts (see Table 7-1 below).

**Table 7-1: Environmental significance rating scale**

Significance rating	Description
<b>Very High (3)</b>	These impacts would constitute a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.
<b>High (2)</b>	These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by the project decision makers as constituting an important and usually long term change to the (natural and/or social) environment. These would have to be viewed in a serious light.
<b>Moderate(1)</b>	These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by the project decision makers as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.
<b>Low (0)</b>	These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW are generally fairly unimportant and usually constitute a short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

The **degree of difficulty of mitigating** the various impacts ranges from very difficult to easily achievable. Four categories are used, and both the practical feasibility of the mitigation measures and their potential effectiveness is taken into consideration in deciding on the appropriate degree of difficulty (Table 7-2)

**Table 7-2: Degree of difficulty of mitigation**

Degree of Difficulty	Description
Very difficult	The impact could be mitigated but it would be very difficult to ensure effectiveness and/or to technically/financially achieve
Difficult	The impact could be mitigated but there will be some difficulty in ensuring effectiveness and/or implementation
Achievable	The impact can be effectively mitigated without much difficulty or cost
Easily achievable	The impact can be easily and effectively mitigated

The **risk matrix**, which determines the overall level of risk associated with an impact by comparing the significance of the impact with its difficulty of mitigation is shown in Table 7-3 below.

**Table 7-3: Risk matrix derived from the pairing of the significance of the impact and the difficulty of mitigation**

Mitigation Potential	Impact Significance			
	Low	Moderate	High	Very High
Very difficult	Medium Risk	Major Risk	Extreme Risk	Extreme Risk
Difficult	Minor Risk	Medium Risk	Major Risk	Extreme Risk
Achievable	Minor Risk	Minor Risk	Medium Risk	Major Risk
Easily achievable	Minor Risk	Minor Risk	Minor Risk	Medium Risk

Impacts that are of High to Very High significance and Difficult to Very Difficult to mitigate are considered to be 'Extreme' environmental or social risks to the project. Those impacts that are less significant and easier to mitigate are rated as 'Major' to 'Medium' to 'Minor' i.e. generally impacts of Low to Moderate significance for which mitigation is Achievable to Easily Achievable. Impacts may potentially be of Very High significance, but if the mitigation is Easily Achievable they are rated as 'Medium' risks, as per Table 7-3. The implications of the risk categories are explained in Table 7-4.

**Table 7-4: Risk categories**

Risk	Description
Extreme	Significant mitigatory actions would be required to reduce these risks. In some cases it may not be possible to reduce these extreme risks meaning they are likely to prevent the option from being used (raised as red flags in this assessment).
Major	These risks are of a serious nature, and without effective mitigation measures would be major hindrances to the project. These would need to be monitored and managed, and in combination Major risks may necessitate the use of a different option to achieve the projects objectives.
Medium	These risks are of a less serious nature but still important, and need to be reduced to As Low As Reasonably Possible (ALARP) for the benefit of the environment or social network affected. In isolation these risks are generally insufficient to prevent the project from proceeding.
Minor	These risks are generally acceptable to the project and environment, and mitigation is desirable but not essential. Best practice, however, should be followed and the risks mitigated to prevent a cumulative effect of such impacts.

## 7.2 PS 1 – Social and Environmental Assessment and Management Systems

Themes: (i) Environmental and Social Assessment, (ii) Environmental and Social Management, (iii) Public Consultation and Information, (iv) Monitoring and Reporting

The execution of an Environmental Social & Health Impact Assessment processes for the Cement Plant site that meet the Equator Principles and is aligned to the IFC Performance Standards will ensure compliance with PS 1. The scope of work also includes the preparation of Environmental and Social Management Plans for the operation, and Mozambique requirements for public consultation, which will be met, meet IFC PS 1 public consultation requirements. Through disclosure of the ESHIA the guiding principle of free prior and informed consent will be met. The ESMP will also include a monitoring programme.

## 7.3 PS 2 – Labour and Working Conditions

Themes: (i) number of workforce and workforce specifications, (ii) indigenous people among the workforce, (iii) ILO Core Labour Standards, (iv) Basic Terms and Conditions of Employment, (v) Occupational health and safety, (vi) retrenchment

### Key Issue 1 - In-migration of job seekers

Detail: The project could lead to an in-migration of job seekers into the area. This could possibly lead to increased pressure on local social services such as schools and clinics.

Significance Statement: The cement plant will be constructed in a regulated industrial park with existing procedures in place to prevent in-migration, and hence this impact will be of LOW significance.

Proposed Mitigation: These issues will be dealt with in the socio economic impact assessment, but currently procedures are in place that seem to be effective, but are generally difficult to implement.

Risk: **Minor**

### Key Issue 2 - Employment issues

Detail: It is anticipated that the project will provide permanent employment for an estimated 255 people within the factory. This will result in both positive and negative impacts on local communities that require further assessment to determine how to mitigate negative impacts (social pathologies, household level tensions, increased gender inequality etc.) and optimise benefits of increased employment in the study area.

Significance Statement: Overall the benefit is considered HIGH, especially if expatriates are replaced with local staff might need to be trained. Negative impacts will be of LOW significance.

Proposed Mitigation: These issues will be dealt with in the socio economic impact assessment, which must consider the implications of the ILO Convention. Mitigation and optimization strategies are achievable.

Risk: None for the benefit. For negative impacts the risk is **Minor**.

### Key Issue 3 - Occupational Health & Safety

Detail: There are areas of high risk to personal safety, due to equipment within the plant, dust, significant vehicle movements and other hazards generally associated with an industrial plant.

**Significance Statement:** Generally impacts are considered to be of MODERATE significance.

**Proposed Mitigation:** Occupational Health and Safety must become part of the employment policy. Employees working at the plant must always wear appropriate Personal Protective Equipment (PPE) specific to their job, as there are areas of high risk to personal safety. Also no person may enter the site without proper briefing and training. Proper Fire Fighting equipment must be available and training has to be implemented, so as to minimise damage that can occur. Appropriate measures must be put in place to deal with all hazardous material on site. These mitigation strategies are achievable.

**Risk: Minor**

#### Key Issue 4 – Working Conditions

**Detail:** The workforce is a valuable asset, and therefore a sound worker-management relationship is a key ingredient to the sustainability and success of the project. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize the project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly, and providing them with safe and healthy working conditions, GS Cimentos will create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

**Significance Statement:** Generally impacts are considered to be of MODERATE significance.

**Proposed Mitigation:** Prepare and implement Human Resources (HR) policies appropriate to the size of the workforce, which sets out the proposed approach to managing employees. The main objectives of these policies are to: (i) establish, maintain and improve the worker-management relationship; (ii) promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with Mozambique labour and employment laws; (iii) protect the workforce by addressing child labour and forced labour; and (iv) promote safe and healthy working conditions, and protect and promote the health of workers. They must be prepared in accordance with, and guided by, the requirements of IFC PS2, and are achievable.

**Risk: Minor**

**Table 7-6: Summary of risks for Performance Standard 2**

Issue	Significance Rating	Mitigation Measure	Risk
1. In-migration of job seekers	LOW	Difficult	MINOR
2. Employment benefits consider as (+ve) as well), as noted in others	HIGH (+ve)	N/A	N/A
	LOW	Achievable	MINOR
3. Occupational Health & Safety	MODERATE	Achievable	MINOR
4. Working Conditions	MODERATE	Achievable	MINOR

#### 7.4 PS 3 – Pollution Prevention and Abatement

Themes: (i) Pollution Prevention, Resource Conservation, Energy Efficiency (ii) Waste (iii) Hazardous Materials (iv) Emergency Preparedness and Response, (v) Greenhouse Gas Emissions, (vi) Pesticide Use and Management

## **Key Issue 1 - Waste Management (Solid and effluent)**

Detail: Waste management will need to be investigated and an integrated waste management plan will be required. In addition to this, it is highlighted that Mozambique is a signatory to a number of international conventions regarding banned chemicals which will need to be adhered to. The main source of wastewater is from the Auxiliary Cooling Water System and Boiler blow down when the hot clinker is cooled during step 6. This water contains high turbidity and total dissolved solids (TSS.) Treatment of this water should include advanced polymer based eco-friendly chemicals for de-scaling and biological growth control. Wastewater streams should also be mixed with each other and the diluted water utilized for irrigation in the green belt and for dust suppression within the plant and cement manufacturing process. Prior to re-use or irrigation, water quality must meet national standards.

Significance Statement: A number of different waste streams (both solid waste and effluent) will be produced, and these have the potential to pollute the environment, especially ground and surface water. Resultant impacts would be of MODERATE significance.

Proposed Mitigation: Mitigation strategies must be developed as part of an Integrated Waste Management Plan. This must be informed by a Waste Management Study which must investigate solid and liquid wastes generated at the plant for the construction, operation and decommissioning phases of the project. Mitigation strategies are likely to be standard industry practice, and hence achievable.

Risk: **Minor**

## **Key Issue 2 - Changes to Air Quality**

Detail: The air quality impact assessment will determine the impacts of emissions during the EIA phase. The plant has significant potential to produce gaseous emissions (SO<sub>2</sub> & NO<sub>x</sub>) and the formation of SO<sub>2</sub> and SO<sub>3</sub> (SO<sub>x</sub>), mainly from the Sulphur present in the raw materials and fuel. However, dust (PM10's) is the primary emission and the impact of this on local air quality will require careful assessment in the ESHIA. Waste fuel will not be used for Plant energy supply, so this will not be a further source of emissions. Although Section 3.3.4 provides further details on the pollution control technologies to be implemented at the plant, which primarily consist of 24 dust collectors (most of which use new reverse pulse jet technology) further recommendations in line with Section 1.1 of IFC Sector Specific EHS Guideline – Cement and Lime Manufacturing (April 2007) are likely to be made by the Air Quality Specialists.

Similarly, the large number of heavy vehicle trips required to transport the final products to port facilities is likely to result in significant emissions, which will be difficult to mitigate.

Significance Statement: At this stage, and in the absence of site specific data, the impacts of changes to air quality are considered HIGH before mitigation.

