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1.0 EXECUTIVE SUMMARY

The article 67 of the Organic Law N° 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda stipulates that every development project shall be required to undergo an Environmental Impact Assessment prior to its commencement.

Furthermore the Ministerial order No. 004/2008 of 15/08/2008 establishing the list of works, activities and projects that have to undertake an environmental impact assessment lists construction of industries, factories and activities carried out in those industries.

It is in this regards that BAKHRESA GRAIN MILLING RWANDA hired the consultancy firm, QUESTAFRICA LTD, to carry out the present Environmental Impact Assessment.

The identification of the impacts of the project on the environment showed that during the operation, there will be no negative impact on environment as it is an agro-processing industry which does not use any chemical. The grain is dry cleaned and hence no effluent. Air used for cleaning and pneumatic conveying of products is purified by use of reverse filter dust collectors before being exhausted back to the atmosphere. There will be an important number of positive impacts on the human environment such as availability of wheat flour in Rwanda, Burundi and parts of Congo bordering to Rwanda, the improved employment opportunities to the population of the zone, the increase in the income of the population working on the site, the support to farmers in Rwanda to grow wheat, payment of taxes to the local and central government as well contributing then to the poverty reduction in the country in general.

The project will also have some marginal negative impacts (especially during the construction phase) on the socio-economical and biophysical environment such as the degradation of air quality by the dust emitted during the site clearing, effects of air pollution, sewage, effluent and wastewater from the factory processing, effects of generated solid wastes, risk of excess soil being eroded and deposited on the site, loss of habitat for some fauna and flora species and biodiversity reduction due to vegetation clearing of the construction etc.

Different mitigation measures for these negative impacts have been proposed to reduce to the minimum their effects on the socio-economical environment as well as on the biophysical environment.
Among the proposed mitigation measures are to fence the construction site in order to separate the works from the surrounding environment, to implement agroforestry techniques, a good site management system is proposed in order to minimize the risk of accidents during construction and operation phase. The fire fighting equipments should be installed with more attention paid to the safety and security of the machines.

The treatment of waste water is proposed as well as the solid waste management system during construction and operation phase of this project.

In order to ensure that the proposed mitigation measures will be implemented, an environmental management plan has been developed to guide all activities of the project during all its phases concerning the protection of the environment. This plan specifies the nature of the negative impact, the proposed mitigation measures, the indicators in the execution of these mitigation measures, the time period, the responsibilities and the follow-up needed from concerned and specified parties. An emergency plan in case of accident or fire was also developed.

Some negative impacts of this project can be eliminated, reduced or compensated if the proposed environmental management plan is followed as proposed. Additional to that some recommendations have been proposed so that the execution of the project becomes a success without harming or with the least negative effect to the environment in general.
2. INTRODUCTION

Flour Milling is one of the oldest trade/Industry and has been with mankind for the last 6,000 years and involves mechanical breakdown of any grain to separate the outer covering of the grain and grinding the inner endosperm to fine flour particles. Bakhresa Grain Milling (Rwanda) Limited, is to invest in the 250 M.T per day Wheat mill and the company was given an approval to invest by Rwanda Development Board on 4th March 20, 2009 through allocation of Business Certificate Number C/613/2009. The company has gone ahead to acquire land at Nyagahinga cell, Rusororo sector, Gasabo District, Kigali city. The plot is about 5.0 hectares and RDB is helping in this land acquisition.

The company has also gone ahead and has entered into a contract with Buhler Ag of Switzerland for supply of European standard, 250 MT per day new State of art Wheat Milling Plant. The Mill will arrive in Kigali in ten months time and erection will take four months.

This Study consists in assessing the Environmental Impacts for the project of construction and operation of the grain milling factory located in plot 175 of the Kigali Industrial Zone.

2.1. Author Presentation

This Report has been produced by Hendon Consultants and Questafrica Ltd that was hired by the Project Promoter, Bakhresa Grain Milling Rwanda, to carry out the study. The Consultancy firm is based in Rwanda and has got strong background and knowledge in the area of Environmental Assessment, and a track record of over 5 years for conducting studies of Environmental Impact Assessment for Development Projects in Africa in general and particularly in Rwanda.

2.2. Promoter Presentation

Bakhresa Grain milling (Rwanda) Limited is an associate concern of Bakhresa Group of Companies, which is the leading industrial group based in Dar es salaam, Tanzania, with its operations extended in East and Central Africa. The group has got grain milling operations in Main Land Tanzania, Uganda, Zanzibar, Malawi and Mozambique. The combined Grain milling Capacity of the group is in excess of
800,000 M.T per annum. In addition to grain milling business, the group has got investments in facilities to produce fruit juices, ice-cream, bottled drinking water, bakeries, and plastic packing materials and operates speed boats. It could be observed that the promoters have long and rich experience in establishing and running similar projects in other African countries, and with partnerships with other Nordic countries such as Switzerland; having the necessary equipment and skills needed for production of high quality flour.

**Government Registrations/Approvals for the Project**

Status with regard to government registration/approvals for the project is as shown below:

**Table 1: Company Registration details**

<table>
<thead>
<tr>
<th>Business Certificate Number</th>
<th>C/613/2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of approval</td>
<td>20th January 2009</td>
</tr>
</tbody>
</table>

**2.3. Objectives of the study**

Reducing the burden of environmental impacts is necessary if development is to become sustainable. As resources become limited, environmental impacts become more complex, EIA has become of ever increasing importance as a tool for development and decision making. This role is formally recognized in principle 17 of the Rio Declaration on Environment and Development (UNCED 1992).

“*Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have significant adverse impact on the environment and are subject to a decision of a competent national authority*”.

In practice, EIA is applied primarily to prevent or minimize the adverse effects of major development projects. It is also used as a planning tool to promote sustainable development by integrating environmental considerations into a wide range of proposed actions. Most notably, the use of policies and plans to focus on the highest levels of decision making and take care of the environment in considering development alternatives and options. More limited forms of EIA can be used to ensure that smaller scale projects, conform to appropriate environmental standards or site and design criteria.
The aim and objective of EIA can be divided into two categories. The immediate aim of EIA is to inform the process of decision making by identifying the potentially significant environmental effects and risks of development projects. The ultimate (long term) aim of EIA is to promote sustainable development by ensuring that development projects do not undermine critical resource and ecological functions or the well being, lifestyle and livelihood of the communities and people who depend on them.

The main objective of this study consist in carrying out a comprehensive Environmental Impact Assessment study for the grain milling factory project on the environment during construction and operation phase

The specific objectives of the study are the following:

- To detect the effects of the project on the neighbouring environment such as the water bodies, the soil, he people, the infrastructure, the fauna, the flora and the atmosphere;
- To detect the effect of the neighbouring environment on the project, this means the effect on the soil of the project and the surrounding activities;
- To detect the effect of the project on the environment;
- To propose alternative measures where it is noticed that adverse effect may occur;
- To enable the proposal mitigation measures where adverse effects may have occurred;
- To carry out a diagnosis of the existing environment and activities in the area of the project;
- To propose enforcement measures where beneficial effects from the project are detected;
- To set up an environmental management plan that will govern all activities of the project for the better protection of the environment.
2.4. Methodology used for the study

Based on terms of reference (ToR) issued by the Rwanda Development Board (RDB) the methodology used by the consultant consisted in the following:

a) Literature review: Documentation on policies, laws, regulations and guidelines related environmental management, industry sector, waste management, land use EIA process etc, at the national level as well as the international level have been done.

b) Interviews: The consultant has interviewed people in the area of the project as well as in the Ministries and other governmental institutions related to this project.

c) Data collection: Through site visit of the site, required qualitative and quantitative data have been collected

d) Stakeholders consultation: the consultant analyzed key partners/stakeholders including REMA, Gasabo District, the Private Sector Federation, neighbouring communities etc, to find out their involvement, role and responsibilities in this project.

e) Mapping and zoning of the site

f) Reporting: the data and information collected were organized and compiled in a report.
3. LEGISLATIVE AND REGULATORY CONSIDERATIONS

3.1. Legislative and policy framework for environmental impact assessment (EIA) in Rwanda

3.1.1. The Constitution of the Republic of Rwanda

In consideration of the Constitution of the Republic of Rwanda of June 4, 2003 as amended to date, the articles 49 states that every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The state shall protect the environment. The law determines the modalities for protecting, safeguarding and promoting the environment.

