

**AFRICAN DEVELOPMENT BANK**



**CIMERWA**  
**Cement Project in Muganza,**  
**Rusizi District, Western Province**  
**RWANDA**

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**SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT  
ASSESSMENT**

PRIVATE SECTOR DEPARTMENT (OPSM)

June 2010

## Environmental and Social Impact Assessment (ESIA) Summary

Project Name : CEMENTS DU RWANDA «CIMERWA »  
Country : Rwanda  
Project number : P-RW-BB0-002

### 1. INTRODUCTION

**Rwanda Investment Group (RIG)** is a Rwandan company created and incorporated in May 2006. **RIG's** objective is to mobilize resources, from both domestic and foreign sources, to invest in high-impact profitable development projects.

**CEMENTS DU RWANDA LIMITED (CIMERWA)**, a company now owned by **RIG** was established in 1984. It is the only cement producer with full process in Rwanda. **CIMERWA** was privatized in 2006 when the Government of Rwanda sold 90% equity stake to **RIG** and retained the balance 10% of the shares.

Currently the **CIMERWA** cement plant produces about 70,000 tonnes per annum (tpa) of clinker equivalent to 100,000 tpa of cement using the wet process of cement manufacture. The plant uses heavy fuel oil from Kenya, leading to a high production cost of cement. **CIMERWA** is modifying its existing plant to replace the use of oil by peat, which is available in abundance in the near vicinity of the plant. After modification the fuel shall comprise of 70% peat and 30% oil.

**CIMERWA** now proposes to expand its cement production capacity to 600,000 tonnes per annum to meet the market demand by establishing a new state-of-the-art modern dry process cement plant. The new cement plant is proposed to be located at Muganza in Rusizi District of Western Province, Rwanda, a location that is adjacent to the existing plant.

The limestone, sandstone and pozzolana requirement for the new plant shall be met by increased production from the existing captive mines. Only one new clay quarry covering 13.23 ha area shall be opened up.

This ESIA Summary outlines the Summary of the Environmental and Social Impact Assessment (ESIA) and the Environmental and Social Management Plan (ESMP) formulated for the proposed project, which includes the cement plant and the captive raw material mines.

### 2. PROJECT DESCRIPTION AND JUSTIFICATION

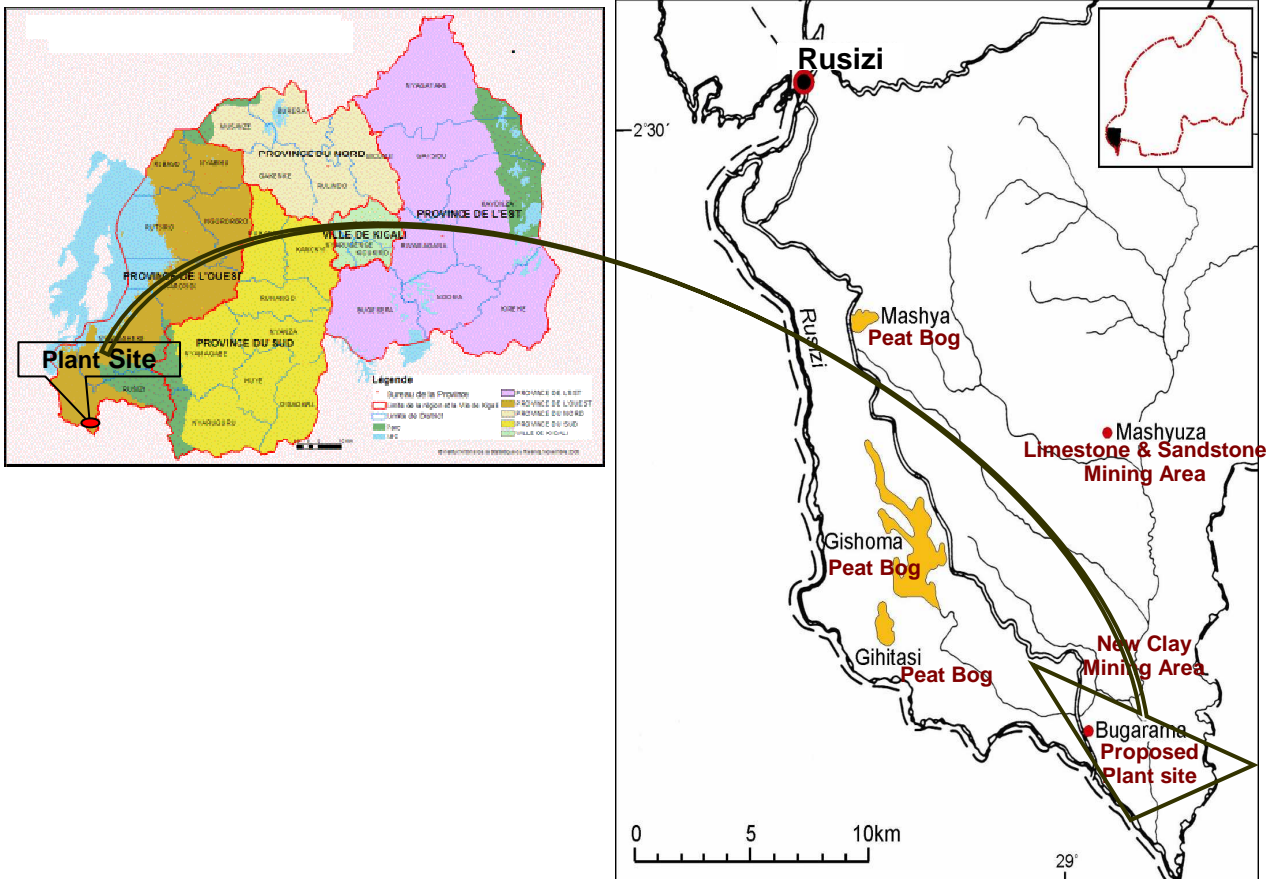
#### 2.1. PROJECT DESCRIPTION

The cement project is proposed to be located in Muganza Sector, Rusizi District of the Western Province. The location is about 350 km from Kigali and 60 km from Kamembe town.

The new clay mining area is located in Muganza Sector; about 2 km from the plant and the limestone and sandstone mining areas are located in Nyakabuye Sector at about 3 km from the plant site. Pozzolana is available from Nyamyumba Sector of Rubavu District.