Proposed Mitigation: Recommendations will be made to appropriately avoid or mitigate any negative impacts, and the result will assist in determining GHG reduction emissions benefits. Compliance with the emissions standards presented in Tables 1 – 3 of IFC Sector Specific EHS Guideline – Cement and Lime Manufacturing is required. This requires the application of best practice and best technology, and since this technology is readily available and incorporated in the design (Section 3.3.4), it will be achievable.

Risk: **Medium**

## **Key issue 3 - Resource and Energy consumption**

Detail: At this stage there is insufficient technical information about the Cement Plant's power and energy consumption to fully assess compliance with IFC Sector Specific EHS Guideline – Cement

and Lime Manufacturing. However, from the limited information available it appears that power consumption will be 92.5 kWh per tonne cement, which is within the guideline norms presented in Table 4 or 90 – 150 kWh per tonne cement.

**Significance Statement:** At this stage, and in the absence of specific technical data, the impacts of resource and energy consumption are considered MODERATE before mitigation.

**Proposed Mitigation:** During the detailed design phase of the project, design criteria must consider and strive to achieve the resource use and energy consumption values presented in Tables 4, 6 & 7 of IFC Sector Specific EHS Guideline – Cement and Lime Manufacturing (pgs 11 & 12). This will be achievable.

**Risk: Minor**

**Table 7-7: Summary of risks for Performance Standard 3**

Issue	Significance Rating	Mitigation Measure	Risk
1. Waste Management (Solid and effluent)	MODERATE	Achievable	MINOR
2. Changes to Air Quality	HIGH	Achievable	MEDIUM
3. Resource and Energy Consumption	MODERATE	Achievable	MINOR

## 7.5 PS 4 – Community Health, Safety and Security

Themes: (i) General Community Health and Safety Aspects (ii) Community Emergency and Preparedness Response (iii) Grievance Mechanism (iv) Security Issues and Security Forces (vi) Community Engagement and Development

### Key Issue 1 – Increased safety risks to community

**Detail:** A Cement Plant can pose severe safety risk to individuals who enter the site without authorisation and appropriate safety information, as well as adjacent communities living proximate to the site.

**Significance Statement:** No communities live close to the site, and access will be restricted hence impacts are considered LOW

**Proposed Mitigation:** The plant site has to be secured to prevent unauthorised access, at all times. This mitigation is easily achievable.

**Risk: Minor**

### Key Issue 2 – Traffic impacts

**Detail:** A limited number of heavy vehicles will need to pass between Maputo Harbour and the project area, but mainly during construction as very little or no plant inputs will be from harbour during operations. Nearly all are either obtained locally in the immediate area of the site, transported by rail (limestone), or small volumes of additional material (e.g. gypsum) from South Africa by road. Pedestrians, including unsupervised children and road side vendors, (most of whom have little understanding of road traffic safety rules, no experience of driving a vehicle, and little understanding of the physics of driving and the difficulties of avoiding accidents) are always encountered by vehicles as they walk along the road on their way to or from towns/villages and while they conduct business on the edge of the road (i.e. buying and selling of goods). However, the low traffic volumes suggest that few pedestrians will in fact be encountered.

**Significance Statement:** An accident event will result in impacts ranging from MODERATE to HIGH, depending on the level of injury, but the likelihood of this event occurring is considered unlikely.

**Proposed Mitigation:** A Vehicle Safety Policy, which *inter alia* defines vehicle safety standards and speed limits, and includes vehicle speed monitoring devices and GPS tracking system should be implemented. Third parties providing delivery service must be compelled to comply with the a GCS Vehicle Safety Policy. An assessment to determine whether the local road infrastructure can sustain the increase in traffic during construction and operation of the project might be required, and measures to improve pedestrian safety in light of this increasing traffic investigated. These mitigation strategies are difficult to achieve.

**Risk:** Ranges from **medium** to **major risk**.

### Key Issue 3 - Visual Impact

**Detail:** The Cement Plant is a large, industrial facility with tall structures. The pre heater tower will reach around 100m in height and will be visible for some distance (possibly 1000m) away. This could affect people living to the east of the Matola River.

**Significance Statement:** It is not anticipated that the project will have very significant visual impacts due to its location within Beluluane Industrial Park and adjacent to the far larger Mozal Smelter, and the fact that there are also additional planned industrial activities in BIP. However, this impact is still considered to be “real and substantive”, and hence is rated as MODERATE.

**Proposed Mitigation:** Other than selecting suitable colours, as has been done for Mozal, the impact is difficult to mitigate.

**Risk: Medium**

### Key Issue 4 - Economic benefits

**Detail:** The proposed plant will add to the regional and economic well being of residents of Maputo, and local benefits from employment will result from an anticipated 200 jobs initially, increasing as local talent is trained to replace most expats (who will be a minority even from outset). Indirect employment in the down stream areas of handling, logistics, sales and retail process further increase these benefits. This impact is considered positive.

**Significance Statement:** Economic benefits at the local level and contributions to GDP and other macro economic benefits will be of HIGH significance.

**Proposed Mitigation:** None required, but optimization strategies (local procurement, enhanced local employment) will increase benefits, although these are difficult to achieve.

**Risk:** None, as this is a benefit.

**Table 7-8: Summary of risks for Performance Standard 4**

Issue	Significance Rating	Mitigation Measure	Risk
1. Increased safety risks to community	LOW	Easily achievable	MINOR
2. Traffic impacts	MODERATE to HIGH	Difficult	MEDIUM to MAJOR
3. Visual Impact	MODERATE	Difficult	MEDIUM
4. Economic benefits (+ve)	HIGH	Difficult	N/A

## 7.6 PS 5 – Land Acquisition and Involuntary Resettlement

Themes: (i) newly acquired land; (ii) newly required rights of ways; (ii) economic or physical displacement; (iii) impacts on access to water, roads, communal lands, cultural resources etc. (iv) number of affected people; (v) Resettlement or Social Impact Assessment/Plan, (vi) status on consultation, (vii) resettlement in the last 10 years, post-resettlement legacy,

### Key Issue 1 - Beluluane Industrial Park Compliance to Resettlement Standards

Detail: All local people living within the boundaries of the Beluluane Industrial Park (BIP) have been resettled to adjacent lands. The results of the independent Environmental and Social Performance Annual Monitoring Report undertaken by SRK in 2002 (a more recent report was not available at this time, and hence a more detailed due diligence as part of the GSC EIA is recommended) indicates that the four-year monitoring programme on the welfare of the people relocated for the establishment of the BIP reflects a high level of professionalism and diligence by the resettlement service provider (Acer Africa has a good reputation for effective resettlement implementation, and were awarded the International Association for Impact Assessment: South African Chapter: NATIONAL PREMIUM AWARD. Presented for the Sasol Natural Gas Project – Resettlement Planning and Implementation Programme in Mozambique.). By 2002 maize production had increased from its previous levels of 300-400 kg a hectare to 1.9 tonnes a hectare. Title deeds for the agricultural areas had been finalised in February 2002. The report concluded that resettlement was “fully implemented and ongoing”.

Significance Statement: There appears to be full compliance with IFC PS 5 with respect to resettlement, hence impacts will be LOW.

Proposed Mitigation: In collaboration with the administration of Beluluane Industrial Park, ensure that all issues are addressed and dealt with in accordance with by PS 5. Easily achievable mitigation.

Risk: **Minor**

### Key Issue 2 – Agriculture within the Beluluane Industrial Park

Detail: Detail: Currently communities are allowed to grow crops with the BIP until such time as a developer requires the land, where after they are required to vacate this land and are not entitled to compensation. The community has been specifically instructed not to engage in farming on the GSC plot within BIP, since the project is seen by the BIP authorities as immediately pending. Some subsistence farming has been permitted in other areas of the park under the above-described arrangement, where projects are not seen to be immediately pending.

Significance Statement: There do not appear to be any crops grown on the site, but if there were then local people are aware of the arrangement and that they will need to vacate the area, hence any impacts will be LOW.

Significance Statement: There do not appear to be any crops grown on the site, but if there were then local people are aware of the arrangement and that they will need to vacate the area, hence any impacts will be LOW.

Proposed Mitigation: Not required, as already in place and achievable.

Risk: **Minor**

**Table 7-9: Summary of risks for Performance Standard 5**

Issue	Significance Rating	Mitigation Measure	Risk
1. Beluluane Industrial Park Compliance to Resettlement	LOW	Easily Achievable	MINOR
2. Agriculture within the Beluluane Industrial Park	LOW	Achievable	MINOR

## 7.7 PS 6 – Biodiversity Conservation and Sustainable Natural Resource Management

Themes: (i) Impacts on biodiversity (habitat, modified habitat, natural habitat, critical habitat, legally protected areas, invasive alien species; (ii) Management and use of natural resources (natural and plantation forests, freshwater and marine systems); (iii) management

### Key Issue 1- Potential Surface water run-off (Stormwater)

Detail: The proposed development site is largely comprised of cultivated lands and fallow areas with some grazing land. The removal of the existing vegetation will leave the soil exposed and prone to erosion, especially if inadequate storm water controls/drainage infrastructure is put in place. Specific issues that need to be addressed are listed below:

1. Soil erosion due to stripping of vegetation and soil exposure.
2. Siltation of water courses from ongoing erosion.
3. Uncontrolled “sheet erosion” from major rainfall events and inadequate stormwater controls.
4. Change in soil characteristics: pH, fertility, micro-organisms and general soil features.

Significance Statement: Disturbed areas are likely to be relatively small, and correctly constructed hard surfaces with suitable drains and water storage tanks associated with roofs, and absence of sensitive ecosystems reduce significance to MODERATE.

Proposed Mitigation: It is recommended that minimal land gets cleared and only the areas needed for the plant and associated requirements. The other land should be fenced off and turned into a green belt allowing for the natural vegetation to re-establish itself. Within the plant area sufficient storm drainage infrastructure needs to be constructed. Silt traps have to be installed in the drainage channels so as to prevent siltation of surface water ways. This mitigation is achievable.