3.1.2. Rwanda Vision 2020

The vision 2020 of Rwanda gives as strategic actions inter alia institute the principle of precaution to mitigate the negative effects caused to the environment by the socioeconomic activities, to institute the “polluter pays” principle as well as preventive and penal measures to ensure the safeguard of the environment and to require the environmental impact study of any development project.

3.1.3. Economic Development and Poverty Reduction Strategy (EDPRS)

Rwanda’s Economic Development and Poverty Reduction Strategy (EDPRS) is a medium-term framework for achieving the country’s long term development aspirations as embodied in Rwanda Vision 2020, the seven year Government of Rwanda (GoR) programme, and the Millennium Development Goals (MDG). The strategy builds on strong achievements in human capital development and promotes three flagship programmes. These flagships serve as a device to prioritize actions by the GoR, mobilize resources for development and improve policy implementation through more coordinated interventions across sectors.
In the EDPRS, environmental and land priorities involve ecosystems rehabilitation of degraded areas and strengthening newly established central and decentralized institutions. Special attention will be paid to sustainable land tenure security through land registration and rational land use planning and management, soil and water conservation, reforestation, preservation of biological diversity and adaptation and mitigation against impacts of climate change. The water and sanitation sector aims to ensure sustainable and integrated water resources management and development for multipurpose use including increased access for all to safe water and sanitation services.

3.1.4. The National Environmental Policy

The National Policy of Environment adopted by the Cabinet in November 2003 has an overall objective to the improvement of human well-being, the judicious utilization of natural resources and the protection and rational management of ecosystems for a sustainable development.

The option of the policy on population and land-use management is to balance the national policy in terms of population, land-use management and environment, while the policy option on Land is to ensure that land, which is the major resource of the country, is not degraded and used in an unplanned manner.

3.1.5. The National Environmental Law

The Chapter IV of the Title III of the Organic Law n° 04/2005 of 08/04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda regulates the Environmental Impact Assessments. In its article 67: Every project shall be subjected to environmental impact assessment, before obtaining authorization for its implementation. This applies to programmes and policies that may affect the environment. An order of the Minister having environment in his or her attributions shall determine the list of projects mentioned in this organic law.
The article 68 specifies the main points that an Environmental Impact Assessment must include.

The article 69 stipulates that the environmental impact assessment shall be examined and approved by the Rwanda Environmental Management Authority or any other person given a written authorization by the Authority. The promoter pays a levy reduced from the operating cost of his or her project excluding the working capital. This tax is determined by the law establishing the National Fund for the Environment. The environment impact assessment shall be carried out at the expense of the promoter.

The article 70 states that an order of the Minister having environment in his attributions establishes the list of projects for which the public administration shall not warrant any authorization without an Environmental Impact Assessment describing direct and indirect consequences of the project to the environment.

Under the Title VI of this Organic Law, the article 81 stipulates that the following activities are prohibited:

1. Dumping or disposal of any solid, liquid waste or hazardous gaseous substances in a stream, river, lake and in their surroundings;
2. Damaging the quality of air and of the surface or underground water;
3. Non authorized bush burning;
4. Smoking in public and in any other place where many people meet;
5. Defecating or urinating in inappropriate place;
6. Spitting, discarding mucus and other human waste in any place.

For the article 87, it is prohibited to construct houses in wetlands (rivers, lakes, big or small swamps), in urban or rural areas, to build markets there, a sewage plant, a cemetery and any other buildings that may damage such a place in various ways. All buildings shall be constructed in a distance of at least twenty (20) meters away from the bank of the swamp. If it is considered necessary, construction of buildings intended for the promotion of tourism may be authorized by the Minister having environment in his or her attributions.

It is also prohibited to carry out any activities, except those related to research and science, in reserved swamps.

For the purpose of enforcement, the article 95 announces that anyone or association that does not carry out environmental impact assessment prior to launching any
project that may have harmful effects on the environment is punished by suspension of his or her activities and closure of his or her association and without prejudice to be ordered to rehabilitate the damaged property, the environment, people and the property. Falsification and alteration of documents of environmental impact assessment is punished in the same manner as what is provided for in paragraph one of this article.

3.2. Institutional framework for environmental management in Rwanda

The institutional framework for environmental management is currently registered in the Organic Law determining the modalities of protection, conservation and promotion of environment in Rwanda, published in the Official Gazette RWA № 9 of the 1st May 2005, particularly in its chapter III relative to the establishment of the institutions.

The article 65 of the Organic Law determining the modalities of protection, conservation and promotion of environment in Rwanda puts the Rwanda Environment Management Authority in place, REMA in English acronym. It is therefore this institution which is responsible for the follow-up of the environmental impact studies concerning investment and development projects.

The article 66 of the Environmental Organic Law specifies that it is established, at the Provincial, City of Kigali, District, Town, Municipality, Sector and the Cell levels; Committees responsible for conservation and protection of the environment. The organization, functioning and their responsibilities are determined by Prime Minister’s Order.
3.3. International legislative framework

The following laws, regulations and conventions are in line with this project and the national policies and laws:

- The international Convention on Biological diversity and its habitat signed in Rio de Janeiro in Brazil on 5 June 1992, as approved by Presidential Order No 017/01 of 18 March 1995;

- The CARTAGENA protocol on biodiversity to the Convention on of Biological biodiversity signed in NAIROBI from May 15, to 26, 2000 and in NEW YORK from June 5, 2000 to June 4, 2001 as authorized to be ratified by Law No 38/2003 of 29 December 2003;

- The United Nations framework Convention on Climate Change, signed in RIO DE JANEIRO in BRASIL on 5 June 1992, as approved by Presidential Order No 021/01 of 30 May 1995;

- The KYOTO Protocol to the framework on climate change adopted at KYOTO on March 6, 1998 as authorized as authorized to be ratified by Law No 36/2003 of December 2003;

- The RAMSAR International Convention of February 2, 1971 on Wetlands of International importance, especially as water flows habitats as authorized to be ratified by Law No 37/2003 of 29 December 2003;

- The STOCKHOLM Convention on persistent organic pollutants, signed in STOCKHOLM on 22 May 2001, as approved by Presidential Order No 78/01 of 8 July 2002;
- The ROTTERDAM International Convention on the establishment of the international procedures agreed by states on commercial transactions of agricultural pesticides and other poisonous products, signed in ROTTERDAM on 11 September 1998 and in New York from 12 November 1998 to 10 September 1999 as approved by Presidential Order No 28/01 of August 2003 approving the membership of Rwanda;

- The BASEL Convention on the Control of Transboundary Movements of Hazardous wastes and their disposal as adopted at BASEL on 22 March 1989, and approved by Presidential Order No 29/01 of 24 August 2003 approving the membership of Rwanda;

- The MONTREAL International Conventional on Substances that deplete the Ozone layer, signed in LONDON (1990), COPENHAGEN (1992), Montreal (1997), BEIJING (1999), especially in its article 2 of LONDON amendments and Article 3 of COPENHAGEN, MONTREAL and BEIJING amendments as approved by Presidential Order no 30/01 of 24 August 2003 related to the membership of Rwanda;

- The BONN Convention opened for signature on June 23, 1979 on conservation of migratory species of wild animals as authorized to be ratified by Law No 35/2003 of 29 December 2003;

3.4. Environmental Standards

Although Rwanda does not yet have specific laws on environmental standards related to industrial operation, it is important to note that Rwanda is highly committed to the principles of the sustainable development by advocating for environmental security and better welfare of its citizens through the promotion of a sound and environment friendly industrial development. This is portrayed for instance through several bold and pioneering actions taken by the leadership of the country and aiming of protection of the environment for a better welfare of its people, such as the banning of the polythene bags, implementation of cleaner production, the banning of any construction activities (and removal of constructions) in wetlands.