Peat, which is proposed to be used as a fuel at the new cement plant in the future, is available from Gishoma bog, which is located close to the Rusizi-Bugarama road, 18 km south of Rusizi. Peat extraction shall be carried out by a separate company of **RIG**. Other peat bogs over which concessions have been obtained include Mashya and Gihitasi, located close to Gishoma bog.

The proposed plant capacity is primarily based on market considerations and the availability of raw materials. The proposed location enjoys the twin advantage of proximity to raw material sources as well



as markets offered by Eastern DRC, Southern Uganda and Burundi in addition to the local Rwandan market.

The raw material and fuel sources for the proposed plant are detailed below.

Sn	Material	Source Locality and its distance from plant	Quantity (tonnes per annum)	Remarks
<b>Raw materials</b>				
1	Limestone	Nyakabuye, 3 km	573,080	Transport to plant by road.
2	Sandstone	Nyakabuye, 3 km	69,890	
3	Clay	Muganza, 2 km	51,000	Considered as corrective. Transport to plant by road.
4	Gypsum	Kenya, 2200 km	24,000	Considered as cement setting time regulator. Transport to plant by road.
5	Pozzolana	Nengo/ Rugeroro, 160 km	180,000	Considered as additive. Transport to plant by lake & road.
<b>Fuel</b>				
1	HFO	Mombasa, Kenya, 2200 km	13,860	Transport to plant by road
2	Peat	Gishoma, etc., 20 km	95,720	

The best available technology, which is the dry process, shall be used for manufacture of cement at the new cement plant. Cement manufacturing consists of raw meal grinding, blending, calcining to form clinker and cement grinding. In short, limestone and other materials containing calcium, silica, aluminium and iron oxides are crushed and milled into a raw meal. This raw meal is blended and is then heated in the pre-heater to initiate the dissociation of carbonate to calcium oxide and carbon dioxide. The meal then proceeds to the kiln for heating and reaction between calcium oxide and other elements to form calcium silicates and aluminates at a temperature up to 1450°C. The products leave the kiln as a nodular material called clinker. The clinker is inter-ground with gypsum and other additives like pozzolana to a fine product called cement. The adjacent Figure shows the cement manufacturing process from raw material quarrying to the bagging of the cement.

The existing cement plant has a total manpower of 353. Since the proposed new cement plant shall be highly automated, its manpower requirement will be reduced to 180. The excess personnel shall be encouraged to form Cooperatives and may be given contracts for transportation of raw materials and cement, cement bagging, etc.

The maximum power demand for the proposed plant is estimated at about 10 MW. The power demand shall be met from the national grid drawn from the nearest substation at Mashyuza which sources power from DRC.

Water supply will be met from Njambwe river. **CIMERWA** is already operating a Water Treatment Plant of capacity 2,600 m<sup>3</sup>/ day around 3 km from the plant to supply treated water to the Plant and Colony and also to the neighboring villages by Company owned pipelines. The total requirement of water for the new project is 1,080 m<sup>3</sup>/day, which shall also be met from the existing treatment plant.

No wastewater is generated from process and cooling in cement manufacturing as the total water undergoes evaporation during the exchange of heat. Wastewater generation from the plant will mainly comprise of cooling water from DG sets and domestic wastewater from plant and colony. A modern Sewage Treatment Plant to treat sewage effluent will be installed. The treated effluent shall be used for plantation.

A residential colony to provide accommodation for plant personnel already exists at the Plant and the same will be adequate. The colony has facilities like a health centre, school, recreation centre, guesthouse, sports playgrounds, etc.

## **2.2. PROJECT JUSTIFICATION**

Rwanda is currently a cement deficit market. Cement consumption is concentrated in and around Kigali, which being the capital is seeing the maximum development, both in terms of infrastructure development and residential and commercial complexes/ buildings. Cement should be made available at a lower price. A large sized investment such as this would lead to all round development of business in the area.

Furthermore, it is well supported that the expansion of CIMERWA will provide some advantages to the immediate project community and other people from other districts and probably in the region. For instance, the average income of respondents before joining CIMERWA was about 66,457 Rfr per year (100US\$) compared to an average of 230,100 Rfr (around 400 US\$) per year after joining CIMERWA.

## **3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

The ESIA study for the proposed Cement project has been carried out within the framework of local, national and international environmental regulations. The legislative framework applicable to the proposed project is governed by the Republic of Rwanda and the African Development Bank (AfDB).

### 3.1 REGULATORY FRAMEWORK OF RWANDA

In February 2005, the Rwandan Parliament passed the Environment Bill, which lays the legal framework for environmental management in Rwanda. The Organic Law no. 04/2005 of 08 April 2005 defines the law determining the modalities of protection, conservation and promotion of environment in Rwanda. The overall responsibility for management of the bio-physical environment throughout Rwanda lies with the Rwanda Environmental Management Authority (REMA), which was legally established in November 2003.

The Cement plant will be responsible for implementing environmental management plans at its facilities in coordination with REMA. The environmental performance of the project will be monitored on a regular basis through REMA and CIMERWA's own set up.

### 3.2 AFRICAN DEVELOPMENT BANK'S GUIDELINES

As per the Environmental and Social Assessment Procedures (ESAP) of AfDB, the proposed cement project including its associated mining operations is classified as Category 1. Additionally, as per AfDB's Involuntary Resettlement Policy, 2003, since the project involves displacement of 204 households, an elaborate Resettlement Action Plan (RAP) has been undertaken.

The following AfDB Standards are applicable:

- Environmental and Social Assessment Procedures
- Policy on Involuntary Resettlement
- Gender Policy
- Policy on Information Disclosure
- Policy on Consultation with Civil Society.

In addition, the ESIA was elaborated in compliance with :

- the World Bank Group's Environmental, Health and Safety (EHS) Guidelines for Cement and Lime Manufacturing
- EHS Guidelines for Construction Material Extraction
- and EHS General Guidelines, 2007.

## 4. DESCRIPTION OF THE PROJECT ENVIRONMENT

In order to assess the baseline environmental status in and around the proposed project site, a comprehensive primary and secondary data collection programme has been undertaken during the period from Nov 2008 to Feb 2009. The plant and mining areas comprise the core zone and the 10 km radius area around the core zone is the buffer zone which comprises the study area. The environmental components studied include:

Physiography, geology, geomorphology, hydrogeology, climatology, meteorology, noise levels, soil and water resources, land use, flora and fauna, socio-economic components including demography, settlement pattern, land and community structure, agricultural system and livestock, livelihoods and consumption patterns, education system, transportation networks and other infrastructure like water supply, medical facilities, public health issues, etc.