Risk: **Minor**

### Key Issue 2 - Loss of vegetation

Detail: The study area has been significantly transformed due to local farming practises and limited on site observations indicated that little in the way of pristine natural vegetation remains. However, pockets of sensitive natural vegetation might occur, but these are likely to be close to the Matola River and hence will not be affected.

Significance Statement: Due to the disturbed nature of the site any impacts on vegetation will be of LOW significance.

Proposed Mitigation: An ecological assessment should be undertaken to investigate, describe and assess the significance of impacts, and identify areas suitable for green belts. Specific recommendations to avoid or minimise any impacts must be included in the Environmental and Management Plans, are will be achievable.

Risk: **Minor**

### Key Issue 3 - Changes to groundwater due to abstraction

Detail: This issue must be dealt with in a groundwater assessment as part of the EIA, and maximum allowable groundwater abstraction rates during different seasons will need to be determined through pump tests.

Significance Statement: The significance of this impact is difficult to assess at this stage, and is conservatively assessed as being of HIGH significance.

Proposed Mitigation: This issue will be dealt with in the ground water assessment of the EIA, but depending on the magnitude of abstraction and resultant impacts a monitoring programme to determine aquifer recharge rates will be required. Abstraction limits will need to be set to ensure no draw-down and that yields are sustainable. These mitigation measures are achievable.

Risk: **Medium**

**Table 7-6: Summary of risks for Performance Standard 6**

Issue	Significance Rating	Mitigation Measure	Risk
1. Potential Surface water run-off (Storm water)	MODERATE	Achievable	MINOR
2. Loss of vegetation	LOW	Achievable	MINOR
3. Changes to groundwater due to abstraction	HIGH	Achievable	MEDIUM

### 7.8 PS 7 – Indigenous People

Themes: (i) indigenous people within or adjacent to the project footprint; (ii) potential impacts on indigenous people (use of traditional or customary lands, cultural resources, resettlement etc.); (iii) information, consultation, participation (iv) management

Key Issue 1- This is not triggered as there are no groupings currently resident in this area that would fall within the definition of Indigenous (First) People.

### 7.9 PS 8 – Cultural Heritage

Themes: (i) Impacts on cultural habitat; (ii) international recognized practices, chance find procedure, consultation; (iii) removal of cultural heritage

#### Key Issue 1 – Archaeological Artefacts

Detail: This is probably not triggered as the site falls within a previously delineated area for industrial activity.

Significance Statement: Any loss of cultural sites would be of MODERATE significance.

Proposed Mitigation: Ensure Beluluane Industrial Park has done its due diligence in this regard, to ensure compliance to this PS. However, develop a “Chance Find” procedure is easily achievable.

Risk: **MINOR**

**Table 7-11: Summary of risks for Performance Standard 8**

Issue	Significance Rating	Mitigation Measure	Risk
Archaeological Artefacts	MODERATE	Easily achievable.	MINOR

## 8 PRELIMINARY ENVIRONMENTAL & SOCIAL RISK ASSESSMENT – QUARRY SITES AT SALAMANGA REGION

### 8.1 PS 1 – Social and Environmental Assessment and Management Systems

Themes: (i) Environmental and Social Assessment, (ii) Environmental and Social Management, (iii) Public Consultation and Information, (iv) monitoring and reporting

The execution of Environmental Social & Health Impact Assessment processes for the Quarry site that meets the Equator Principles and is aligned to the IFC Performance Standards will ensure compliance with PS 1. The scope of work also includes the preparation of Environmental and Social Management Plan for the operation, and as Mozambique requirements for public consultation will be met, IFC PS 1 public consultation requirements will also be achieved. The ESMP will also include a monitoring programme.

Although a Social Impact Assessment and Resettlement Action Plan, as well as disclosure of the ESHIA will take place, it is felt at this stage that the guiding principles of PS 1 as they relate to community engagement, and especially the principle of free prior and informed consent will not be met until a Grievance Mechanism is implemented at this stage of project development. A grievance mechanism is required to enable community members to express concerns about the project and to receive responses in a formalised manner. A generic process is presented below, but further refinement by GSC will be required:

**Step 1: Receipt of grievance:** GSC shall employ a Community Liaison Officer (CLO) or allocate this responsibly to an existing staff member. Grievances should be received by a GSC Community Liaison Officer (CLO) either verbally or by written notification and be entered into a complaints register. Language used should be English. The person submitting the grievance must be given a receipt of his/her submission. People will also have the option of making their initial complaint either through the Chief or other local structures. It is the responsibility of the CLO to receive verbal complaints and to enter complaints in the register. The register must provide for triplicate copies of the complaints/comments, one copy to be provided to the person submitting the complaint, one copy to be used to implement the corrective action and for document control and one copy to remain in the register. The comment/complaint is then entered into a database to be set up for this purpose.

**Step 2: Assessment** The CLO must assess the grievance in terms of the capacity to resolve it locally amongst GSC staff. If this is not possible, the grievance might need to be communicated to Government structures for further discussion and resolution.

**Step 3: Acknowledgement of Complaint/Grievance:** Written information as to steps that will be undertaken to resolve the grievance and the expected time for its resolution must be provided to the complainant within two weeks. Where appropriate this feedback is provided in the local language to ensure all interested parties understand the response. All exchanges are recorded in the register.

**Step 4: Investigation and Resolution of Grievance:** GSC must conduct an internal investigation to determine the underlying cause of the grievance and make any changes required to internal systems to prevent reoccurrence of a similar grievance. As appropriate, GSC must hold meetings with the person/group expressing the grievances to discuss, clarify and solve the issue, and prevent it from reoccurring.

**Step 5: Closure:** Once the investigation has been completed and necessary measures have been taken, the results will be communicated to the complainant and entered in the register a copy of which is entered in the database by the CLO.

**Step 6: Outcome of the corrective action is verified with the complainant:** Following completion of the corrective action, the appropriate CLO will verify the outcome with the complainant. The complainant will be asked to sign off on his/her acceptance of the 'solution' (or nominate someone to do so on his/her behalf). In the event that the complainant remains dissatisfied with the outcome, additional corrective action may be agreed and carried out by GSC.

**Step 7: Legal Recourse** - Situations may arise where complainants will choose to pursue legal recourse and appeal the outcome of the grievance mechanism. In such cases the possibility of obtaining an independent opinion on the grievance should be considered since this may aid in the arbitration process. GSC should not impede access to this recourse.

**Key Issue 1 - Perceived lack of Government interest in the Project and the EIA process**

Detail: The primary concern identified during the public participation process was that the local government is not involved and there appears to be a lack of interest in the project.

Significance Statement: These perceptions are difficult to assess, but could lead to some opposition to the project, with resultant impacts of MODERATE significance.

Proposed Mitigation: The EIA process will follow the IFC guidelines and will involve the preparation of a Stakeholder Engagement Plan, initially as part of the EIA process and later as part of a management plan to ensure initial and ongoing stakeholder engagement. All relevant government departments must be provided with sufficient time to comment on the Scoping and EIA reports. All consultation and engagement must be carefully recorded and included as an annexure to all reports. This achievable mitigation helps to reduce the potential impact.

Risk: **Minor**

**Table 8-1: Summary of risks for Performance Standard 1**

Issue	Significance Rating	Mitigation Measure	Risk
1. Perceived lack of Government interest in the Project / EIA	MODERATE	Achievable	MINOR

**8.2 PS 2 – Labour and Working Conditions**

Themes: (i) number of workforce and workforce specifications, (ii) indigenous people among the workforce, (iii) ILO Core Labour Standards, (iv) Basic Terms and Conditions of Employment, (v) Occupational health and safety, (vi) retrenchment

**Key Issue 1 - Employment Benefits (expectations)**

Detail: It is anticipated that the project will provide employment within the project area. This will result in both positive and negative impacts on local communities (social pathologies, household level tensions, increased gender inequality etc.). Ways to optimise benefits of increased employment in the study area need to be explored

Significance Statement: Although only a limited number (<20) of unskilled labourers will be required, in the context of the study area where unemployment exceeds 90%, the benefit is of MODERATE significance. Negative impacts are likely to be of LOW significance.

Proposed Mitigation: These issues will be dealt with in the socio economic impact assessment, which must consider the implications of the ILO Convention. Mitigation and optimisation strategies are achievable.

Risk: None, for the benefit. For negative impacts the risk is **Minor**.

### **Key Issue 2 - In-migration of Job seekers**

Detail: The project could lead to an in-migration of job seekers into the area. This could possibly lead to increased pressure on local social services such as schools and clinics. These issues could affect social relations within neighbouring communities; increase the pressure on natural resources, as well as on already limited government infrastructure and social services. This could result in conflicts between local residents and “outsiders”.

Significance Statement: The negative effects are tempered by the fact that few people will be directly employed at the quarry, and through the Environmental Impact Assessment process local people will become aware of this. The impact is considered to be of MODERATE significance.

Proposed Mitigation: These issues will be dealt with in the socio economic impact assessment. Recommendations will be made to discourage in-migration of job seekers, including the development of an employment policy (Labour Policy), which gives preferential treatment to local communities over people from outside the area. Despite this the impact is difficult to mitigate.

Risk: **Medium**

### **Key Issue 3 - Occupational Health & Safety**

Detail: There are areas of high risk to personal safety, due to equipment within the plant, dust, significant vehicle movements and other hazards generally associated with an industrial plant.

Significance Statement: Generally impacts are considered to be of MODERATE significance.

Proposed Mitigation: Occupational Health and Safety must become part of the employment policy. Employees working at the plant must always wear appropriate Personal Protective Equipment (PPE) specific to their job, as there are areas of high risk to personal safety. Also no person may enter the site without proper briefing and training. These mitigation strategies are achievable.

Risk: **Minor**

### **Key Issue 4 – Working Conditions**

Detail: The workforce is a valuable asset, and therefore a sound worker-management relationship is a key ingredient to the sustainability and success of the project. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize the project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly, and providing them with safe and healthy working conditions, GS Cimentos will create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

Significance Statement: Generally impacts are considered to be of MODERATE significance.