In the absence of such specific legal and framework, however, the environmental organic law, and the other relevant specific laws pertaining to environment still apply.

Nevertheless, the following are some of the environmental standards related to Environmental, Health and Safety guidelines generally accepted and which are also applicable in the case of Rwanda.

3.4.1. Concerning Air Emissions

The sources of emissions, means of control and acceptable standards:

- The pneumatic fans and filters used to transport the milled flour from the roller mills should be controlled by cyclone and fibre filters with air flow of 450m3/min.
- Aspiration points on each roller mill, flour collection conveyors, and filter flow collection conveyor to be controlled by having cyclone and fabric filter with air flow of 150m3/min

Source: Environment Assessment Sourcebook
3.4.2. Concerning Effluents

Limits for pollutants in wastewater vary depending on the type of receiving water body. The parameters that should be monitored and/or inspected are BOD, COD, pH, temperature, and residual chlorine, TSS, TDS, Oil and Grease. Table 1 presents the permissible limits for discharges to the different recipients (sea, rivers, canals, agricultural drains, public sewer)
## Table 2: Environmental Requirements for industrial Wastewater

<table>
<thead>
<tr>
<th>Parameter (mg/l unless otherwise noted)</th>
<th>Discharge coastal environment</th>
<th>Discharge to sewer system</th>
<th>Discharge into:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Underground Reservoir &amp; River</td>
<td>River (Main Stream)</td>
<td>Drain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Municipal</td>
</tr>
<tr>
<td><strong>BOD</strong> (5day, 20degr.)</td>
<td>60</td>
<td>&lt;600</td>
<td>20</td>
</tr>
<tr>
<td><strong>COD</strong></td>
<td>100</td>
<td>&lt;1100</td>
<td>30</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>6-9</td>
<td>6-9.5</td>
<td>6-9</td>
</tr>
<tr>
<td><strong>Oil &amp; Grease</strong></td>
<td>15</td>
<td>&lt;100</td>
<td>5</td>
</tr>
<tr>
<td><strong>Temperature (dgr.)</strong></td>
<td><strong>10°C&gt;avg.temp of receiving body</strong></td>
<td>&lt;43</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total Suspended Solids</strong></td>
<td>60</td>
<td>&lt;800</td>
<td>30</td>
</tr>
<tr>
<td><strong>Settable Solids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>8cm³/l (10min)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 cm³/l (30min)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Cadmium</strong></td>
<td>0.05</td>
<td>0.2</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Chromium</strong></td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Chromium</strong></td>
<td>-</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Hexavalent</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Copper</strong></td>
<td>1.5</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Iron</strong></td>
<td>1.5</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Lead</strong></td>
<td>0.5</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Nickel</strong></td>
<td>0.1</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Zinc</strong></td>
<td>5</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Heavy metals</strong></td>
<td>-</td>
<td>&lt;5</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>Aluminium</strong></td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook
### 3.4.3. Concerning Work Environment

**Table 3**: Threshold limits for some pollutants in Work Place

<table>
<thead>
<tr>
<th>Material</th>
<th>Threshold limits for short periods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time average</td>
</tr>
<tr>
<td></td>
<td>Ppm</td>
</tr>
<tr>
<td>Acetone</td>
<td>750</td>
</tr>
<tr>
<td>Aluminium metal and its oxides</td>
<td>10</td>
</tr>
<tr>
<td>Welding smoke and fumes</td>
<td>5</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>5000</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>50</td>
</tr>
<tr>
<td>Ethylene Glycol vapor</td>
<td>50</td>
</tr>
<tr>
<td>Ethyl Methyl Ketone</td>
<td>200</td>
</tr>
<tr>
<td>Trichloro Ethylene</td>
<td>50</td>
</tr>
<tr>
<td>Fine Saw Dust</td>
<td>5</td>
</tr>
<tr>
<td>Carbon Tertiary Chloride</td>
<td>100</td>
</tr>
<tr>
<td>Xylene</td>
<td></td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook

**Table 4**: Maximum permissible Limits for Heat Stress

<table>
<thead>
<tr>
<th>Type of Work</th>
<th>Low Air Velocity</th>
<th>High Air Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light work</td>
<td>30 °C</td>
<td>32.2 °C</td>
</tr>
<tr>
<td>Moderate work</td>
<td>27.8 °C</td>
<td>30.5 °C</td>
</tr>
<tr>
<td>Severe work</td>
<td>26.1 °C</td>
<td>28.9 °C</td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook

**Table 5**: Maximum Permissible Noise Levels

<table>
<thead>
<tr>
<th>No</th>
<th>Type of place and activity</th>
<th>Maximum permissible noise decibel (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Work place with up to 8 hour and aiming to limit noise hazards on sense of hearing</td>
<td>90 dB</td>
</tr>
<tr>
<td>2</td>
<td>Work place where acoustic signals and good audibility are required</td>
<td>80 dB</td>
</tr>
<tr>
<td>3</td>
<td>Work rooms for the follow up, measurement and adjustment of high performance operations</td>
<td>65 dB</td>
</tr>
<tr>
<td>4</td>
<td>Work rooms for computers, typewriters or similar equipment</td>
<td>70 dB</td>
</tr>
<tr>
<td>5</td>
<td>Work rooms for activities requiring routine mental concentration</td>
<td>60 dB</td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook
### Table 6: Noise Intensity Level Related to the Exposure Period

<table>
<thead>
<tr>
<th>Noise intensity level decibel (A)</th>
<th>95</th>
<th>100</th>
<th>105</th>
<th>110</th>
<th>115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period of exposure (hour)</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>(\frac{1}{2})</td>
<td>(\frac{1}{4})</td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook

### Table 7: Noise Intensity Level In Intermittent Knocking Places

<table>
<thead>
<tr>
<th>Noise Intensity dB</th>
<th>Max Allowable Knocks During Daily Work Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>135</td>
<td>300</td>
</tr>
<tr>
<td>130</td>
<td>1000</td>
</tr>
<tr>
<td>125</td>
<td>3000</td>
</tr>
<tr>
<td>120</td>
<td>10,000</td>
</tr>
<tr>
<td>115</td>
<td>30,000</td>
</tr>
</tbody>
</table>

Source: Environmental Assessment Sourcebook

### 3.4.4. Concerning Solid wastes

There are number of laws and regulations specific to the situation of countries and which related to:

- Public cleanliness, regulating the collection, and disposal of solid wastes from houses, public places, commercial and industrial establishments
- Transportation, composting, incineration and land disposal of domestic and industrial waste
4. BASELINE DATA

4.1. General description of the project area

The project site is located on a small hill in Nyandungu sector, Gasabo District in Kigali City. It is a rural area, where most of the people live of agriculture. The site is situated by the road from Kimironko to Rwamagana, at the right hand side but an approximation of 2hr drive from the site to Rwamagana.

[Fig.1: Picture showing the project site]

There are no wetlands existing in the plant site. The required land for grain milling factory is an area of approximately 5.0ha. There are no major rivers passing through plant site. Due care has been taken while identifying the project site to avoid habitations, forest lands and vicinity of wildlife sanctuaries, national parks and other sensitive areas. There are no industries / factories in the vicinity of the project site, but it is anticipated that these will come in future as the area is earmarked as industrial area according to the City Land Use Master Plan.
4.2. Bio-physical environment

This section gives in details the description of existing environment and describes the present land use of the project and area contiguous to it.

4.2.1. Physical environment

The site is situated on a sloping hillside with a dominantly loamy soil. There is only little natural vegetation consisting of grasses and bushes.

4.2.2. Climate

a) Temperature: the annual average air temperatures measured at different times of the day are:

- At 7:00 a.m. : 16.1°C
- At 12:00 p.m. : 25.7°C
- At 17:00 a.m. : 23.2°C

The minimum recorded being 14.2°C and the maximum of 32.4°C.

b) Precipitation: the average annual precipitation recorded in the area of the project varies between 910mm and 1120mm.