**TOPOGRAPHY & DRAINAGE :** The topography of the project area and the surrounding consists of plains, mountains and valleys. The drainage of the project area is governed by the catchments of Rusizi and Rubyiro rivers. The region has known a series of tectonic movements and has an important network of geological fractures resulting in a number of thermal water points on the ground surface like Mashyuza near the limestone quarry.

**CLIMATE :** The project area experiences tropical climate, characterized by an average temperature of 24°C and a dry season of three months starting from June to September. The total annual rainfall is about 1,050 mm. There are two rainy seasons, the short wet season lasts from October to November and the main rainy season lasts from mid March to end May.

**HYDROLOGY :** A detailed hydro-geological study has been carried out in the area. During the study, the evapo-transpiration has been calculated as 51.9 mm, the runoff is 27.6 mm with the resultant storage being 13.7 mm. Considering the flow of water in Njambwe River, which has been measured as 141,313 m<sup>3</sup> / day, the withdrawal of about 1200 m<sup>3</sup> / day surface water to meet the water requirement of the proposed **CIMERWA** plant and the local population shall not adversely affect the hydrological conditions of the area.

Thermal water springs of Mashyuza occur towards the bottom of the sandstone ridge. The spring is used for bathing purposes by the local population. Care needs to be taken during the blasting and mining operations to prevent any boulders or rocks from falling into the thermal springs.

**WATER QUALITY :** Surface water samples from three (3) rivers, two (2) thermal springs and two (2) drinking water samples have been analyzed for their physico-chemical properties.

- An analysis of the water quality of samples from upstream Njambwe and Rubyiro rivers shows that values of iron, manganese, cadmium and lead were above the WHO norms for drinking water. Rest of the parameters are within WHO norms. Water was very turbid and also contaminated by fecal coliform. This is due to the fact that the river water is being used for toilet purposes. The presence of E Coli bacteria shows that the water is a potential health hazard and should not be used without treatment.
- A perusal of the water quality analysis from Mashyuza thermal water spring shows that the water has a high electrical conductivity, high TDS, high total hardness and high alkalinity. These high values can be attributed to the very high concentration of metallic ions due to the intensive underground thermal activity. The water sample from Mashyuza water spring has high E. Coli bacteria as it was being used for bathing and washing purposes by the surrounding area.

**NOISE LEVELS:** The noise levels have been estimated at site and at various locations within the study area during the period December 08 -January 2009. The noise levels at all the sampling locations are within the EHS guidelines.

**LAND USE:** A major part (77%) of the 10 km study area comprises of mixed agriculture and settlements. Around 12.8% of the buffer zone comprises of natural forests and 1.3% is covered by Forest Plantations. Rice cultivation covers 7.75% of the buffer zone.

**FLORA :** A detailed ecological study has been carried out in the study area. The vegetation composition, abundance, and other ecological information of the area have been collected.

The study area around the plant and mining sites is rich in species composition. Besides the extensive areas of cultivated mixed crops widely distributed in the study area, some relic and several ruderal species constitute the actual natural vegetation of the region. Several primitive and indigenous plant species of the area are gradually disappearing due to severe land use pressure and utilization by local people. A total of 149 species have been recorded in the study area. Most of these species are indigenous while a few others are exotic or naturalized. A total of 13 medicinal plants were recorded. The plant species encountered include 10 threatened species.

**FAUNA:** A total of 5 species of amphibians belonging to two families and 15 species of reptiles belonging to ten families have been recorded in the region. A total of 74 bird species representing 38 different families were observed and documented in the buffer zone. Among the birds found in the study area, 6 species are globally threatened and appear on CITES list. Five migrant Palearctic species were observed in wetland area, which would be on passage through Rwanda. No endemic bird species was observed in the study area. The population of mammals in the study area is very low, and in most cases the species that inhabited forest areas and wet marshlands in the past have become extinct locally due to loss of habitat and hunting pressure.

**CULTURAL, HISTORICAL & ARCHAEOLOGICAL FEATURES:** No visible archaeological remains, which have scientific, cultural, public, economic, ethnic and historic significances, have been observed in the area. The risk value of both the plant and the mining sites is very low, where no significant observable archaeological evidence is found. The sites have no archaeological importance.

**SOCIO-ECONOMIC SCENARIO OF THE AREA:** A detailed socio-economic survey has been carried out in the 10 km area around the project site. The socio-economic profile of the area is given below.

**Demography:** The plant and mining areas fall within Muganza and Nyakabuye Sectors of Rusizi District and Gisenyi Sector of Rubavu District. The buffer zone (area within 10 km of plant and mining sites) falls partly in six Sectors, namely, Muganza, Gikundamvura, Bugarama, Nyakabuye, Rwimbogo and Gitambi. The total population in the 6 Sectors which partly fall within the 10 km radius area is 116,954 (District Report of 3rd December, 2008). The estimated total number of households in all these 6 Sectors in 2007 was 17,133.

**Major Economic Activities:** Major economic activities that characterize the study area include those related to agriculture, apiculture, and handicrafts. Muganza Sector where **CIMERWA** is located has 11 agricultural based cooperatives of which 8 are involved in rice production in the Bugarama Marshland, 2 are involved in maize production and 1 in honey production. Some local people are employed by **CIMERWA**, by the Health Centres, primary schools, financial institutions like COGEBANK and Micro-financing organisations, NGOs (like PREPAF, CARITAS, and Global Fund), etc. Commercial activities such as kiosks and small scale trade centres also characterize the study area.

**Agriculture and Livestock:** Agriculture is the chief occupation of the area and is the main source of income for all Sectors under the buffer zone. The dominant crops in the study area are maize, cassava, rice, beans, sorghum, banana, and mangoes. The dominant farming system is mixed crops compared to mono cropping.

The main livestock in the area include pigs, goats, sheep, cattle and hens. The livestock diseases prevalent in the area include Verminose, Typhos aviaire, Muryamo y'ingurube, Indwara ziterwa n'uburondwe. There are no existing veterinarian facilities in the area.

**Educational Facilities:** There are limited governmental educational facilities in the area. There are a total of 29 primary schools, and 11 middle schools and 4 secondary schools in the six Sectors of the study area. Most of the schools are up to primary or middle levels. There are two secondary schools in Muganza, one in Bugarama and one in Rwimbogo Sectors. At the primary school level, the student-teacher ratio is around 66-68 which reduces to 30 at the middle school level.