Proposed Mitigation: Prepare and implement Human Resources (HR) policies appropriate to the size of the workforce, which sets out the proposed approach to managing employees. The main objectives of these policies are to: (i) establish, maintain and improve the worker-management relationship; (ii) promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with Mozambique labour and employment laws; (iii) protect the workforce by addressing child labour and forced labour; and (iv) promote safe and healthy working conditions,

and protect and promote the health of workers. They must be prepared in accordance with, and guided by, the requirements of IFC PS2, and are achievable.

**Risk: Minor**

**Table 8-2: Summary of risks for Performance Standard 2**

Issue	Significance Rating	Mitigation Measure	Risk
1. Employment Benefits (expectations)	LOW	Achievable	MINOR
2. In-migration of Job seekers	MODERATE	Difficult	MEDIUM
3. Occupational Health & Safety	MODERATE	Achievable	MINOR
4. Working Conditions	MODERATE	Achievable	MINOR

### 8.3 PS 3 – Pollution Prevention and Abatement

Themes: (i) Pollution Prevention, Resource Conservation, Energy Efficiency (ii) Waste (iii) Hazardous Materials (iv) Emergency Preparedness and Response, (v) Greenhouse Gas Emissions, (vi) Pesticide Use and Management

#### Key Issue 1 - Solid Waste Management

Detail: Solid waste management at the quarry site will need to be investigated and a solid waste management plan is required.

Significance Statement: Limited solid waste will be generated, and the impact will be of MODERATE significance.

Proposed Mitigation: This will be dealt with in the Waste Management Study, but it is preferable that this be disposed of off-site by being returned to the BIP, and not buried since the quarry sites are close to the Maputo River. This mitigation is easily achievable.

**Risk: Minor**

#### Key Issue 2 – Increased levels of dust

Detail: The clearing of land for mining, as well as the increased use of unpaved roads that characterise the area will lead to dust generation. This dust would result in negative impacts for the local communities and the workforce. Specific issues that need to be addressed are:

1. The amount of dust generated as a result of vehicle entrainment on dirt roads.
2. The incidence of dust generated from the mining pit during windy period in the dry season.
3. The generation of PM10 (particulate) dust and potential health and nuisance related effects.

No technical information on the anticipated measures to control dust levels is presently available (at this pre-feasibility stage). Thus, it is not possible to determine whether emission levels will comply with the various IFC General EHS Standards.

Significance Statement: Consequently, at this stage the impacts from dust are considered MODERATE before mitigation.

Proposed Mitigation: The issue of fugitive dust generation would need to be assessed in the air quality specialist study, and a determination of what mitigation and management measures will be feasible (e.g. water or chemical suppression), and what monitoring will be required, must be

provided. Generally at the scale of a quarry dust suppression is expensive and hence difficult to achieve. However, compliance with IFC General EHS Standards must be achieved, and the use of the Wirtgen Surface Miner will assist in reducing dust levels, as it combines mining, crushing and loading in one operation.

**Risk: Medium**

**Table 8-3: Summary of risks for Performance Standard 3**

Issue	Significance Rating	Mitigation Measure	Risk
1. Solid Waste Management	MODERATE	Achievable	MINOR
2. Increased levels of dust	MODERATE	Difficult	MEDIUM

## 8.4 PS 4 – Community Health, Safety and Security

Themes: (i) General Community Health and Safety Aspects (ii) Community Emergency and Preparedness Response (iii) Grievance Mechanism (iv) Security Issues and Security Forces (vi) Community Engagement and Development

Community Engagement measures, including a grievance mechanism, are required to enable community members to express concerns about the project and to receive responses in a formalised manner. A generic process is presented above under PS 1.

### Key Issue 1 – Increased health & safety risks to community

Detail: The mine can pose severe safety risk to individuals who enter the site without authorisation and appropriate safety information, as well as adjacent people living close to the site.

Significance Statement: As a quarry site has not been selected it is not known for certain if there are people living close to the site, but indications are that this will be likely as all quarry sites currently have people residing on them. Although access will be restricted the impacts on adjacent people (dust, noise, hazards etc.) is considered HIGH before mitigation.

Proposed Mitigation: The mine site has to be secured to prevent unauthorised access, at all times, and households living too close to the site will need to be resettled. This impact will be difficult to achieve.

**Risk: Major**

### Key Issue 2 - Increase Vehicle Movement

Detail: As noted earlier, pedestrians (including unsupervised children) and road side vendors are likely to be encountered along provincial roads as they walk along the road on their way to or from towns/villages and while they conduct business on the edge of the road (i.e. buying and selling of goods). However, within Licence Area 1169 the railway siding will be extended so it adjacent to the site, and traffic will therefore not include heavy vehicles carrying limestone to a rail siding. For sites 1170 & 71 it is unlikely that the railway siding can be extended, as this will require a (very expensive) rail bridge across the Maputo River, which will also bring with it a suite of impacts not assessed in this study. It has therefore been assumed that for sites 1170 & 71 existing roads will be used to transport limestone to a siding. As a result these impacts are assessed separately for the sites.

Significance Statement: An accident is far more likely for sites 1170 & 71, and could result in impacts ranging from MODERATE to VERY HIGH, depending on the level of injury. For site 1169

an accident involving a local person is unlikely as vehicle movements will be limited to within the quarry site. Impacts are likely to be of MODERATE to HIGH significance for site 1169.

Proposed Mitigation: A Vehicle Safety Policy, which *inter alia* defines vehicle safety standards and speed limits, and includes vehicle speed monitoring devices and a GPS tracking system should be implemented. Third parties providing delivery service must be compelled to comply with the GCS Vehicle Safety Policy. An assessment to determine whether the local road infrastructure can sustain the increase in traffic during construction and operation of the project might be required, and measures to improve pedestrian safety in light of this increasing traffic investigated. These mitigation strategies are difficult to achieve.

Risk: Ranges from **minor** to **extreme risk**.

### Key Issue 3 - Visual Impacts

Detail: The clearing of land for mining, as well as increased dust generation and the presence of large scale industrial equipment in a rural setting negatively changes the landscape.

Significance Statement: The remoteness of the quarry sites reduces the potential significance of visual intrusion to MODERATE (and not high), especially given that other quarries exist in the area, and the immediately neighbouring CIF project has already fully stripped land and intend to build an integrated, coal-fired cement plant, in addition to associated mining.

Proposed Mitigation: The issue of changes to landscape quality as a result of an almost permanent, unsightly feature on the landscape cannot be mitigated until closure, and even then this mitigation is difficult to achieve.

Risk: **Medium**

**Table 8-4: Summary of risks for Performance Standard 4**

Issue	Significance Rating	Mitigation Measure	Risk
1. Increased safety risks to community	HIGH	Difficult	MAJOR
2a. Increase Vehicle Movement – sites 1170 & 71	MODERATE to VERY HIGH	Difficult	MEDIUM EXTREME
2b. Increase Vehicle Movement – sites 1169	MODERATE to HIGH	Achievable	MINOR MEDIUM
3. Visual Impacts	MODERATE	Difficult	MEDIUM

## 8.5 PS 5 – Land Acquisition and Involuntary Resettlement

Themes: (i) newly acquired land; (ii) newly required rights of ways; (ii) economic or physical displacement; (iii) impacts on access to water, roads, communal lands, cultural resources etc. (iv) number of affected people; (v) Resettlement or Social Impact Assessment/Plan, (vi) status on consultation, (vii) resettlement in the last 10 years, post-resettlement legacy,

### Key Issue 1 - Loss of Arable and grazing land

Detail: The loss of productive land and resources is of concern to project affected people (PAP's). Access to land and the resources that flow from this land is of critical importance to sustaining a livelihood in communities that are extremely vulnerable as a result of poverty and their isolation from income-generating activities.

**Significance Statement:** People have expressed concerns about the loss of productive land. And in all areas most of the land is used for grazing, with area 1169 being used more extensively. Subsistence agriculture occurs across all sites, and loss of this land will be of HIGH significance to those households directly affected.

**Proposed Mitigation:** Compensation for loss of land and crops is regulated in Mozambique and standard practice for many developments. However, replacing lost land, and ensuring all parties accept the compensation and replacement areas is difficult to achieve.

**Risk: Major**

**Key Issue 2 - Strong resistance to resettlement**

**Detail:** At present no accurate count / mapping of the number of households that are likely to be directly affected has been conducted, as this level of detail will be obtained during the EIA. The licence areas are fairly extensive, and not the entire site will be used for the quarry, hence most physical resettlement could probably be avoided. However, economic displacement will take place, and these resettlement issues must be dealt with sensitively and must ensure minimum disturbance to the affected communities.

**Significance Statement:** During the public consultation processes strong opposition to resettlement, especially at Licence Area 1169 was voiced. Consequently, VERY HIGH impacts on PAP's arising from physical resettlement or economic displacement are likely.

**Proposed Mitigation:** More detailed compensation and resettlement work, which needs to describe the project's impacts as well as the entitlement and compensation framework is required. To comply with PS 5 a Resettlement Action Plan (RAP) will be required, but this opposition means the implementation of a resettlement strategy will be difficult.

**Risk: Extreme**

**Key Issue 3 - Major expectations of benefits from the project**

**Detail:** Currently the communities have high expectations and most of the comments on the project centred on the types of benefits they wish to receive. Expectations include receiving water and electrical infrastructure, as well as better schooling, health care facilities and farming implements.

**Significance Statement:** It is unlikely that a relatively small quarry operation will be able to deliver major benefits, and because these (unrealistic) expectations will not be met the impact will be perceived as HIGH negative.

**Proposed Mitigation:** These issues must be dealt with in the socio economic impact assessment and RAP. The EIA process must involve the preparation of a Stakeholder Engagement Plan and all consultation and engagement must be carefully recorded. It is recommended that social benefits from the plant (the required Corporate Social Responsibility spend) should be spent in the Salamanga area, where the demand is greater. However, this impact will be difficult to mitigate as the various districts will compete for the benefits which flow from the project.