A summary of geographical characteristics of the project site is given in the following table:
### Table 8: Environmental setting in 10-km radius

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Parameters</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Latitude</td>
<td>1°37'S</td>
</tr>
<tr>
<td>2.</td>
<td>Longitude</td>
<td>30°56'</td>
</tr>
<tr>
<td>3.</td>
<td>Elevation ASL</td>
<td>1499.8m – 1523.2m</td>
</tr>
<tr>
<td>4.</td>
<td>Climatic Conditions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Annual Mean Max Temp.</td>
<td>16°C</td>
</tr>
<tr>
<td></td>
<td>- Annual Mean Min Temp.</td>
<td>29°C</td>
</tr>
<tr>
<td></td>
<td>- Annual Total Rainfall</td>
<td>910-1120mm</td>
</tr>
<tr>
<td></td>
<td>- Predominant Wind Direction</td>
<td>N-S</td>
</tr>
<tr>
<td>5.</td>
<td>Land use at project site</td>
<td>Used to be occupied land, mainly for subsistence agriculture</td>
</tr>
<tr>
<td>6.</td>
<td>Nearest Highway</td>
<td>By the Road Kimironko– Rwamagana</td>
</tr>
<tr>
<td>7.</td>
<td>Nearest Human settlements</td>
<td>Kimironko residential area, approximately 3km</td>
</tr>
<tr>
<td>8.</td>
<td>Forest Reserve within 10km radius</td>
<td>None</td>
</tr>
<tr>
<td>9.</td>
<td>Ecologically Sensitive Zones</td>
<td>Slop runs into a small valley down the hill, the beginning of which is part of the project site</td>
</tr>
<tr>
<td>10.</td>
<td>Notified Archaeological Monuments</td>
<td>None</td>
</tr>
<tr>
<td>11.</td>
<td>Water bodies</td>
<td>None</td>
</tr>
<tr>
<td>12.</td>
<td>Defence installations</td>
<td>None</td>
</tr>
<tr>
<td>13.</td>
<td>Socio-economic factors</td>
<td>Small village, next to the project site</td>
</tr>
<tr>
<td>14.</td>
<td>List of factories / industries within 10km radius</td>
<td>None yet, but industries / factories to come in future as the area is earmarked as industrial area on the Kigali Land Use Master Plan</td>
</tr>
</tbody>
</table>

#### 4.2.3. Biological environment

The site selected for the implementation of the grain milling factory in Gasabo District has little natural flora, and the existing land use at the beginning of the project included subsistence crops like banana trees, sorghum and beans. The site also presents different types of bushes that can, on the wildlife point of view, shelter rodents and lizards or serve as ecological niche for various types of birds.
4.3. Socio-economical environment

The neighbouring households to the grain milling factory are low-income households. The main products grown are beans, sorghum, banana, potatoes, rice, maize and legumes such as tomatoes, etc...

The main domestic animals are cows, goats, sheep, and chickens.
5. PROJECT DESCRIPTION

5.1. Location, description of the current use of the location, project size

5.1.1. Plot description and geographic localization of the project

Area: 5 Ha
Location: the project site is located in Nyandungu Sector, Gasabo District in the Kigali city.
The plot for the factory is situated by the main road Kimironko – Rwamagana, on the right hand side.

5.1.2. Current use of the location

The main part of the site selected for the implementation of the project of the grain milling factory is occupied by natural grasses and bushes. The rest of the area was partially scattered occupied by crops such banana, maize, vegetables, fruits and some trees.

5.1.3. Project size and land requirement

Bakhresa Grain Milling (Rwanda) Limited has been allocated approximately 5 ha for construction in the sector Nyandungu. The different units to be constructed are divided as follows (see annex 1 for ground layout of different plant units).

Table 9: Area size of different Plant’s units

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Plant Facility</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Administration block</td>
<td>4.725%</td>
</tr>
<tr>
<td>2.</td>
<td>Flour milling</td>
<td>15.75%</td>
</tr>
<tr>
<td>3.</td>
<td>Car parking yard</td>
<td>0.25%</td>
</tr>
<tr>
<td>4.</td>
<td>Restaurant</td>
<td>1.5%</td>
</tr>
<tr>
<td>5.</td>
<td>Open Air</td>
<td>77.775%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

The project of the establishment of a flour milling factory, has got two phases: the Construction phase; and the Operation Phase
5.1.3.1. Construction phase

The site preparation will involve the erection of a fence of around the property, the levelling, and the construction of the storage and the provision of the construction raw material to the site.

The construction of the production facility will consist in setting up a foundation for to support the grinding machines. This will be done as per normal construction technique, as it does not require any special purpose engineering.

The equipment that will be used for the construction phase includes:

- Cement mixture machines x 2 Nos
- Welding machines x 3 Nos
- Mobile Crane
- Bulldozer and Earth leveler
- Wheelbarrows
- General tools and tackles
- Shuttering material (wood, nails e.t.c)
- Generator x 2 (250 KVA)
- Water pump (10 hp motor)
- Vibrator and compactor for concrete

Construction process would be as per the norm, with due attention and care to the safety and security of all the staff and workers. All the workers will be equipped with appropriate work gears and helmet... We are proceeding with construction to a height of 15 meters maximum, and as such the construction would not be significant as compared to a multi complex building or mining facilities etc.

During the construction phase, water from local supply will be used.
5.1.3.2. Operation phase

The operation phase will consist in two major processes,

The grain will be dry cleaned in enclosed cleaning machineries which use different principles, size, shape, density, air resistance and natural peculiarities to remove screenings. The cleaned grain is conditioned by addition of water and let to lay for a period of time to make separation of outer covering easy and also reduce power used to grind. The milling will be done using steel Roller mills for grinding, Purifiers and Plan sifters for sieving. Pneumatic air system will be used for conveying the materials and Flour will be stored in bulk bins ready for packing.

Packaging Materials will be Paper bags of 1 and 2 kg and packing will use automatic packing Machine acquired for Germany. PP bags of 25 / 50 kg will be used to pack flour for Bakeries. Packed flour will be stored in warehouse awaiting dispatch to customers.

a. Power requirement

A 15kv rated high tension cables will be installed, which will conduct electricity to the plant. The site of the plant has been strategically located as there is an ELECTROGAZ’s electric pole running along the boundary close to the plant site. Therefore power will be drawn from this already existing infrastructure and use HT Cables mentioned above to carry this to the two transformers on site.

The total power required for the proposed unit is 2.5 MW per day. The power requirement will be met from ELECTROGAZ supply. However, power generators set having capacity of 250KVA with acoustic enclosure have been envisaged to meet the emergency power requirements. In case of main’s power failure these generators will automatically start and supply power to the emergency loads using Cooling circuit.
b. Water Requirement

Water is required in the proposed plant for cooling of grinding machines. In addition, it is used for drinking and sanitation. The total water requirement of the plant is 8m$^3$/day. This will be recycled. A water recycling complex will be built. This is a system of water collection, cooling and reuse which will be installed for the constant reuse of water so as to minimise waste water rejections.

Possibility to drill water from the earth with the installation of a bore well will also be looked at so as to use the water drawn from this bore well in the production process. Also a system of rainwater collection will be installed so as to supply the plant’s water requirements.

c. Workforce Requirement and Staff Categories

The construction phase will start with up to 20 employees and will gradually increase this to 50 people over the course of the project. The construction is planned to go up to 6 months.

During the operation, the following are the staff required in each category:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Category</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Drivers</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Electricians</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Mechanical Engineers</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Production Staff</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>Grain Movement</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>Accountants</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Secretary</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Administration Staff</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Sales</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Security</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>286</td>
</tr>
</tbody>
</table>
d. Safety Measures

Construction process would be as per the norm, with due attention and care to the safety and security of all the staff and workers (work gear, helmets...).