It is observed that the Muganza Sector, where the **CIMERWA** plant is located has higher literacy level as compared to other Sectors. Muganza Sector has the highest proportion of residents who have procured a University degree as also a higher proportion as far as secondary education is concerned.

**Housing Conditions:** On the basis of sample survey, it is seen that 85.7% of households own houses, 12% live in rented accommodation and the balance people use houses temporarily. As regards the quality of construction of houses, 41.3% people have houses constructed with clay bricks followed by those with houses constructed using timber (32.2 %). Very few people use cement bricks/ blocks. As per survey carried out, only 32% of people in Muganza Sector have access to electricity in their homes. The situation is worse in Bugarama and Rwimbogo Sectors where an abysmally low 5% and 3% of the households have electricity connections.

**Average Landholding:** Land is a scarce resource in the project area and an important indicator of the fragmented land holding pattern in the area. A majority, 53% of the survey respondents have a land size of 0-0.2 hectare which is less than the national average of 0.4 hectare. Few households have a land holding more than 2 hectares.

**Health Facilities:** In general, the health status of the community can be described as poor. The prevalent diseases in the project areas, as diagnosed by the existing different health facilities are Malaria, Respiratory Tract Infection, Urinary tract infection, Intestinal parasites, HIV/ AIDS, etc.

Most of the respondents are familiar with health service providers such as Health Centers. They were mostly facilitated by health insurance scheme such as Mutuelle de santé. There is no large hospital in the six surveyed Sectors though there are 6 Health Centres in the six Sectors of the study area.

**CIMERWA** is currently operating a Health Centre established at the Plant premises since 1984, which comprises of a Pharmacy, a 14 bed hospital and a laboratory manned by trained staff. In addition to the staff of the Plant and their dependents, the Health Center is open to the local population who pay a subsidized consultation fee and the medicines are made available to them at cost price. The Health Centre records about 1,200-1,500 consultations per month and about 70% of the patients are local people and only 30% are **CIMERWA** employees and their dependents. Monthly Reports of the Check ups at the Clinic are reported to the Government. Immunisation is carried out at the Health Centre with vaccines provided by the Government. Family planning facilities are also available at the Center.

**CIMERWA** has recently signed a contract (MOU) with Mibilizi Hospital (main Government Hospital in the area) to avail the services of its Doctors for two days per week to help in consultations and treatment of serious illnesses. In addition to Mibilizi Hospital, there are two Government Health Clinics at about 3 km from the Plant. These Health Clinics are doing HIV surveillance in the area under Government programmes.

As a part of its CSR activities, **CIMERWA** will continue to extend medical facilities at its Health Center to the local community which will also include the resettlers in Gitambi Sector from whom land has been acquired for the project. This resettled community will be specially monitored for health issues. However, there are no diseases or illnesses that the resettled population will be exposed to.

## 5. PROJECT ALTERNATIVES

Prior to arriving at a decision regarding establishment of the new cement plant, the “No Project Option” and the option of establishment of a new modern cement plant close to the existing cement plant and raw materials quarry were considered.

The site proposed for the new line is adjacent to the existing plant which has ensured minimal additional land acquisition. The adjoining site location was also selected because it enabled optimal utilization of the facilities of the existing plant. The raw material quarries are located within 3 km of this site. The availability of adequate reserves of peat is ensured which shall be used as the fuel for the new plant.

## 6. POTENTIAL IMPACTS & MITIGATION MEASURES

The Operation phase of the proposed cement plant mainly comprises of a number of activities, viz., excavation of limestone, sandstone and clay from the captive mines, transportation of limestone from mines to plant site, transportation of other correctives/ additives to the plant site, preparation of raw meal by adding correctives to limestone, clinkerisation of raw meal, cooling and heat recovery, blending & grinding of clinker by adding additives and packing & despatch.

The details of main activities and actions to be undertaken and their impacts during operation phase of plant and mines are summarized below.

Sn	Component	Activities	Potential Impacts
1	Transportation of raw materials and products	<ul style="list-style-type: none"> <li><input type="checkbox"/> Increase in traffic movement</li> <li><input type="checkbox"/> Washing and maintenance of vehicles</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Disturbance to community &amp; its safety</li> <li><input type="checkbox"/> Contribution of dust and gaseous pollutants like SO<sub>2</sub>, NO<sub>x</sub>, CO, VOC to ambient air quality</li> <li><input type="checkbox"/> Contribution to ambient noise level</li> </ul>
2	Operation of plant / mines	<p><b>Mines</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Drilling</li> <li><input type="checkbox"/> Blasting</li> <li><input type="checkbox"/> Loading &amp; transportation</li> <li><input type="checkbox"/> Operation of mining machinery</li> </ul> <p><b>Plant</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Crushing of limestone/ other raw materials</li> <li><input type="checkbox"/> Preparation of raw meal</li> <li><input type="checkbox"/> Clinkerisation of raw meal</li> <li><input type="checkbox"/> Cooling and heat recovery</li> <li><input type="checkbox"/> Blending/grinding of clinker</li> <li><input type="checkbox"/> Packing &amp; Dispatch</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Air emissions from operations are Dust, NO<sub>x</sub>, SO<sub>2</sub>, GHG and unburnt hydrocarbons.</li> <li><input type="checkbox"/> Generation of noise and vibrations from blasting</li> <li><input type="checkbox"/> Waste water generation</li> <li><input type="checkbox"/> Solid waste from waste lubricating oil from machinery and municipal waste from domestic usages</li> <li><input type="checkbox"/> Accidental spillage of oil, if any.</li> </ul>
3	Socio-economic	<ul style="list-style-type: none"> <li><input type="checkbox"/> Acquisition of land</li> <li><input type="checkbox"/> Indirect employment</li> <li><input type="checkbox"/> Development of infrastructure like roads, medical, health, etc</li> <li><input type="checkbox"/> Implementation of Welfare schemes</li> <li><input type="checkbox"/> Demand of local products and agricultural products</li> <li><input type="checkbox"/> Development of green belt</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Loss of agricultural land</li> <li><input type="checkbox"/> Resettlement of households</li> <li><input type="checkbox"/> Employment to locals</li> <li><input type="checkbox"/> Business opportunities to locals</li> <li><input type="checkbox"/> Increase in per capita income</li> <li><input type="checkbox"/> Increase in literacy rate</li> <li><input type="checkbox"/> Change in living standard</li> <li><input type="checkbox"/> Regional development</li> <li><input type="checkbox"/> Saving of foreign exchange</li> </ul>



Sn	Component	Activities	Potential Impacts
		☐ Payment of taxes and royalty	

The plant area and the new clay mining area have necessitated acquisition of land. The land has been acquired by **CIMERWA** as per local Rwandan expropriation law and a full RAP has been prepared. The executive summary of the RAP is posted with this ESIA's summary.