**Risk: Major**

**Table 8-5: Summary of risks for Performance Standard 5**

Issue	Significance Rating	Mitigation Measure	Risk
1. Loss of Arable and grazing land	HIGH	Difficult	MAJOR
2. Strong resistance to resettlement	VERY HIGH	Difficult	EXTREME

Issue	Significance Rating	Mitigation Measure	Risk
3. Major expectations of benefits from the project	HIGH	Difficult	MAJOR

## 8.6 PS 6 – Biodiversity Conservation and Sustainable Natural Resource Management

Themes: (i) Impacts on biodiversity (habitat, modified habitat, natural habitat, critical habitat, legally protected areas, invasive alien species); (ii) Management and use of natural resources (natural and plantation forests, freshwater and marine systems); (iii) management

### Key Issue 1 - Impacts on Surface water

Detail: The issue of contamination of local rivers and surface water resources through silt laden runoff from the mine area could potential increase the sediment load of the Maputo River, due to increase run-off from exposed soils.

Significance Statement: This impact is potentially of HIGH highly significance, as all sites are close to the Maputo River.

Proposed Mitigation: Detailed design and operational recommendations will be required, possibly using sediment traps to act as filtering mechanisms before the runoff water reaches the surface water systems in the area. A setback line between the river and quarry must also be determined and a surface water monitoring programme will be required. These recommendations are achievable, as they are standard requirements in the industry.

Risk: **Medium**

### Key Issue 2 - Impacts on Groundwater

Detail: De-watering of the quarry pit will be required as the water table is less than 10m from the surface. Potential issues or concern regarding the impacts of mine de-watering and effects on the water table, wetlands and local wells will have to be investigated.

Significance Statement: At this stage very little information on the groundwater could be obtained, but anecdotal evidence indicates that it is relatively shallow, and that people draw water from shallow wells. Wetlands and water loving grasslands (vleis) are common in all three licence areas, and if these are impacted the significance could be HIGH.

Proposed Mitigation: This issue will be dealt with in the ground and surface water assessment, and mitigation will depend on the magnitude of abstraction required for mine de-watering. Monitoring of changes to the water table will be required, but if the depth of the water table is reduced mitigation of ecological impacts will be difficult. For social impacts, boreholes can be established and mitigation is considered achievable.

Risk: **Medium to Major**

### Key Issue 3 - Impacts on Vegetation and Biodiversity

Detail: Potential impacts on the local flora within the study area and surrounds will need to be assessed. Although the area has been transformed due to local farming practises there is still a relatively large amount of semi-natural vegetation in the licence areas. Pockets of sensitive natural vegetation are found on small ridges and along the river (riparian vegetation).

Significance Statement: Specific negative issues that will need to be addressed include further loss of “natural vegetation types”; loss of natural pathways/ecological corridors; loss of unknown,

unidentified, rare or endangered plant species; and habitat fragmentation. However, at this stage it is considered unlikely that any rare or endangered plant species will be encountered. These impacts will be permanent and of MODERATE significance.

Proposed Mitigation: Specific recommendations to avoid or minimise any impacts on adjacent vegetation, and guidelines to rehabilitate disturbed areas will be required, but since much of the loss will be permanent the impact is difficult to mitigate.

Risk: **Medium**

#### **Key Issue 4 - Impacts on Fauna and Conservation**

Detail: Most of the medium and all the larger mammals have been extirpated in the area, but birds still seem abundant and due to the range of wetland habitats frogs will still be common. The proximity of the quarry sites to the Maputo Elephant Park, and the relatively high landscape level diversity increases the conservation value of the area.

Significance Statement: There are a number of potential impacts on the local fauna in the study area, with birds and amphibians being of particular concern. Hunting and “habitat loss” have reduced the number of faunal species significantly, which increases the need to consider the impacts on remaining species during the EIA. Further very localised loss is considered to be of LOW significance.

Proposed Mitigation: A Biodiversity and Faunal Assessment is proposed to investigate, describe and assess the significance of these impacts. Although specific recommendations to avoid or minimise any impacts can be made, in reality these will be difficult to implement in the context of the quarry operations, as impacts will be permanent and secondary impacts from local people cannot be mitigated by GCS.

Risk: **Minor**

#### **Key Issue 5 - Changes to topography and Landform**

Detail: The proposed development site is largely comprised of cultivated lands and fallow areas with some grazing land. The removal of the existing vegetation will leave the soil exposed and prone to erosion, especially if inadequate storm water controls/drainage infrastructure is put in place. Specific issues that need to be addressed are listed below:

1. Soil erosion due to stripping of vegetation and soil exposure.
2. Siltation of water courses from ongoing erosion.
3. Uncontrolled “sheet erosion” from major rainfall events and inadequate stormwater controls.
4. Change in soil characteristics: pH, fertility, micro-organisms and general soil features.

Significance Statement: Increased soil erosion and resultant siltation of the Maputo River, with concomitant effects on water quality could result in unmitigated impacts of HIGH significance.

Proposed Mitigation: Soil erosion and any potential impacts on soil quality would need to be assessed in the Hydrology and Surface Water Assessment. In general, compliance with IFC Sector Specific guidelines will be achievable.

Risk: **Medium**

**Table 8-6: Summary of risks for Performance Standard 6**

Issue	Significance Rating	Mitigation Measure	Risk
1. Impacts on Surface water	HIGH	Achievable	MEDIUM
2. Impacts on Groundwater	HIGH	Achievable to Difficult	MEDIUM MAJOR
3. Impacts on Vegetation and Biodiversity	MODERATE	Difficult	MEDIUM
4. Impacts on Fauna and Conservation	LOW	Difficult	MINOR
5. Changes to topography and Landform	HIGH	Achievable	MEDIUM

## 8.7 PS 7 – Indigenous People

Themes: (i) indigenous people within or adjacent to the project footprint; (ii) potential impacts on indigenous people (use of traditional or customary lands, cultural resources, resettlement etc.); (iii) information, consultation, participation (iv) management

### Key Issue 1 - None

Detail: This is not triggered as there are no groupings currently resident in the Salamanga area that would fall within the definition of Indigenous (First) People.

## 8.8 PS 8 – Cultural Heritage

Themes: (i) Impacts on cultural habitat; (ii) international recognized practices, chance find procedure, consultation; (iii) removal of cultural heritage

### **Key Issue 1 - Cultural and Archaeological Heritage**

Detail: Graves are an integral part of families and communities and contribute to the traditional and customary laws about access to land and inheritance, as well as contributing to issues of individual and family identity. The physical removal or relocation graves are a sensitive impact. Relocation could also increase social tension within the household, disrupting social stability.

Significance Statement: The relocation of graves could potentially result in impacts of MODERATE significance, although it is not known at this stage whether graves occur in the areas to be mined, but this is considered likely.

Proposed Mitigation: The relocation of single graves or graveyards will require sensitive negotiation between the developer and local residence. Any relocation must take place with the full participation of affected families and communities, and all costs related thereto must be covered by the developer. This mitigation is achievable.

**Risk: Minor**

**Table 8-8: Summary of risks for Performance Standard 8**

Issue	Significance Rating	Mitigation Measure	Risk
Cultural and Archaeological Heritage	MODERATE	Achievable	MINOR

## 9 TERMS OF REFERENCE FOR THE ESIA SPECIALIST STUDIES

This chapter defines the terms of reference for all the specialist studies which have been suggested by CES for the ESHIA. The following specialist studies are proposed:

1. Vegetation and Ecological Assessment
2. Groundwater Assessment
3. Surface Water Assessment
4. Socio-economic Impact and Land Use Assessment
5. Cultural and Heritage Assessment
6. Resettlement Policy Framework
7. Scoping Health Impact Assessment (however consider note in 9.7)
8. Waste Management Study
9. Air Quality Impact Assessment

The following sections define the tasks that will need to be undertaken to assess the potential impacts the project would have within the particular field of expertise. It is the responsibility of the specialist to determine the best approach, methodologies, and analysis to ensure that all issues are adequately covered and assessed.

### 9.1 Specialist study 1 - Vegetation and Ecological Assessment

The quarry and plant will result in the clearing of vegetation, which is an important aspect of the landscape and the ecological functioning of the area, especially at the quarry sites. It provides important habitats for faunal species, particularly birds. Clearing the vegetation will, therefore, affect the ecological functioning of the area, and to a lesser extent faunal diversity as the site is severely depleted of indigenous faunal species due to hunting and loss of habitat. Removal of the vegetation could also create a habitat for the invasion of alien species. Consequently baseline data on the vegetation of the area is needed, as this will also facilitate a rehabilitation programme. The specific terms of reference are as follows:

1. Record the plant species that occur within the quarry area, based on field surveys.
2. As far as possible, identify any species of special concern, namely species with conservation status or which are endemic to the area.
3. Comment on the conservation status of specific plant species.
4. Compile a broad-scale vegetation or habitat map of the area. This vegetation map should indicate the extent that quarry activities would affect each vegetation or habitat type, such as the impacts on wetlands.
5. Assess the conservation value of the various plant communities and ecological habitats in the area, in order to assess the significance of habitat loss on faunal groups as a result of the development.
6. Record as many plant species of ethnobotanical/resource use as possible.
7. Assess the level of dependence of the local people on the vegetation of the immediate and surrounding areas, and the impact that the removal of this vegetation would have on the community. Close liaison with the social scientists will be essential.
8. Identify alien invasive species and the levels of infestation, with particular focus on rehabilitation that would reduce the significance of this impact.
9. Determine mitigation measures, with particular focus on rehabilitation that would reduce the significance of vegetation loss.
10. Address all issues and concerns raised by I&APs during the scoping phase
11. Assess the significance of the identified impacts, and provide practical and realistic recommendations to mitigate impacts.

## 9.2 Specialist study 2 - Ground Water Assessment

Quarry activities will occur below the water table, and de-watering of the void will be required. Mining may therefore impact on ground water and the resources this provides, thus it is important to:

1. Ascertain the ecological state and functioning of the groundwater system.
2. Determine the extent of groundwater abstraction by local people.
3. Identify any environmental impacts on groundwater resources that may result from the mining process.
4. Comment on any risks of polluting groundwater resources.
5. Identify any other significant impacts that may result from de-watering activities.
6. Work in consultation with other specialists to ensure that the linkages between the surface and groundwater systems are understood.
7. Assess the significance of the impacts, and make recommendations to mitigate these.
8. Address all issues and concerns raised by interested and affected parties during the scoping stage, and reported on in the Scoping Report.
9. Provide practical and realistic recommendations (from a cost perspective) to mitigate impacts.