As safety measures for staff / workers during operation, employees in the induction furnace will be equipped with:

- High Boots to provide support and protection past the ankles
- Protective uniform
- Dust Masks
- Helmets
- Eye goggles with a dark shade so as to protect the workers from the bright color of the liquid metal

In the grinding mill division, employees will have the following:

- High Boots to provide support and protection past the ankles
- Protective uniform
- Dust Masks
- Helmets
6. EVALUATION OF IMPACTS

6.1. Introduction

During conducted site visits, we noted that there is no economic activity going on since all the former inhabitants were expropriated the first inhabited houses are located at a distance of about 20 m from the project site. There is very little natural vegetation considering the agricultural activities in the vicinity of the project site. The project would definitely have some impacts (positive and negative) on the surrounding environment in both direct and indirect ways, as there will be direct and indirect interactions between project activities and the environment. This will have different effects on the environment and on the project itself.

This chapter identifies analyses and classifies these impacts that could arise from the activities of the project, either during the construction phase or the operation phase. The impacts apply as well on the socioeconomic environment (health, security, economic activities, finances, etc) and on the biophysical environment (fauna, flora, water, air, soil, energy).

It is necessary to note that it is not only the project that will have impacts on the environment, but also the environment will have some impacts on the project. These impacts can also be positive or negative, direct or indirect and they are also described in this study.

6.2. Impacts classification

The impacts are classified and their range varies in space and time. The intensity of these impacts is classified according to the following criteria:

- Effects on the health species
- Effects on endangered species
- Reduction of the diversity of species
- Loss of habitats
- Transformation of natural landscapes
- Impacts on the human health
• Effects on the present use of available natural resources
• Abandonment of either use or future production of natural resources

The criteria of classification of the impacts as being important, middle or weak are according to:
• Size and geographical extent
• Duration and Frequency
• Irreversibility
• Ecological context

6.3. Identification of Potential Impacts of the project

The Major impacts that are expected to arise as a result of the implementation of the project are the following:

6.3.1. Potential Positive Impacts of the project
• Supply the flour market in Rwanda at a reasonable price
• Development of the industry sector in the rural area;
• Job creation and employment opportunities for those who will be employed by the project, either in the construction phase or the operation phase;
• New opportunities for income generation for many individuals who will be cultivating wheat in some parts of the country and sell it as raw material.
• Generation of foreign exchange through importation of parked flour;
• Improvement of general welfare for the local population as a result of increased income;
• Increased economic activities directly or indirectly related to the project;
• Increase in the income of the population working on the site and development of small businesses that will serve the employee of the construction site;
• Possibility of meeting the fundamental social needs for the employees and their families (health care, schooling children, “mutuelle de santé” etc;
• Possibility of savings for the local population and employee of the factory.
• Payment of taxes to the local and central government.

6.3.2. Potential Negative Impacts of the project

• Risk of excess soil being eroded and deposited on the site during construction;
• Loss of habitat for some fauna and flora species and biodiversity reduction as a consequence of migrating species due to vegetation clearing of the construction site;
• Soil erosion due to exposure of the soil after removal of ground cover;
• Degradation of air quality due to land clearing, and plant operation;
• Risk of accidents during the construction and operation phases;
• Effects of sewage, effluent and wastewater from the factory processing;
• Effects of generated solid wastes;
• Contamination of ground water by generated wastewater from the factory and by used oil from the maintenance of the machines;
• Risk of increase in road accidents resulting from increase in road traffic;
• Risk of noise pollution of plant machinery and vehicles and its related impacts like air pollution increased in the area;
6.4. Evaluation and analysis of the projects’ impacts

In this section, the impacts of construction works and related activities on the human and biophysical environment are evaluated and analyzed during the construction and operation phases.

6.4.1. Impacts on the human environment

6.4.1.1. Impacts during the construction phase

During the phase of site installation and construction, the project will need an important number of personnel for its activities. The impacts on the socio-economic environment can be summarized as follows:

**Table 11**: Impacts on the human environment during the construction phase

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Employment opportunities to the population of the zone directly concerned with the works and to the people in the vicinity.</td>
<td>Positive, important and temporary impact</td>
</tr>
<tr>
<td>2</td>
<td>Increase in the income of the population working on the site and development of small businesses that will serve the employee of the construction site.</td>
<td>Positive, important and temporary impact</td>
</tr>
<tr>
<td>3</td>
<td>Possibility of meeting the fundamental social needs for the employees and their families (health care, schooling children, “mutuelle de santé”, etc.)</td>
<td>Positive, important and temporary impact</td>
</tr>
<tr>
<td>4</td>
<td>Possibility of savings for the local population and employee of the factory.</td>
<td>Positive, important and temporary impact</td>
</tr>
<tr>
<td>5</td>
<td>Risk of the increase of HIV/AIDS and other Sexually Transmitted Diseases due to the increase in income which may cause unsafe behaviours.</td>
<td>Negative, middle and temporary impact</td>
</tr>
<tr>
<td>6</td>
<td>Risk of the accidents on the personnel of the site. Some of the workforce may not be familiar to construction techniques which can be a cause of accidents. If the protection equipment is not adequate accidents are most likely to occur.</td>
<td>Negative, middle and temporary impact</td>
</tr>
</tbody>
</table>
6.4.1.2. Impacts during the operation phase

These impacts are summarised as below (in table 16)

**Table 12:** Impacts during the operation phase

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provision of country with all the needed flour</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>2</td>
<td>Job creation for those who will be employed in different services of the factory</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>3</td>
<td>New opportunities for income generation for many individuals who will be supplying wheat to the grain mill</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>4</td>
<td>Generation of foreign currency through exportation of parked flour to neighbouring countries</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>5</td>
<td>Improvement of general welfare as a result of increased income;</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>6</td>
<td>Increased economic activities directly or indirectly related to the project;</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>7</td>
<td>Increase in the income of the population working on the site and development of small businesses that will serve the employee of the construction site;</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>8</td>
<td>Possibility of meeting the fundamental social needs for the employees and their families (health care, schooling children, “mutuelle de santé” etc;</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>9</td>
<td>Possibility of savings for the local population and employee of the plant.</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>10</td>
<td>Payment of taxes to the local and central government</td>
<td>Positive, important and permanent impact</td>
</tr>
</tbody>
</table>
6.4.2. Impacts on the biophysical environment

6.4.2.1. Impacts during the construction phase

These impacts are summarised in Table 17.

Table 13: Impacts on biophysical environment during the construction phase

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Air pollution by the dust emitted during site clearing.</td>
<td>Negative, middle and temporary impact</td>
</tr>
<tr>
<td>2</td>
<td>Risk of excess soil being eroded and deposited on the site;</td>
<td>Negative, middle and temporary impact</td>
</tr>
<tr>
<td>3</td>
<td>Loss of habitat for some fauna and flora species and biodiversity reduction as a consequence of migrating species due to vegetation clearing of the construction site;</td>
<td>Negative, middle and permanent impact</td>
</tr>
<tr>
<td>4</td>
<td>Soil erosion due to exposure of the soil after removal of ground cover;</td>
<td>Negative, middle and temporary impact</td>
</tr>
<tr>
<td>5</td>
<td>Degradation of air quality due to land clearing;</td>
<td>Negative, weak and temporary impact</td>
</tr>
</tbody>
</table>

6.4.2.2. Impacts during the operation phase

a. Potential Impacts of air pollutants on Health and Environment

Pollution emitted from grain milling factories is measured in terms of volume of dust particulate emitted. Air pollutants in the atmosphere cause concern primarily because of their potential adverse affects on human health. The adverse human heat effects attributable to air pollution from respiratory illness: Other potential adverse impacts of air pollution include damage to animal life, vegetation and buildings, and the degradation of visibility. However there is a wide range of dust control processes and equipment to choose from, depending on the volume and composition of potential dust to be recovered or discharged to the environment (cyclone and fabric filters among others)
b. Potential Impacts of Effluents on Human Health and Environment

Water pollution threatens individuals who come in direct contact with surface such as the rivers and lakes, as well as those who depend on surface and ground water for drinking water. Water pollutants can enter the food chain through crop irrigation and the contamination of aquatic life. Impacts of pollutants of wastewater of grain milling factory can range from a loss of aesthetics to a reduction in biological health, which is reflected in a variety of ways: from the loss of species diversity in the ecosystem to direct human health hazards.