### 6.1 QUALITATIVE IMPACT ASSESSMENT

The details of criteria adopted for impact assessment are as follows:

Impact Rating		Criteria		
Nature of impact	Beneficial	Positive		
	Adverse	Negative		
Duration of impact	Short term	Impacts shall be confined to a stipulated time		
	Long term	Impacts shall continue till the end of plant life		
Likelihood of occurrence	Negligible	<10%	Low	10-40%
	Medium	40-60%	High	60-80%
	Very high	80-100%		
Significance of impact	Minor	Noticeable impacts only		
	Localized	Noticed by adjacent locality & may have direct impacts		
	Major	Have direct sustainable impacts		
	Massive	Ability to change the system		
Potential impact level	Low	Has practically no impact		
	Medium	Has impact in local area		
	High	Has impact in region		

The qualitative impacts of the proposed project are summarized here.

Particulars	Impact Rating				
	Nature	Duration	Likelihood	Severity	Potential
<b>Construction Phase</b>					
Land Use	Adverse	Long term	Medium	Localized	High
Air Quality	Adverse	Short term	Medium	Localized	Medium
Noise level	Adverse	Short term	Medium	Localized	Medium
Water Resources	Adverse	Short term	Medium	Localized	Medium
Waste Water	Adverse	Short term	Medium	Localized	Medium
Soil & Solid Waste	Adverse	Short term	Medium	Localized	Medium
Ecology	Adverse	Short term	Medium	Localized	High
Socio-economic & employment	Beneficial	Short term	Medium	Localized	High
<b>Operation Phase</b>					
Green House Gas Emission	Adverse	Long term	High	Regional	Medium
Air Quality	Adverse	Long term	Medium	Localized	Medium
Noise level	Adverse	Long term	Medium	Localized	Medium
Traffic movement	Adverse	Long term	High	Localized	Medium
Water Resources	Adverse	Long term	Medium	Localized	Medium
Waste Water	Adverse	Long term	Medium	Localized	Low
Solid Waste	Adverse	Long term	Medium	Localized	Low
Ecology	Adverse	Long term	Medium	Localized	High
Loss of agricultural land	Adverse	Long term	High	Localized	High
Employment & Economic growth	Beneficial	Long term	High	Regional	High
Socio-economic Measures	Beneficial	Long term	High	Localized	High

### 6.2 MITIGATION MEASURES

The mitigation measures for the identified impacts are described below.

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
1	Natural	Depletion of	☐ Raw material reserves shall be estimated properly,

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
	Resources	Limestone reserves and other corrective materials and additives	<ul style="list-style-type: none"> <li><input type="checkbox"/> Regular review of raw mix to get consistent quality of products,</li> <li><input type="checkbox"/> Continuous attempt to control wastages during transportation, storage and handling of raw materials,</li> <li><input type="checkbox"/> Mining plan will be prepared to optimize the mining methodology and ensure the implementation of a progressive reclamation plan to make the land fit for cultivation in areas where limestone has been excavated,</li> <li><input type="checkbox"/> Regular monitoring of availability of stocks and consumption of raw materials, dispatch of products and loss of material.</li> </ul>
2	Air Emissions		
A	Emission from mines	<ul style="list-style-type: none"> <li>o Drilling</li> <li>o Blasting</li> <li>o Loading and unloading</li> <li>o Crusher</li> <li>o Transportation</li> <li>o Wind erosion</li> <li>o Traffic movement</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Dust emissions from crusher will be controlled by bag filter,</li> <li><input type="checkbox"/> All dumps will be suitably vegetated,</li> <li><input type="checkbox"/> A speed limit will be defined for the trucks/ dumpers moving within the mining area,</li> <li><input type="checkbox"/> Dust suppression systems (water spraying) will be adopted at faces/ sites before and after blasting and while loading,</li> <li><input type="checkbox"/> Dust generated due to blast hole drilling will be suppressed by using water injecting system of dust collectors,</li> <li><input type="checkbox"/> Use of sharp drill bits for drilling holes and drills with water flushing systems (wet drilling) to reduce dust generation,</li> <li><input type="checkbox"/> Use of sharp teeth for shovels to reduce dust generation,</li> <li><input type="checkbox"/> Regular water spraying will be carried out on haulage roads during transportation of raw materials,</li> <li><input type="checkbox"/> All vehicles and their exhausts will be well maintained and regularly tested for emission concentration,</li> <li><input type="checkbox"/> Dust masks will be provided to workers engaged at dust generation points like drills, loading, unloading points, etc.</li> <li><input type="checkbox"/> Extensive plantation will be carried out in and around the mining area,</li> <li><input type="checkbox"/> Use of good quality explosives having proper oxygen balance with regular monitoring.</li> </ul>
B	Air emissions from stacks	Air Emissions <ul style="list-style-type: none"> <li>o Crusher</li> <li>o Raw Mill</li> <li>o Peat Mill</li> <li>o Kiln</li> <li>o Clinker Cooler</li> <li>o Cement Mill</li> <li>o Packing Plant</li> <li>o DG sets</li> <li>o Traffic movement</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure maximum efficiency of combustion in kiln</li> <li><input type="checkbox"/> Performance guarantee of suitably designed Bag filters/ ESP will limit the dust concentration to 50 mg/ Nm<sup>3</sup> in all emissions</li> <li><input type="checkbox"/> In the event of failure of any pollution control equipment, automatic tripping in the control system will be provided</li> <li><input type="checkbox"/> Efficiency of each air pollution control equipment will be ensured to more than 99%</li> <li><input type="checkbox"/> Continuous dust monitor will be installed on kiln stack</li> <li><input type="checkbox"/> Performance guarantee of SO<sub>2</sub> and NO<sub>x</sub> emissions from stacks is within the norms of 400 mg/ Nm<sup>3</sup> and 600 mg/ Nm<sup>3</sup> respectively as specified by IFC.</li> <li><input type="checkbox"/> A well-designed low NO<sub>x</sub> burner system will limit the core flame temperature to ensure a low value of NO<sub>x</sub></li> <li><input type="checkbox"/> Impact of CO emission will be negligible in view of the firing technique of keeping a positive oxygen balance.</li> <li><input type="checkbox"/> Regular preventive maintenance of pollution control equipment</li> <li><input type="checkbox"/> All vehicles and their exhausts will be well maintained and regularly tested for emission concentration.</li> </ul>
C	Fugitive Emissions	<ul style="list-style-type: none"> <li><input type="checkbox"/> Storage and Conveying/ transportation of raw materials and products</li> <li><input type="checkbox"/> Leakages from machinery and pipes</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Jet Pulse bag filters will be provided at all dry material conveying and transfer points,</li> <li><input type="checkbox"/> Drop distances will be minimized by adjusting the conveyors,</li> <li><input type="checkbox"/> Dust suppression system by water sprinkler at dump hopper of raw materials,</li> <li><input type="checkbox"/> Regular dust suppression on the haul roads</li> <li><input type="checkbox"/> Plant roads &amp; approach roads will be made of bitumen/ concrete &amp; mechanical vacuum cleaner shall be used for cleaning of dust on internal roads,</li> <li><input type="checkbox"/> Open areas within the plant premises/ along boundaries of the plant premises will be covered under green belt,</li> <li><input type="checkbox"/> Raw Materials/ products will be fully covered during transportation to/ from the site by road.</li> </ul>