## 9.3 Specialist study 3 - Surface Water Assessment

Mining activities are expected to take place close to the Maputo River, and mining might impact on surface water systems. The specific terms of reference are as follows:

1. Ascertain the ecological state and functioning of the drainage network, and the linkages between the low-lying drainage areas and the river system.
2. Comment on any risks of polluting surface water resources.
3. Determine an ecological setback line for the quarry pit that will prevent any impacts of surface water flow on the riparian areas, wetlands and river system.
4. Identify any other significant impacts that may result, either directly on surface water or indirectly.
5. Assess the significance of the impacts, and make recommendations to mitigate these.
6. Address all issues and concerns raised by interested and affected parties during the scoping stage, and reported on in the Scoping Report.
7. Provide practical and realistic recommendations (from a cost perspective) to mitigate impacts.

## 9.4 Specialist study 4 - Socio-economic Impact and Land Use Assessment

The project will result in national and regional economic benefits, and is also likely to result in some local economic benefits. It could also provide support for infrastructural development and, at a local level, there is great expectation that this will occur. It will also provide (limited) job opportunities and benefits arising from the multiplier effects associated with these. At present an accurate count of the number of households that are likely to be directly affected has not been conducted. However, the affected quarry area is small and physical resettlement could be avoided.

The SIA must provide a detailed description of the socio-economic environment in and around the quarry area, and to a limited extent around the BIP, analyse the potential impacts of the proposed project and provide guidelines for limiting or mitigating negative impacts and optimising benefits.

The specific terms of reference are as follows:

- i. Describe the local socio-economic environment, with particular reference to the communities that will be directly affected by the quarry project.
- ii. Determine the number of households (and people) that might need to be resettled as a result of the project (both economic and physical displacement).

- iii. Determine the current land use of the development area and the areas outside of the development boundary that are likely to be affected.
  - i. Identify and comment on land use within the quarry and plant areas (e.g. productivity levels).
- iv. Evaluate the land capability/suitability of the area at a reconnaissance level and comment on the productive potential of the area for agriculture and other land uses
  - v. Ensure that the study deals with the issues raised during scoping.
  - vi. Assess the significance of potential social impacts on the local populace and the District.
- vii. Qualify the direct and indirect economic benefits of the project at local, regional and national levels.
- viii. Evaluate how the project could contribute to community upliftment programmes.
- ix. Investigate possible effects on health, livelihoods, income levels, education levels, food security and other factors relevant to the affected communities' ability to participate in the potential economic benefits the project may offer should be discussed
- x. Consultation with stakeholders should be done in such a way as to contribute to the formulation of a Resettlement Action Plan (RAP).
- xi. Gain an understanding of cultural beliefs and practices, particularly those relating to sites of cultural significance that could be affected, to ensure compliance with PS 8.
- xii. Identify any sites of historical importance.
- xiii. Identify project-related impacts and provide recommendations for mitigating negative impacts and optimising positive impacts.

## 9.5 Specialist study 5 – Cultural and Heritage Assessment

A cultural and heritage assessment is required to comply with IFC PS 8. The primary objective is to determine whether there are any indications that areas within the proposed quarry site(s) are of archaeological or cultural significance, and to describe any important heritage aspects. A phase 1 assessment, which is a minor study given the spatial extent of the quarry site will be adequate to meet PS 8 requirements. This will largely be a desk-top study with limited field survey work. However, a site visit will be required to provide the specialist with the opportunity to look for significant artefacts on the surface of the site.

The specific terms of reference are as follows:

1. Provide a summary of the relevant legislation;
2. Determine the likelihood of archaeological remains of significance in the proposed sites;
3. Identify and map (where applicable) the location of any significant archaeological remains;
4. Identify and map any sites of cultural-historical importance in the study areas.
5. Assess the sensitivity and significance of archaeological remains and cultural sites;
6. Assess the significance of direct and cumulative impacts of the proposed development on archaeological and heritage resources;
7. Identify mitigation measures to protect and maintain any valuable archaeological or cultural sites and remains.

## 9.6 Specialist study 6 - Resettlement Action Plan

A Resettlement Action Plan (RAP) is deemed to be an integral part of the ESHIA process, and should comply with OD 4.30 as issued by the World Bank and adopted by the IFC as part of its Performance Standard 5. A RAP will be required for the Quarry site(s) due to the strong negative sentiments expressed by local communities, classified as an Extreme Risk. A RAP will not be required for the plant site in the BIP. The number of households requiring resettlement will be determined during the socio-economic survey, with the aid of accurate mapping of the project site and the location of households in the vicinity of the project.

The RAP must deal with physical and economic displacement, and must investigate ways to minimise resettlement, and must include a census and socio-economic surveys, which should be done in parallel with the SIA. The main tasks of the RAP are as follow:

- Task 1: Screening - provide some understanding of the scope of the likely resettlement, and a preliminary analysis of the resettlement and 'way forward'
- Task 2: Authority and Community Consultation - Ensure stakeholder participation during all stages of the resettlement. Stakeholders must be defined as any individuals or group that may be affected or have some vested interest in the resettlement, or play a critical role in developing the resettlement process.
- Task 3: Household and Community Surveys - A critical aspect in undertaking a resettlement programme is to determine the existing socio-economic context of potentially affected households and communities. This is accomplished by undertaking a suite of socio-economic studies, including: Mapping; undertaking a census and an asset inventory (including homesteads and homestead structures; trees and natural resources; graves associated with each household; community resources including schools, churches and health facilities; community land and natural resources; and sites of cultural or historical importance).
- Task 4: Identification and Evaluation of Resettlement Sites – If resettlement requires the physical relocation of people to a new site or location the process of identifying and selecting potential resettlement sites should be transparent and include consultation with affected households and notably the host community.
- Task 5: Determination and Negotiation of Entitlements and Compensation - The resettlement process must identify households, individuals and communities that are deemed to be entitled to compensation. The nature of the entitlement will vary between each individual and household, and must be based on specific entitlement criteria. These criteria need to be defined early in the resettlement process and should be agreed to by all stakeholders.
- Task 6: Income Restoration and Sustainable Development Initiatives - Economic displacement and disruption of livelihoods is often an 'invisible' impact of resettlement. In essence, resettlement may lead to the disruption of income-earning capacity or livelihood strategies such as subsistence farming. Any resettlement must be undertaken as a sustainable development initiative, i.e. an initiative that improves the standard of living of project-affected people. This will act as a means of restoring and, if possible, improving economic opportunities and promoting long-term development. The overall aim of any initiative is to ensure that the affected peoples' livelihoods and living standards are restored as closely as possible or they are better-off than they were prior to resettlement.
- Task 7: Resettlement Planning, Scheduling, Budget and Responsibilities - The RAP should provide detailed information in terms of resettlement planning, schedules, budget and responsibilities. These various components should be developed based on the outcomes of the previous steps, and negotiated and ratified.
- Task 8: Production of Resettlement Action Plan - The RAP must provide a synthesis of the outcomes of the above tasks. The RAP should function as a practical and useful management plan for the planning, implementation and monitoring of the resettlement process, and should be subject to scrutiny by all relevant stakeholders including affected households, local communities, and relevant authorities, and if needed peer review.
- Task 9: Initiation of Resettlement and Compensation - Resettlement and compensation should be initiated in line with the RAP. In general the actual resettlement should only commence when the project is confirmed but prior to any civil works. Overall responsibility for the implementation of the RAP will lie with the proponent but managed by a resettlement team, with close co-operation from local authorities.
- Task 10: Monitoring - Monitoring is critical in gauging the short to long terms affects of the resettlement process. It also highlights key successes and failures that need to be addressed. The monitoring programme should be explicitly defined in the RAP and include details in terms of responsibilities, timing of monitoring, methodology employed and independent review.

## 9.7 Specialist study 7 – Scoping level Health Impact Assessment

Community and public health is increasingly regarded as an important consideration when evaluating project developments. Health and well-being is regarded as a basic need and is recognised as a fundamental human right. It will be exceptional that a health affect, whether internally or externally driven, presents a fatal flaw to project development, but it is often a critical path to consider when evaluating and planning projects. Health affects can influence projects from many directions and need to be considered in all phases of the project life cycle. The project is likely to impart future health impacts to the surrounding community, but also presents an opportunity to improve the existing health status of the community through direct and indirect benefits.

At this stage the scope of work is restricted to outlining the first phase in developing an evidence-based community health action plan for the GCS project as the final outcome of a Health Impact Assessment (HIA). This will be defined in conjunction with the overall GCS project team so that assessments consider a similar reference point, and so that overlaps are well defined and reporting is consistent. This will allow, for example, the community profiling to be done in an identical fashion so that health and social impacts are considered as a whole and integrated as required into the project ESHIA and ESMP's (Community and Occupational Health & Safety Management Plans). The specific Terms of Reference are:

1. Undertake a scoping assessment to ensure that the HIA is focused toward the expected outcomes of the project and is integrated into the ESHIA.
2. Use the scoping survey to inform the baseline data collection and risk and impact assessment process, to support the final development of a community health action plan.
3. Develop a profile of potentially affected communities and impact areas of concern, completed in conjunction with the social assessments.
4. Analyse environmental health areas, including health determinants and health outcomes, and incorporate both health impacts and health needs (the preferred International Finance Corporation methodology)
5. Identify relevant data gaps that may exist in the baseline data.
6. Identify key stakeholders and develop a small key stakeholders forum to support the development of the management plan in the next phase.
7. Rank the significance of potential health impacts based on consequence and likelihood scenarios and integrate into the ESHIA
8. Based on this information develop a health impact assessment scoping study to highlight key potential health impacts and opportunities that need to be addressed in the management plans, divided into community, project and institutional risk factors.
9. Development a plan to provide the project with pre-execution advice on how project activities, design, or plans may be changed, modified, or adapted in order to avoid or mitigate negative impacts and enhance anticipated benefits. This must be in the form of a community health action plan that can be integrated into the ESMP.