Grain milling waste hazards are minimal due to the fact that no chemical is used and that dry cleaning is usually employed. Modern industrial facilities use a range of physical, chemical, and biological treatment technologies to bring the water quality of discharges to acceptable levels.

c. Potential Impacts of Solid waste on human health and environment

Organic matters, are the main wastes produced from graining mills which cannot cause substantial hazards to human health or the environment when properly managed. Because some of these organic wastes may undergo decay and cause unpleasant smells, attract disease causing vectors etc.
Table 18 below summarises the potential impacts of the plant during the operation phase

**Table 14:** Impacts on biophysical environment during the operation phase

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effects of fumes and green house gases, effluent and wastewater from the plant operation on human health and environment;</td>
<td>Negative, middle and permanent impact</td>
</tr>
<tr>
<td>2</td>
<td>Effects of generated solid wastes;</td>
<td>Negative, middle and permanent impact</td>
</tr>
<tr>
<td>3</td>
<td>Risk of contamination of ground water by generated wastewater from the plant and by used oil from the maintenance of the machines;</td>
<td>Negative, middle and permanent impact</td>
</tr>
<tr>
<td>4</td>
<td>Risk of increase in road accidents resulting from increase in road traffic;</td>
<td>Negative, weak and permanent impact</td>
</tr>
<tr>
<td>5</td>
<td>Risk of noise pollution of machinery and vehicles and its related impacts like air pollution increased in the area;</td>
<td>Negative, weak and permanent impact</td>
</tr>
<tr>
<td>6</td>
<td>Risk of increase in road accidents resulting from increase in road traffic;</td>
<td>Negative, weak and permanent impact</td>
</tr>
<tr>
<td>7</td>
<td>Risk of fire accidents</td>
<td>Negative, important and permanent impact</td>
</tr>
</tbody>
</table>

**6.5. Evaluation and analysis of impacts of the environment on the project**

The table 19 provide classification of the potential effects on the project itself

**Table 15:** Impacts of the environment on the project

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project is located in the designated industrial zone with easy access from the road. This is an added value to the project.</td>
<td>Positive, important and permanent impact</td>
</tr>
<tr>
<td>2</td>
<td>The project being located in a Kigali city, the recruitment of qualified personnel like engineers for construction will be easy.</td>
<td>Positive, middle and permanent impact</td>
</tr>
<tr>
<td>3</td>
<td>The plant will benefit a lot from the area aesthetic view</td>
<td>Positive, middle and permanent impact</td>
</tr>
</tbody>
</table>
6.6. Analysis of alternatives

This chapter analyzes the possible alternatives besides the methods and other parameters already considered in the design of the project. Bearing in mind the critical need for the protection of environmental ecosystems and the core role that Steel Manufacturing Plant will play in the social and economic of the country, it’s imperative to analyze and balance the need for planet, people and profit in the context of the sustainable development.

6.6.1. Zero scenario

In the case where the zero scenarios are considered, this means that there won't be construction of the grain milling factory in Gasabo District. This alternative would have following effects:

- The costs for flour will stay high for Rwanda as a country which is land locked;
- Opportunity for income generating would be lost to many individuals for would supply the factory with wheat as raw material;
- Lack of employment for the intended staff members, and job or business opportunities in general;
- The population surrounding the proposed site would lose an opportunity to develop income generating projects related to the grain milling factory
- No taxes collected for the State treasury;
- As the project won’t be implemented, all the negative impacts enumerated in the previous chapter will be avoided;
6.6.2. Site selection

The site has the following advantages:

- Being located in the industrial zone will have direct access to electrical connection, water source and administrative zone;
- Being located in the designated industrial area where selection criteria have been initially discussed and agreed
- Not being located in Kigali, for the transport of the raw material and finished product.

6.6.3. Construction Technique

The design considered the construction techniques which use local materials as much as possible and imported materials where they cannot be obtained in the region. The chosen technology is construction with heavy materials (reinforced concrete) which can be replaced by light materials. The use of light materials would ease and speed up construction but considering the long term, the adopted system is the best.

6.6.4. Air emissions treatment

Gas emissions from the proposed flour mill would be predominantly associated with the electrical energy required for the operation of the plant, equipment and lighting. The potential emission source has therefore been considered negligible and excluded from the assessment. The proposed mill will also not utilise steam during the process and would not directly combust gas or any other fuels. Electricity would be used on site to operate lighting and equipment.
6.6.5. Solid waste management

6.6.5.1. During site preparation

Before construction, it is expected that some organic wastes that will be generated. This will be composted to be used as fertilizers and some will be sold to briquettes manufacturers; stony and earthy materials will be converted to construction materials. Artificial and non-biodegradable materials (metals, glasses, plastics, etc) will be collected in separate container from the site and reused where possible or taken to approved landfill in the region.

6.6.5.2. During operation

The solid waste expected to be given off is mainly organic from debris of packaging materials, papers from administration use etc. These would be collected in appropriate waste handling containers and later transported by registered waste handlers to the designated land fill of the district.

6.6.6. Management of Effluents

The major source of effluents in the EAF is the water used in cooling, the rolling processes is also using a substantial amounts of oils and lubricating fluids, water from the cleaning process etc.
6.6.7. Water supply

Water supply will be through connection to the existing water network in the zone, especially during the construction phase.

A water recycling complex will be built. This is a system of water collection, cooling and reuse which will be installed for the constant reuse of water so as to minimise waste water rejections.

Possibility to drill water from the earth with the installation of a bore well will also be looked at so as to use the water drawn from this bore well in the production process. However the use of rain water will be an important supplement, especially in activities like cleaning, toilets operation or green spaces irrigation.

6.6.8. Energy supply

There will be different types of energy supply:

The best option would be to use a source of energy that is renewable: Solar energy would be a better option if the said conditions are considered, however the solar radiance is not very regular and not enough to be relied on. With the high demand in energy of machines to be used, it is anticipated that the solar energy cannot cope with the demand.

It is expected to use cleaner production principles to reduce the energy using in the factory. In some place of the workshops of the factory, transparent roof must be installed so that sun lights can be used as alternative to electricity light during the day.

The use of a generator presents also many disadvantages, among them, the high prices of fuel, air pollution and the noise of generators.

The only reliable remaining option is to connect the factory to the hydropower electricity network. But this is not very regular; it must be coupled to the generator which may be used for a short time when the hydro-electricity is cut off.

The last option is the one adopted by the project, and it is the far better option given the reasons listed above.
7. MITIGATION MEASURES

This section provides measures envisaged to avoid, reduce minimize present or compensate negative impacts of the project. Considering the project design and the site layout plans, most of the mentioned impacts are not likely to happen. The following mitigation measures which consider policy, engineering and social-economic interventions, have been recommended.

7.1. During preparation / construction phase

7.1.1. Air pollution

During site preparation and construction phase, it is anticipated that the surrounding air might be polluted by the dust emitted during site clearing. For this it would important to regularly water the site so as to reduce the amount of dust emitted in the air. Also the construction site will be fenced, and no fire to clear off the bush will be used.

To avoid the risk of the soil during operation, the soil will be compacted after the appropriate levelling whereas the excessive soil will be used to maintain the roads in the nearby surroundings.

7.1.2. Human waste management

During the construction phase, temporally toilets will be used. The best system is to use the “Ecosan” system consisting of plastic cabins with regularly empty able contains. This is a sanitation system that does not require any water to function. Not only does it save on water use, but it is entirely isolated from the surrounding environment and cannot contaminate underground water resources. The system utilises a natural biological process to break down human waste into a dehydrated odorless compost-like material.

The following is a brief description of the ECOSAN toilet concept as well as its main features Fig:3 : Description of Ecosan toilet system.
The human excrement falls down a vertical chute (2) and into one end of a specially designed helical screw conveyor (3). Every time the toilet lid (1) is lifted, a mechanism rotates the conveyor. With each rotation the human excrement slowly moves along, taking approximately twenty-five days before falling into a reusable collection bag (4). It takes six months for the bag to fill with dry and odorless waste.