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
D	Green house Gas Emissions	<ul style="list-style-type: none"> <li><input type="checkbox"/> Stack emissions</li> <li><input type="checkbox"/> Traffic movement</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> The proposal to manufacture blended cement shall reduce clinker requirement in cement, thereby reducing GHG emissions,</li> <li><input type="checkbox"/> The state-of-the-art dry process technology with six stage precalciner will lead to increased energy efficiency thereby reducing GHG emissions.</li> </ul>
3	Noise Emissions	<ul style="list-style-type: none"> <li><input type="checkbox"/> Operation of noise generating equipment like compressors, pumps, etc.</li> <li><input type="checkbox"/> Maintenance</li> <li><input type="checkbox"/> Traffic movement</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Cumulative noise level at walkways and work areas will be &lt;85 dB (A) and no worker will be exposed to a noise level &gt;85 dB (A) without hearing protection,</li> <li><input type="checkbox"/> Noise level at the boundary of plant will be &lt;70 dB (A),</li> <li><input type="checkbox"/> Blasting operations will be carried out only during the day time using milliseconds detonators and cord relay so as to avoid high noise intensity,</li> <li><input type="checkbox"/> Procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin</li> <li><input type="checkbox"/> Regular maintenance of noise generating equipment,</li> <li><input type="checkbox"/> Provision of silencers will be made wherever possible,</li> <li><input type="checkbox"/> Necessary enclosures will also be provided on the working platforms/areas for local protection in high noise level areas,</li> <li><input type="checkbox"/> Proper lubrication &amp; housekeeping to avoid excessive noise,</li> <li><input type="checkbox"/> The operators will be provided with necessary safety and protection equipment such as ear plugs, ear muffs etc.,</li> <li><input type="checkbox"/> Provision of plantation in and around the plant premises,</li> </ul>
4	Ground Vibration/ Fly Rocks	<ul style="list-style-type: none"> <li><input type="checkbox"/> Drilling</li> <li><input type="checkbox"/> Blasting</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Careful planning, checking, execution &amp; monitoring of each blast</li> <li><input type="checkbox"/> Blast holes will always be initiated by short delay detonators rather than adopting instantaneous detonation. Short delay in blasting of successive blast holes effectively reduces the vibration problem,</li> <li><input type="checkbox"/> Free faces will be sufficiently cleared of any loose material before blasting and burden,</li> <li><input type="checkbox"/> Multi row blasting will be followed,</li> <li><input type="checkbox"/> Use of ANFO, which has low velocity of detonation, shall also reduce the vibration problem,</li> </ul>
5	Water Resources	<ul style="list-style-type: none"> <li><input type="checkbox"/> Make up water for cooling</li> <li><input type="checkbox"/> Dust suppression</li> <li><input type="checkbox"/> Domestic</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attempt will be made to optimize/reduce the use of water,</li> <li><input type="checkbox"/> Water harvesting will be carried out to the maximum extent possible.</li> </ul>
6	Waste Water	<ul style="list-style-type: none"> <li><input type="checkbox"/> Domestic</li> <li><input type="checkbox"/> DG set</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> A modern Sewage Treatment Plant will be provided and no waste water shall be discharged from the plant premises</li> <li><input type="checkbox"/> Treated effluent will be used for dust suppression and plantation/ greenbelt development</li> <li><input type="checkbox"/> Construction of suitably designed drains all along the roads and boundary of the plant premises</li> <li><input type="checkbox"/> Appropriate storm water and runoff control systems will be provided to minimize the quantities of suspended material carried off site</li> </ul>
7	Solid waste (hazardous & non-hazardous)	<ul style="list-style-type: none"> <li><input type="checkbox"/> Maintenance and Operation of integrated plant</li> <li><input type="checkbox"/> Storage and handling of fuel</li> <li><input type="checkbox"/> Accidental spillage</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Whenever possible, use of non-hazardous instead of hazardous materials,</li> <li><input type="checkbox"/> All hazardous (ignitable, reactive, flammable, corrosive, and toxic) materials will be stored in clearly labeled containers or vessels,</li> <li><input type="checkbox"/> All hazardous wastes, process residues, solvents, oils, and sludge will be burnt in kiln after obtaining permission from statutory authorities</li> <li><input type="checkbox"/> Recycle or reclaim materials where possible,</li> <li><input type="checkbox"/> Careful garbage transportation to dumping site and disinfection of transport vehicles body,</li> <li><input type="checkbox"/> Fire prevention systems and secondary containment will be provided for storage facilities, to prevent fires or release of hazardous materials to the environment.</li> </ul>