## 9.8 Specialist study 8 – Waste Management Study

This study will focus on the environmental impacts that may arise from the handling, storage and disposal of solid and liquid wastes from the Cement Plant, as well as the quarry activities. Although it is recognised and acknowledged that cement plants do not generate large quantities of solid or liquid wastes, as in reality they are incinerators, a relatively cursory waste study will be required to meet the requirements of PS 3. This study will focus on solid wastes, as generally cement manufacturing generates almost no effluent, limited to sewage

The specific terms of reference are as follows:

- i. Compile an inventory of (identify, describe and, where possible, quantify) the various waste streams to be generated by sources. This will not require the analysis of solid waste samples.
- ii. Briefly describe the processes giving rise to the waste streams and the volumes and tonnages of waste streams.
- iii. Identify and describe the possible impacts of any solid and liquid wastes.
- iv. Assess the environmental significance of these impacts using a standard methodology.
- v. Assess the risks to the health and safety of workers at the quarry and plant, and residents within the project's area of influence.
- vi. Provide recommendations on the most feasible options for the disposal of solid and liquid wastes.
- vii. Describe the levels of hazardous waste on-site, and make recommendations for the disposal and/or recycling of these materials.
- viii. Relate levels of any potentially toxic waste to recognised international standards, and ensure that any waste management strategy is in line with these standards.
- ix. Provide recommendations on ways in which GHG emissions can be avoided or reduced.
- x. Ensure that the study deals with the issues raised during scoping.

## 9.9 Specialist study 9 - Air quality Impact Assessment

The plant has the potential to increase the amount of air pollution within the BIP, and the possible release of CO<sub>2</sub> and NO<sub>x</sub>. In light of this, and the sensitivities around GHG emissions, the specific terms of reference are as follows:

1. Assess the current levels of air pollution (including dust) and characterise current air quality in the BIP using available data.
2. Identify any risk sources of air pollution from the project.
3. Quantify all particulate emissions using local meteorological data, and the proposed throughput for the operational phase of the Cement plant.
4. Predict, using suitable dispersion modelling or other appropriate methodologies, the air concentrations and emissions fallout due to each of the identified sources.
5. Quantify all emissions arising from the plant and transport of materials and products.
6. Assess what the impact of the project will be on ambient air quality. This will mean determining increased levels of pollution in the area and ranking them in terms of severity, frequency, locality and impact on the receiving environment.
7. Assess cumulative impacts, and consider especially the emissions from the existing Mozal Smelter.
8. Ensure that the study deals with the issues raised during scoping.
9. Assess the environmental significance of these impacts.
10. Review IFC Sector Specific EHS Guideline – Cement and Lime manufacturing (April 2007) and provide recommendations to ensure emissions comply with those presented in Tables 1 - 3.
11. Suggest ways to avoid, mitigate, or ameliorate the impacts by discussing modifications or improvements to process design with production engineers.
12. Develop a monitoring programme to ensure effective implementation of the recommended mitigation measures.

## 10 THE ESHIA REPORT CONTENT

The report prepared for the ESHIA will be divided into a number of volumes in order to cover the information as stipulated by Mozambique, World Bank, IFC and other requirements. The volumes will be as follows:

### Volume 1: Scoping Report (This Volume)

### Volume 2: Specialist Studies

This volume will be a compilation of all the nine specialist studies described in Section 9 above.

### Volume 3: Environmental, Social and Health Impact Report (ESHIA)

This volume is likely to include the following (but please note that the Table of Contents presented below is indicative and likely to change):

- 1 INTRODUCTION
  - 1.1 Project rationale
  - 1.2 Overview
  - 1.3 Mozambique country overview
- 2 ESHIA PROCESS
  - 2.1 The project team
  - 2.2 The pre-feasibility and scoping study
  - 2.3 The Environmental, Social and Health Impact Assessment (ESHIA)
  - 2.4 The Stakeholder Engagement Plan
  - 2.5 Environmental and Social Management Plans
  - 2.6 Relationship between ESHIA and IFC Standards
- 3 LEGAL FRAMEWORK
  - 3.1 International legislation
  - 3.2 National legislation
  - 3.3 International conventions to which Mozambique is a signatory
  - 3.4 International guidelines, standards and policies applicable to the mining and cement plants
  - 3.5 Security Arrangements best management practices applicable to the project
- 4 PROJECT DESCRIPTION
  - 4.1 Project area site selection
  - 4.7 Quantity of water required for project
  - 4.8 Methods of abstraction
  - 4.9 Land clearing and preparation
  - 4.10 Mine and Plant layout
  - 4.12 Hazardous materials
  - 4.12 Mining
  - 4.13 Haulage
  - 4.15 Cement plant
  - 4.16 Product transportation between the factory and the port
  - 4.17 Additional infrastructure and housing
  - 4.18 Labour and workforce requirements
  - 4.19 Human resources policies and management
  - 4.20 Project execution - organisation and project management
  - 4.21 Security arrangements
  - 4.22 Project alternatives

- 5 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT
  - 5.1 Physical environment
    - 5.1.1 Climate
    - 5.1.2 Geology and landform
    - 5.1.3 Groundwater
    - 5.1.4 Hydrology of the Maputo River
  - 5.2 Flora and vegetation
    - 5.2.1 Description of vegetation types
    - 5.2.2 Sensitivity analysis
  - 5.3 Fauna
  - 5.4 Biodiversity and conservation
  
- 6 DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT
  - 6.1 Introduction
  - 6.2 Levels of governance
    - 6.2.1 Provincial level
    - 6.2.2 District
    - 6.2.3 Chiefdom, Sections and Villages
  - 6.3 Districts in the study area
  - 6.4 Demographics
  - 6.5 Livelihood strategies
    - 6.5.1 Agriculture
    - 6.5.2 Livestock
    - 6.5.3 Natural resource use
    - 6.5.4 Access to land
  - 6.6 Standard of living
    - 6.6.1 Income
    - 6.6.2 Expenditure
    - 6.6.3 Food security
    - 6.6.4 Habitation
  - 6.7 Historical, political and socio-cultural situation
    - 6.7.1 Regional history
    - 6.7.2 Village histories
    - 6.7.3 Religion and traditional cultural beliefs and practices
    - 6.7.4 Contemporary social system, practices and social problems
  - 6.8 Gender
  - 6.9 Youth
  - 6.10 Seasonal calendar
  - 6.11 Social infrastructure
    - 6.11.1 Health
    - 6.11.2 Education
  - 6.12 Transport, communication and interactions between villages and towns
  - 6.13 Development needs and programmes
  - 6.14 Community Perceptions of the GS Cimentos Project
  - 6.15 Determination of the population in the study area and project affected people
  
- 7 DESCRIPTION OF THE AGRICULTURAL PRACTICES
  - 7.1 Current land uses in Mozambique
  - 7.2 Current land use practises in the study area
  - 7.3 Levels of agriculture in the study area
    - 7.3.2 Cultivation
    - 7.3.4 Charcoal production
    - 7.3.5 Livestock land-use practices
    - 7.3.6 Limitations to current agricultural practices
    - 7.3.7 Impacts of land use

- 7.4 Determination of type and extent of land use
- 8 ASSESSMENT OF BIOPHYSICAL IMPACTS
  - 8.1 Introduction
  - 8.2 Terrestrial flora and fauna
    - 8.2.1 Issue 1: Loss of habitat and species diversity etc
  - 8.3 Aquatic environment
    - 8.3.1 Issue 1: Land clearing etc
  - 8.4 Fisheries
    - 8.4.1 Issue 1: Onsite impacts etc
  - 8.5 Monitoring and management
- 9 ASSESSMENT OF SOCIO ECONOMIC IMPACTS
  - 9.1 Introduction
  - 9.2 Socio economic impacts
    - 9.2.1 Issue 1: Job creation and stimulation of economic growth
  - 9.3 Land use impacts
    - 9.3.1 Issue 1: Reduced crop yields
  - 9.4 Resettlement
  - 9.5 Monitoring and management etc.
- 10 HEALTH IMPACT ASSESSMENT
  - 10.1 Introduction
  - 10.2 Major health impacts
- 11 ASSESSMENT OF INFRASTRUCTURE AND WASTE IMPACTS
  - 11.1 Introduction
  - 11.2 Transportation
  - 11.3 Infrastructure – Quarry area
  - 11.4 Infrastructure – Cement Plant
  - 11.5 Materials storage and handling facilities
  - 11.6 Waste assessment
  - 11.7 Air quality
  - 11.8 Monitoring and management
- 12 NATIONAL & REGIONAL SOCIAL AND ENVIRONMENTAL PROJECT BENEFITS
  - 12.1 Context
  - 12.2 Project alignment with Mozambique Policy
- 13 RECOMMENDATIONS
- 14 CONCLUSIONS

## **Volume 5: Social and Environmental Management Programmes**

All recommendations cited in the ESHIA report (resulting from the ESHIA process) will be described in the Social and Environmental Management Programme (SEMP), which will provide details on the Environmental and Social Management Plans (ESMP's) that will be required to be implemented during the construction and operation phases of the project. The development of many of these ESMP's is will only be undertaken once all the issues relating to the project's design and layout have been resolved and determined. ESMP's are recognised as very important tools for the sound environmental management of projects.

The main objectives of a Construction Environmental and Social Management Plan (CESMP) are to detail the correct way in which the proponent must approach all construction activities for the

project. It will contain details of how frequently the project must be audited to ensure that the mitigation measures which are implemented are effective in minimising or avoiding negative impacts.

Management plans that are likely to be developed or regularly reviewed in later stages (post ESHIA phase) of the project might include:

1. Resettlement Action Plan
2. Stakeholder Engagement Plan
3. Labour Recruitment, procurement & In-migration Management Plan
4. Security Management Plan
5. Ecological and rehabilitation Management Plan
6. Integrated Waste Management Plan
7. Occupational Health and Safety Management Plan
8. Emergency Preparedness Management Plan
9. Community Health and Safety Management Plan
10. Environmental & Social Monitoring Programme
11. Closure Plan

## 11 CONCLUSION

The preliminary Environmental and Social Risk Assessment is based on limited field work, and in the case of the quarry sites limited information on the exact area to be quarried. Consequently all three quarry sites were assessed together in the risk assessment.