Through the uniquely designed ventilation pipe (5), adequate airflow is provided for the dehydration / evaporation, deodorising process. Human excrement consists of roughly 95% moisture. As the solids dry in the conveyer the urine and moisture is vented into the atmosphere. The solid waste then dries into a compost-like material, roughly 5 - 10% of its original mass.

As a variation on the home model designed for normal use, a special modification was made to accommodate installations where there is a high frequency of use of toilets. This model uses a drum instead of a bag for waste collection. The unit is therefore not a completely dry system and also means that the drum needs to be emptied on a regular basis. This unit is ideally suited for places where the installation of sewerage pipes are difficult, for instance underground mines or very busy public places.

The dry waste is manageable and can be processed and used in the making of compost, dispose of it by using municipal waste services or use it as a source of fuel.
7.2. During operation phase

7.2.1. Mitigation Measures for air pollution

All exhaust discharge points on the plant would be fitted with buhler airjets filters which are capable of achieving an in-stack particulate concentration of substantially less than 50mg/m3 when operated in accordance with manufacturer’s instructions. The removal efficiency of the fibre filters would also be dependent on the site. The total suspended particulates of 90ug/m3 (annual average) and fine particulates of 50ug/m3 (24hr average) and 30 ug/m3 (annual average) which must not be exceeded at the nearest sensitive receptors.

Source: Clean Air regulations 2005

7.2.2. Mitigation measures for sewage

The major source of effluents in the EAF is the water used in cooling, the rolling processes is also using a substantial amounts of oils and lubricating fluids. The conventional casting process may use some liquid chemicals for the cleaning process of the casting, but it comprises minor amounts of effluents as most of the water and oil will be recycled to be reused in the plant operation. Nevertheless, the small amount of effluent will be treated before it may be released and reused, and therefore, a better waste management system is below described.

Waste water system from the grain milling plant

There will be an oil separator before the effluent go into the system. Oil separators will be installed on surface before the entry to the wastewater treatment to protect the system from impact of the oil. The drainage system inside the factory will be designed in order to avoid the rain water to enter into it.
Waste water from the toilets

With regard to the wastewater from the toilets of the workers and administrative staff a Jet wastewater treatment plant will be installed. It uses Biologically Accelerated Treatment process to transform wastewater into colourless, odourless, clean and environmentally-friendly effluent. The capacity requirement of the plant (equivalent to 200 inhabitants: 10 to 15 m$^3$ wastewater treated per day).
Jet Wastewater Treatment Plants employ a biological process known as “extended aeration” or “aerobic digestion.” In this process incoming wastewater enters an aeration tank where the contents are thoroughly mixed and aerated by large volumes of air which are pumped into the tank under pressure. As the air bubbles to the surface, it transfers oxygen to the tank liquids. Aerobic bacteria present in the activated sludge in the tank use this oxygen to convert the wastewater to inoffensive, clear, odorless liquids and gases. Sometimes this process is referred to as “wet burning” because the bacteria actually destroy the wastewater by using oxygen, just as fire uses oxygen to burn trash. After the treated liquid leaves Jet’s Aeration Tank, it is held in a “settling” tank, which is completely still. Here any partially treated particles settle to the tank bottom and are returned to the aeration tank for further treatment. This settling produces a clear, highly treated liquid which is ready for final discharge.

The management of the steel plant shall carry out physical-chemical test every semester to monitor the efficiency of the waste treatment plant. The following parameter must be tested: the Biochemical oxygen demand (BOD), the chemical oxygen demand (COD), total nitrogen (N), total phosphorus (P), iron (Fe), lead (Pb), total suspended solids (TSS), turbidity, total dissolved substance (TDS), coli forms etc.

7.2.3. Mitigation measures for solid waste

Solid waste from the grinding machines is mainly organic waste such as wheat residues from sieves ie impurities smaller or larger than wheat; stones from the gravity separators; ferrous metal impurities from the magnetic separators and other light impurities from aspirators.

All these wastes must be separated after their production, collected and managed according to their nature. The principle of waste prevention, minimization/reduction will be implemented in the Plant. This will apply the adoption and the use of the cleaner production principles in this Plant.
The management of the Plant shall organize regular training of the personnel on cleaner production principles to be used through the control of raw materials, the control of processing, packaging, storage etc. Waste, particularly solid waste will be minimized, recycled or reused.

7.2.4. Measures to avoid accidents during operation

The major industry operation will be carried out in the workshop. Condition for acceptable working environment will be respected, i.e. sufficient aeration, acceptable level of noise, permanent availability of drinking clean water... Moreover, as safety measures for staff / workers during operation, employees will be equipped with adequate equipment, ex: in the magnetic separators will be equipped with:

- High Boots to provide support and protection past the ankles
- Protective uniform
- Dust Masks
- Helmets
- Eye goggles with a dark shade so as to protect the workers from the bright color of the liquid metal

In the rolling mill division, employees will have the following:

- High Boots to provide support and protection past the ankles
- Protective uniform
- Dust Masks
- Helmets

First aid equipments should be available at the site at all time, and several individuals among the permanent personnel on the site should have the skills necessary to use the equipment.

A contract should be signed between management of the grain mill factory and the nearest dispensary or hospital for taking care of injured staff in case of accident.

The insurance should be contracted for all the personnel during the construction phase and for those who will be employed in the factory during the operation phase.
Workers will be regularly trained on the use of the equipment as well as on the safety measures and procedures so as to limit the risk of accidents due to the ignorance in the equipment use as well as the importance of the safety procedures.

Table 16 below summarises all the proposed mitigation measures in line with the anticipated impacts

**Table 16: Mitigation measures**

<table>
<thead>
<tr>
<th>#</th>
<th>Impacts</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Impacts during Construction phase</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Air pollution by the dust emitted during site clearing.</td>
<td>• Soil watering when soil works are being executed and where dust is emitted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To fence the construction site</td>
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<tr>
<td></td>
<td></td>
<td>• Not to use fire for land clearing</td>
</tr>
<tr>
<td>2</td>
<td>Risk of excess soil being eroded and deposited on the site;</td>
<td>• Use the excess soil in repairing the road to the project site by filling potholes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compact the soil immediately after removal of top soil.</td>
</tr>
<tr>
<td>3</td>
<td>Loss of habitat for some fauna and flora species and biodiversity reduction due to vegetation clearing of the construction site;</td>
<td>• During land clearing, to maintain a maximum of vegetation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Implementation of agro forestry techniques well adapted to the site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Landscaping and extensive plantation will be done.</td>
</tr>
<tr>
<td>4</td>
<td>Soil erosion due to exposure of the soil after removal of ground cover;</td>
<td>• To avoid steep slopes and level the land as much as possible.</td>
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<tr>
<td></td>
<td></td>
<td>• To maintain vegetation edges in order to reduce wind erosion.</td>
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<tr>
<td>5</td>
<td>Risk of the accidents on the personnel of the site. Some of the workforce may not be familiar to construction techniques which can be a cause of accidents. If the protection equipment is not adequate accidents are most likely to occur.</td>
<td>• Provide all staff on construction site with protective equipments (helmets, gloves, coats and boots where applicable).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To teach the workers how to use adequately these equipments</td>
</tr>
<tr>
<td></td>
<td><strong>Impacts during Operation phase</strong></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Degradation of air quality by air emissions during plant operation</td>
<td>• High efficiency cyclone and fabric filters will be installed to control Particulates.</td>
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<tr>
<td></td>
<td></td>
<td>• Adequate stack height will be provided as per industrial guidelines for the proper dispersion of potential pollutants.</td>
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<td></td>
<td></td>
<td>• Motorable roads in the plant area will be paved to reduce dust emission.</td>
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<tr>
<td></td>
<td></td>
<td>• Tree plantation programs in the whole areas</td>
</tr>
</tbody>
</table>
7. Risk of the increase of HIV/AIDS and other Sexually Transmitted Diseases due to the increase in income which may cause unsafe behaviours.
   - The biggest workforce will be recruited from the region, and they normally return to their homes.
   - Sensitization campaign to the staff on HIV/AIDS and other STDs, and avail condoms on site, free of charge.