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
8	Spill Management	<ul style="list-style-type: none"> <li><input type="checkbox"/> Maintenance and Operation</li> <li><input type="checkbox"/> Storage and handling of fuel</li> <li><input type="checkbox"/> Accidental spillage</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Impervious liners will be used for fuel, lubricants and chemicals storage area,</li> <li><input type="checkbox"/> Effective bunds capable of containing 110% of the volume within and enclosing all potentially contaminating materials will be used for fuel and lubricants storage area,</li> <li><input type="checkbox"/> Oil drip pans will be used wherever there is significant potential for leakage including, but not limited to;                             <ul style="list-style-type: none"> <li>o Electric generator engine</li> <li>o Compressors, pumps or other motors</li> <li>o Maintenance areas</li> <li>o Fuel transfer areas</li> </ul> </li> </ul>
9	Fire Safety	<ul style="list-style-type: none"> <li><input type="checkbox"/> Storage and handling of peat</li> <li><input type="checkbox"/> Peat mill</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Equipment for pulverizing peat will be dust tight and hot parts will be sufficiently insulated,</li> <li><input type="checkbox"/> Temperature of the peat dust and carrier gas mixture after the peat mill will be monitored,</li> <li><input type="checkbox"/> Lowering the oxygen content (&lt;10-12%) in the dust-air mixture by use of inert gas will lower the risk of explosion,</li> <li><input type="checkbox"/> The velocity of pulverized peat in the pipes will be &gt;18m/s,</li> <li><input type="checkbox"/> Pipeline will be equipped with flow monitors/ pressure indicators to stop the feed if speed drops &lt;18m/s, or if pipeline is plugged</li> <li><input type="checkbox"/> The suction side of the blower which will receive peat will be designed such that peat dust cannot be heated by friction,</li> <li><input type="checkbox"/> Peat milling process and feeding of pulverized peat to the combustion process will be carefully planned and controlled,</li> <li><input type="checkbox"/> Fire protection system will be integrated into the main plant system.</li> </ul>
10	Occupational Health & Safety	<ul style="list-style-type: none"> <li><input type="checkbox"/> All Operations</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Provision of PPE like ear muffs, helmets, boots, dust masks, etc. to employees,</li> <li><input type="checkbox"/> Safe procedure for storage and handling the explosives will be developed and implemented,</li> <li><input type="checkbox"/> Adequate training will be provided to the staff,</li> <li><input type="checkbox"/> Regular medical check up of workers.</li> </ul>

## 7. ENVIRONMENTAL HAZARD MANAGEMENT

The hazardous wastes generated from a cement plant mainly are:

- \_ Waste oil and grease drained out of gearboxes and other equipment
- \_ Scrapped automobile batteries

Waste oil shall be stored in leak proof steel drums. The waste oil drums shall be properly identified with label of what is contained both in local language (Kinyarwanda) and French. The waste oil will be disposed of by burning it in the cement kiln under controlled conditions.

Storage and handling of explosives, exposure to high dust and noise levels are some of the occupational hazards associated with cement plant and mining operations. The explosives are being stored in a magazine under Rwandan Defence Forces control. The explosives are issued and transported to the blasting site by the Army. Their officials are trained to store, handle and use these explosives.

Workers in the CIMERWA mine are being provided with Personal Protective Equipment (PPE) like dust masks, ear muffs, helmets, boots, etc. and this practice shall be continued.

All workers are undergoing periodic and regular health checkups and detailed records are maintained for the same. They are being trained in safe work practices and this would continue at the new plant also. Frequent third party audits shall also be carried out.

The closure of a quarry can present safety issues. Prior to closure, a hazard assessment study shall be conducted to identify possible areas of concern, which may impact on the safety of the community and employees, giving particular consideration to preventing uncontrolled access as well as potential exposure to any hazardous materials on site.

It is recommended that a detailed progressive Mine Reclamation and Closure Plan be prepared by CIMERWA. Progressively, as the extraction takes place and areas are exhausted according to the

Mining Plan, the stacked topsoil will be backfilled into the pit. The land will be again readied for cultivation and handed over to local farmers for farming purpose.

## 8. MONITORING PROGRAM

Environmental monitoring and audits will be undertaken during the construction/ development phase and operation phase to check that the environmental management measures are being satisfactorily implemented and that they are delivering the appropriate level of environmental performance. A summary of the proposed monitoring plan is given below.

Impact	Monitoring method	Parameters	Location	Frequency
Air Quality	Measurement/ sampling	PM/ PM <sub>10</sub>	Kiln stack	Continuous
		NO <sub>x</sub> , SO <sub>x</sub>	Kiln stack	Quarterly
		PM/ PM <sub>10</sub>	Cement grinding and clinker cooler stacks	Quarterly
		Temperature, Oxygen level, combustion efficiency	Combustion sources	Biannually
		Ambient PM/ PM <sub>10</sub> , NO <sub>x</sub> and SO <sub>x</sub>	Selected receptor villages, colony, plant premises	Biannually
Noise	Measurement	Leq (dB(A))	Mines, Crusher, Raw mill, Cement Mill	Biannually
			4 sites around Plant site	Biannually and upon complaints
Water	Sampling	Temperature, pH, Oil content, Suspended solids, COD	Surface sources, installed grease traps, oil/ water separators, sedimentation tanks, effluent, inlet and outlet of STP	Quarterly
Soil	Sampling	Moisture content, pH, salinity, Nitrogen, Phosphate, Chloride, Potassium, Sodium	Agricultural plots near project site	Annual
		Heavy metal content (mercury, lead, chromium, copper, nickel, zinc and cadmium)		Every three years
Solid Waste	Audits, photographic documentation, and interviews	Generation, storage, recycling, transport and disposal	Plant premises	Quarterly
Biodiversity	Visual inspection and photographic documentation	General condition of the floral cover	Plant, mines and landscaped areas	Annual
Resource use	Metering	Water and energy consumption	Plant and mines	Continuously
	Audit	Raw material consumption	Plant and mines	Continuously
Health and Safety	Health and safety surveys	Proper use of PPE, presence of safety signs, first aid kit, fire fighting devices, Injury/ illness records. Accident statistics recording	Plant, road linking CIMERWA with the main road network	Continuously
Fire Hazard	Inspection & Testing	Checking/ Cleaning of peat receiving/ firing system during overhaul	Peat receiving, handling & firing areas	Annually
		Checking velocity of peat in the pipes (Auto control)		Continuous
		Checking oxygen content in dust-air mixture (Auto control)		Continuous
Socio-economic	Field questionnaire	Local population	Plant and surrounding areas	Annually
	Interviews	Employment records	Plant	Continuously
Operations monitoring	Visual inspection and documentation	Production rate, gas flow rates, counter readings, pressure valves, temperatures, abnormal readings, overloads, stoppages	All facilities and major equipment at Plant and Mines	Daily

CIMERWA will have a dedicated Environmental Management Cell within the plant to oversee environmental management of its operations.