### **Cement Plant**

For the cement plant, located in the existing Beluluane Industrial Park (BIP), no impacts were rated as **extreme** risks. Of the remaining 14 risks identified, four were regarded as being of **medium risk**, and would require management interventions to reduce them to as low as reasonably possible.

- **Traffic Impacts** - This risk ranged from medium to major as it relates to the possibility of a vehicle accident resulting in slight (medium risk) to serious injury (major risk) to persons involved in the accident. Managing this risk requires development of a vehicle safety policy, which should include restricting driving to daylight hours. The risk of a traffic impact is reduced as the limestone will be transported via rail to the cement plant, and hence a limited number of heavy vehicles will need to pass between Maputo Harbour and the project area. This risk is no greater than one would expect for any operation of this magnitude.
- **Visual impacts** - The risk related to the visual impact of the cement plant cannot be mitigated, but does not require mitigation as the plant is located within an industrial park.
- **Air quality** - Changes to air quality could constitute a medium risk, and more detailed investigations during the EIA phase are required to carefully assess this risk.
- **Ground water** - Finally, changes to ground water due to abstraction of ground water for plant operations is a medium risk that similarly requires more detailed investigation during the EIA phase.

The remaining 10 impacts are minor risks that are generally acceptable and can be mitigated with ease.

### **Quarry sites**

Of the 19 risks identified for the quarry sites, six were identified as medium risks, six as minor risks, three as major risks and one as extreme. One risk ranged from minor to medium, one from medium to major and one from medium to extreme. Only medium, major and extreme risks and those with a range are discussed further below as minor risks are deemed acceptable.

The **extreme risk** is:

- **Resistance to resettlement** – this risk relates to strong resistance to resettlement amongst the local community, especially at quarry site 1169. This resistance was raised by community members during the scoping meetings, and requires the implementation of a Resettlement Action Plan (RAP) as part of the EIA process to ensure the risk can be proactively managed. Further identification of the exact area to be quarried in site 1169, if this site is chosen as the preferred location, is urgently required in order to more carefully assess the magnitude of this risk. It is quite conceivable that no direct resettlement will take place, but economic displacement due to the loss of grazing land and other resources will occur. Compensation strategies will need to be developed as part of the RAP.

**Major risks** are:

- **Increased health and safety risks to communities** adjacent to the quarry site was identified as a major risk to community health and safety. This risk results from both the unauthorized entry into the quarry site by local communities, as well as secondary impacts from dust, noise and other hazards on communities living in proximity to the quarry site.

Site selection will need to consider these risks in addition to usual selection criteria such as depth of overburden and quality of deposit. The type of mining (surface mining and no blasting) should help to reduce this risk, but at this stage and without more detailed analysis it is flagged as a major risk, but could conceivably be reduced to minor.

- Two risks associated with Performance Standard 5 (land acquisition and involuntary resettlement), namely **loss of arable and grazing land; and major expectations of benefits from the project** are regarded as major risks. Local people have major (unrealistic) expectations of benefits that could arise from the project. These risks will require careful attention during the EIA process, and should also be dealt with as part of the proposed resettlement action plan.

**Medium risks** arise from:

- Changes to **topography and landform**, as well as **visual impacts** of the quarry (PS 1 risks). These impacts would be difficult to mitigate and are essentially the residual effects of a quarry operation. Although of medium risk, they are likely to be deemed acceptable by the decision making authority.
- The **in-migration of job seekers** was identified as a PS 2 medium risk.
- **Increased levels of dust** arising from quarry operations is a PS 2 risk. Both of these will require more detailed investigation in the EIA process and the development of suitable management strategies to reduce the significance of any resultant impacts.
- In terms of Performance Standard 6, an impact of high significance on **surface water** is anticipated, but mitigation is achievable resulting in a medium risk. Due to the relatively high biodiversity in the area, the impact on vegetation and biodiversity (especially at site 1169) is also a medium risk.

The following three risks range from minor to extreme:

- **Vehicle accidents** - the potential risks associated with a vehicle accident range from **medium to extreme** for sites 1170 & 71, and minor to medium for site 1169. The range is dependant on the seriousness of the accident, and the difference between sites is results from the fact that limestone will most probably need to be transported from sites 1170 & 71 to a rail siding. Thus, for site 1169 the risks range from **minor to medium**.
- Impacts on **ground water** are anticipated to be high at this stage, and have been rated as a **medium to major risk**, the range being dependant on how difficult it will be to mitigate impacts. However, it is acknowledged that we have very little understanding of groundwater conditions in the quarry sites and further information should be gathered to better assess the extent of mine de-watering that will be required and the potential impacts on groundwater.

The scoping and risk assessment report has not identified any fatal flaws that might prevent the project from proceeding. However, a number of significant risks associated with Performance Standard 5 – Involuntary Resettlement have been identified. The recommendation to deal with these risks is to initiate a resettlement action plan immediately and in parallel with the social impact assessment and EIA process, in order to better manage these risks. In our opinion a well executed RAP and stakeholder engagement process (SEP) will effectively manage these risks.

Risks associated with potential pollution and changes to surface and groundwater were also identified as major risks in the absence of any information on especially groundwater in the quarry sites. It is recommended that GCS determine exactly where the groundwater table is and provide estimates of groundwater recharge rates; and determine the extent to which quarry pit dewatering will be required. This information is necessary in order to assess the impacts on surface and groundwater (Specialist studies 2 and 3).

Due to the resistance from communities living in quarry site 1169, it has been difficult to recommend which of the three sites should be developed by GCS as a quarry. Table 10.1 draws a comparison of impacts between the three sites. Initial indications are that site 1169 would cause the least amount of social disruption as it has the least number of people live on or adjacent to that

area. Consequently, visual impacts and impacts from dust are rated as moderate and not high. Impacts and risks associated with vehicle movements will also be lower for site 1169, as shorter distances will need to be covered. Loss of arable land is also less significant as fewer people utilize the site. However, site 1169 is more ecologically diverse than the remaining two sites, as they have been subject to significant population pressure and resource use. Overall there are 5 impacts of high significance at site 1169, whereas the other two sites have eight impacts of high significance. Provided a resettlement action plan is executed in parallel with the EIA process, in order to manage the very high risk related to resistance to resettlement, then site 1169 should be selected as the quarry site.

In order to manage the various risks, nine specialist studies are recommended. The first three deal with impacts on the biophysical environment, especially ground and surface water. As mentioned a social impact and land use assessment are recommended.

**Table 10.1 – Comparison of impacts between the three quarry sites. (Impacts in red differ at the three sites).**

<b>Significance Rating</b>			
<b>Issue</b>	<b>1169</b>	<b>1170</b>	<b>1171</b>
<b>PS 1</b>			
1. Perceived lack of Government interest in the Project / EIA	MODERATE	MODERATE	MODERATE
<b>PS 2</b>			
1. Employment Benefits (expectations)	LOW	LOW	LOW
2. In-migration of Job seekers	MODERATE	MODERATE	MODERATE
3. Occupational Health & Safety	MODERATE	MODERATE	MODERATE
4. Working Conditions	MODERATE	MODERATE	MODERATE
<b>PS 3</b>			
1. Solid Waste Management	MODERATE	MODERATE	MODERATE
2. Increased levels of dust	MODERATE	HIGH	HIGH
<b>PS 4</b>			
1. Increased safety risks to community	HIGH	HIGH	HIGH
2. Increase Vehicle Movement	MODERATE	HIGH	HIGH
3. Visual Impacts	MODERATE	HIGH	HIGH
<b>PS 5</b>			
1. Loss of Arable and grazing land	MODERATE	HIGH	HIGH
2. Strong resistance to resettlement	VERY HIGH	MODERATE	MODERATE
3. Major expectations of benefits from the project	HIGH	HIGH	HIGH
<b>PS 6</b>			
1. Impacts on Surface water	HIGH	LOW	LOW
2. Impacts on Groundwater	HIGH	HIGH	HIGH
3. Impacts on Vegetation and Biodiversity	MODERATE	LOW	LOW
4. Impacts on Fauna and Conservation	LOW	LOW	LOW
5. Changes to topography and Landform	HIGH	HIGH	HIGH
<b>PS 8</b>			
Cultural and Archaeological Heritage	MODERATE	MODERATE	MODERATE
<b>TOTALS</b>			
LOW	2	4	4
MODERATE	11	7	7
HIGH	5	8	8
VERY HIGH	1	0	0

Whilst safety issues have been raised as extreme risks, the scoping phase did not reveal any issues linked to community health. However, a scoping level health impact assessment is recommended to align the EIA process with IFC Performance Standard 4, but we are uncertain whether this study is essential. The management of operational phase impacts requires a specialist study on waste management as well as air quality.

In our opinion the implementation of a sound EIA process supported by the nine specialist studies presented in chapter 9 will reveal that all significant risks can be effectively managed and mitigated to acceptable levels.

## 12 REFERENCES

Rutherford, M. C., O'Farrel, P., Goldberg, K., Midgley, G.F., Powrie, L.W., Ringrose, S., Mattheson, W., and Timberlake, J. (2005). *SAFARI 2000 NBI Vegetation Map of the Savannas of Southern Africa*. Data set. Available on-line [<http://daac.ornl.gov/>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Wild, H. & Fernandes, A. (1967). *Flora Zambesiaca Supplement: Vegetation Map of the Flora Zambesiaca Area*. *Flora Zambesiaca*. Vol. 12, Part 2 Collins, Harare.68 pp and Map

**APPENDIX A – THE AIA FORM SUBMITTED TO MICOA, AND THEIR RESPONSE**

## **APPENDIX B – BACKGROUND INFORMATION DOCUMENT**

**APPENDIX C – COPY OF PAMPHLETS INFORMING STAKEHOLDERS OF PUBLIC MEETINGS**

## **APPENDIX D – MINUTES OF PUBLIC MEETINGS**