## 9. PUBLIC CONSULTATION AND PUBLIC DISCLOSURE

Public consultation has played a key role in enabling the locals to participate in the planning of the project. In addition to the Group discussions and the primary survey carried out, two formal Public Hearings were organized. The Public Hearing at Kigali was organized by Rwanda Development Board-

Division of Business Operations and Services (RDB-BOS)/ REMA on 21<sup>st</sup> July 2009 and was attended by participants drawn from RDB, REMA, Rwanda Bureau of Standards (RBS), Rwandan Geology & Mining Authority (OGMR), Ministry of Land, Environment, Forestry, Water & Mines (MINITERE), Ministry of Commerce & Industry (MINICOM), Ministry of Infrastructure (MININFRA), ELECTROGAZ (now Rwanda Energy Company (RECO) and Rwanda Water and Sanitary Company (RWASCO)), NGOs, media organizations, employees of **CIMERWA**, ESIA Consultants, etc. A second Public Hearing was organized by the RDB-BOS/ REMA at the existing cement plant of **CIMERWA** at Muganza on 23<sup>rd</sup> July 2009. The participants included representatives of local newspapers, NGOs, institutions in the public sector, local administration including the Vice Mayor of the District of Rusizi in charge of Economic Affairs, Executive Secretaries of Gitambi, Gikundamvura and Muganza Sectors, representatives of the National Police and Army, representatives of faith based organizations including the Roman Catholic Church, Muslim community, Methodists and Anglicans, PAPs, etc. The major issues identified and the solutions proposed during the Public Consultation have been incorporated in the ESMP.

Being a category 1 project and in compliance with the disclosure policy of the African development bank, this executive summary is posted on the web site of the Bank for 60 days before the board approval.

## 10. COMPLEMENTARY INITIATIVES

**CIMERWA** will actively contribute to improve the socio-economic conditions of the area. The salient features of the proposed Socio-economic Development Plan are given below.

**Employment and Business Opportunities:** Preference is being/ will be given in temporary employment during construction stage to qualified locals. Though the direct employment at the Plant shall reduce, the avenues for indirect employment due to establishment of the new unit shall increase due to the larger scale of operations. Currently, the packaging of cement has been outsourced to a cooperative comprising of local labourers. This practice shall be continued at the new plant and more such activities could be outsourced to similar cooperatives.

**CIMERWA** will encourage the interested affected people in setting up small businesses like transportation, auto workshops, small eateries, and other small shops which shall come up to cater to the new cement plant. Preference shall be given to engage interested people for transportation of raw materials/ cement, distribution of cement in the region, transportation and supply of other essential items to plant, supply of food items and other items to the colony

**Road Development:** The road from Bugarama crossing to the Plant will be upgraded and compacted over a length of 11 km. A road from the main Kamembe-Bugarama road to the peat areas is also being constructed over a length of 3 km by **CIMERWA**'s parent company. With improved roads, connectivity to the area shall improve.

**Health Facilities:** **CIMERWA** is operating a Health Centre at the Plant since 1984, which comprises of a Pharmacy, a 14 bed hospital and other services manned by trained staff. The Health Centre is also open to the locals and around 70% of the patients are from surrounding areas. Expenses of 5 mio RWF were incurred by **CIMERWA** on the Health Centre during the year 2008.

To prevent spread of malaria, **CIMERWA** shall undertake measures such as improvement in sanitation to eliminate breeding habitats, use of repellants, clothing, netting, educating project personnel and area residents on risks, prevention, and available treatment, etc.

**Education:** **CIMERWA** is currently running a KG and primary school at the Plant which caters to wards of employees as well as locals. At present, the number of students is 312 and 10 teachers. The School enjoys a very good reputation and its students have performed consistently well. **CIMERWA** spent 123.8 million RWF on the School during the year 2008. **CIMERWA** is expanding the School to include 3 years of High School education with an additional student intake of 120 by the time the new plant is commissioned.

**Water Supply:** **CIMERWA** has installed a Water Treatment Plant in village Nkangabashi which draws water from Njambwe river. The water is treated and then supplied to the cement plant and Colony. The Water Treatment Plant treats 2,500 m<sup>3</sup> of water per day out of which 1200 m<sup>3</sup>/ day is supplied to the Plant. **CIMERWA** is supplying balance water to six villages Kabarore, Ramiro, Rubeho, Nyenyeri, Murabyo and Busasamana Primary School meeting the requirement of around 6,000 local villagers

through Company owned pipelines. An attempt will be made to extend the Water supply access to more villages.

**Communication:** With the expansion of the plant, **CIMERWA** shall strengthen the modern communication facilities like telephones, internet, etc. in the area, which will also be available to the local population.

**Electricity :** **CIMERWA** will extend the electric power line up to the new plant site. This may also facilitate personal connections for the community.

## 11. CONCLUSIONS

An ESIA (september 2009) was prepared for the entire project. The ESIA analyzed the following issues related to both project construction and operational phases: air emissions and noise, waste management, water resources, land use, socioeconomic impacts, community and worker safety.

The Environmental Management and Monitoring Plan (EMMP) provide:

- the framework for planning and implementation of activities during both the construction and operational phases of the project.
- And the means to monitor the predicted impacts, to provide reassurance as to compliance with legal, corporate and international requirements and to allow detection of emerging issues. The ESMP addresses anticipated impacts with respect to air, noise, water, soil, waste, community consultation, and socioeconomic welfare and worker safety.

## 12. REFERNCES AND CONTACTS

The primary document reviewed by AfDB is the CIMERWA Project Environmental and Social Impact Assessment (ESIA) including the Environmental Management Plan (ESMP), authored by Holtec Consulting Private Limited on behalf of CIMERWA., September 2009.

### CONTACTS:

#### CIMERWA

Fiacre G. Birasa, CEO, Rwanda Investment Group (RIG), UTC Building, 5th Floor, P.B. 2876 Kigali Rwanda, [f.birasa@rig.co.rw](mailto:f.birasa@rig.co.rw),  
Tel: + 250 (0) 252 500 288/9, [www.rig.co.rw](http://www.rig.co.rw)

#### AFRICAN DEVELOPMENT BANK

Paul-Sylvain DIOP , Investment Officer, Industries and Services Division, Private Sector Department, African Development Bank, B.P.323-1002 Tunis Belvedere, Tunisia, T: + (216) 711 03 540, F: + (216) 711 03 710, P.DIOP@AFDB.ORG

Mrs Awatef SIALA FOURATI, Senior Environment Officer, Environment and Climate Change Division (ONEC.3), Energy, Environment and Climate Change Department (ONEC), African Development Bank , BP 323 - 1002 Tunis Belvedere, TUNISIATel: (216) 71 103854, [s.fourati@afdb.org](mailto:s.fourati@afdb.org)