8. Occupational health effects on workers due to fugitive dust, material handling, noise or other process operations.
   - Plant will implement the safety and health program designed to:
     - Identify, evaluate, monitor and control safety and health hazards
     - Provide safety training to workers (accidents occur at higher than normal frequency because of the level of skill or labor)

9. Effects of sewage, effluent and wastewater from the factory processing.
   - To reduce the impact of waste water this study proposes a method for treating the wastewater.
   - Adequate treatment facilities will be provided so that the treated effluents conform to the regulatory standards.
   - The plant effluent after treatment will be reused to maximum possible extent.
   - Rain water percolation and runoff from solid material, fuel and waste piles will be controlled by covering and / or containment to prevent percolation and runoff to ground and water surface waters.

10. Effects of generated solid wastes.
    - The garbage will be sorted on site and 5 categories of wastes will be treated separately.
    - Regular inspection of the site
    - Remove the soil degraded
    - Efforts will be made to utilize the solid waste to the extent possible. The non usable part would be appropriately dumped in an officially designated area.

11. Contamination of ground water by generated wastewater from the factory and by used oil from the maintenance of the machines.
    - Regular inspection of the machines
    - Used oil will be collected, stored in water tight recipients and taken to reuse or recycling plants
    - Maintain storage and disposal area to prevent accidental release.
<p>| | | |</p>
<table>
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</table>
| **12** | **Risk of increase in road accidents resulting from increase in road traffic;** | • Regular maintenance of the road  
• Humps added where needed.  
• Use of traffic signs |
| **13** | **Risk of noise pollution of machinery and vehicles and its related impacts like air pollution increased in the area;** | • Use of new machines and vehicles with minimum noise  
• Equipment will be kept in good condition to keep the noise level within 90 dB(A).  
• Workers will be provided with necessary protective equipment e.g. ear plug, earmuffs  
• Provision of green belt and plantation would further help in attenuating noise. |
| **14** | **Risk of fire accidents** | • Fire fighting equipments (fire extinguishers) should be installed with more attention paid to the safety and security of machines.  
• The extinguishers should be regularly inspected and maintained.  
• The personnel of the factory must be trained on their use. |
8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

This section describes the modalities provided in the project for the implementation of the proposed mitigation measures to its potential negative impacts. It proposes the institutional responsibilities for the implementation of the mitigation measures, the implementation indicators, the time frame for monitoring and follow-up and also the estimated cost for the implementation activities. The Environmental Management Plan of the grain milling plant is summarized in a table below.
8.1. Detailed description of the modalities to implement the proposed mitigations measures

Table 17: The Environmental Management Plan

<table>
<thead>
<tr>
<th>Component</th>
<th>Negative Impacts</th>
<th>Mitigation measures</th>
<th>Implementation indicators</th>
<th>Timeframe</th>
<th>Responsibility</th>
<th>Estimated cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human environment</td>
<td>Risk of the accidents on the personnel of the site</td>
<td>• Provide all staff on construction site with protective equipments (helmets, gloves, coats and boots where applicable).&lt;br&gt;• Use adequately these equipments</td>
<td>• Number of accidents on site&lt;br&gt; • Availability of protective equipments</td>
<td>During the construction</td>
<td>- Bakhesa Grain milling Rwanda</td>
<td>To be incorporated in the contract</td>
</tr>
<tr>
<td>Risk of the increase of HIV/AIDS and other Sexually Transmitted Diseases (STD)</td>
<td>• The biggest workforce will be recruited from the region, and they normally return to their homes.&lt;br&gt;• Sensitization campaign to the staff on HIV/AIDS and other STDs, and avail condoms on site free of charge.</td>
<td>• Number or % of workforce recruited&lt;br&gt; • Number of Sensitization campaigns on HIV/AIDS and other STDs, and avail condoms on site free of charge</td>
<td>All the project life</td>
<td>-Bakhresa&lt;br&gt;-Contractor&lt;br&gt;-MINISANTE&lt;br&gt;-Local Authorities</td>
<td>USD 2200</td>
<td></td>
</tr>
<tr>
<td>Increase in the risk of</td>
<td>• Use of machine with minimum Noise intensity of machines Amount of dust in the atmosphere</td>
<td></td>
<td>During the construction</td>
<td>• Construction Company</td>
<td>To be incorporated in the contract</td>
<td></td>
</tr>
<tr>
<td>Biophysical Environment</td>
<td>Air emission by dust emitted during site clearing</td>
<td>Amount of dust in the atmosphere</td>
<td>During the construction</td>
<td>• Bakhresa</td>
<td>the contract</td>
<td></td>
</tr>
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<td>-------------------------</td>
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<td>---------------------------------</td>
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<td></td>
</tr>
</tbody>
</table>
| Risk of excess soil being eroded and deposited on the site | • Take out the soil and deposit it somewhere else where it is needed to be used (ex: repairing the roads)  
• Compact the soil immediately after removal of the top soil | State of the road  
• Soil compacted | During the site preparation and construction | • Construction Company  
• Bakhresa | To be incorporated in the contract |
| Loss of habitat for some flora and fauna species and biodiversity reduction as a consequence of species migration due to vegetation clearing on the construction site | Implementation of agroforestry techniques well adapted to the site | Number of agroforestry trees planted | During site preparation and operation phase | • Contractor  
• Bakhresa  
• Local Authorities | To be incorporated in the contract |
| Biophysical environment | Soil erosion due to exposure after removal of the ground cover | Soil erosion rate | During site preparation | • Bakhresa  
• Contractor | To be incorporated in the contract |
| **Degradation of air quality due to land clearing** | • Soil watering during soil works, especially where dust is being emitted | Amount of dust in the atmosphere | During construction | • Bakhresa  
• Contractor | To be incorporated in the contract |

| **Effect of sewage, effluent and wastewater from plant operation** | • Treatment of wastewater from the plant  
• Cover / contain solid material, fuel and waste piles from rain to prevent percolation and runoff to ground and water surface waters | Quality of underground water and effluent | During operation phase  
Physical and chemical test every semester | • REMA  
• Local Authority | The cost of water treatment to be incorporated in the contract  
The cost of maintenance: 2000USD/yr |

| **Degradation of air quality by air emissions during plant operation** | • Control particulates by cyclone and fabric filters | Quality of air | During operation phase | • Bakhresa  
• REMA  
• Local Authority | 5000USD/yr |

| **Effect of generated solid waste** | • To take the rest solid waste in the appropriate dumping site  
• Garbage will be • 5 categories to be treated separately  
• Contract with the garbage collector (local NGO) | During Operation Phase | • Bakhresa  
• REMA  
• Local Cleaning NGO  
• Local Authority | USD6000 /yr |
| Risk of increase in road accidents resulting from increase in road traffic | Regular maintenance of the road  
- Humps added where needed  
- Use of traffic signs | Number of road accidents | During site preparation of operation | Bakhresa  
- National Police  
- Contractor  
- Local Authority | 2000USD/yr |
|---|---|---|---|---|---|
| Risk of noise pollution of machinery and vehicles | Use of quality new machines equipped | Noise level | During site preparation | Bakhresa  
- REMA | In the contract |
| Contamination of ground water by generated wastewater from the plant and by used oil from the maintenance of the machines | Regular inspection of the machines  
- Used oil will be collected, stored in water tight recipients and taken to reuse or recycling plants  
- Maintain storage and disposal area to prevent accidental release  
- Provide spill mitigation equipment, double wall tanks and / or diking storage tanks | Number of recipients, quantity of used oil taken for recycling | During operation | Bakhresa  
- Local Cleaning NGO  
- REMA  
- Local Authority | 4800USD/yr |
and its related impacts like air pollution

<table>
<thead>
<tr>
<th>and its related impacts like air pollution</th>
<th>with air functional pollution devices (ex: fabric filter collectors or electrostatic precipitators)</th>
<th>and operation phase</th>
</tr>
</thead>
</table>
| Risk of fire accidents | • Fire fighting equipment should be installed with more attention paid to the safety and security of the machines  
  • The extinguishers should be regularly inspected and maintained  
  • The personnel of the plant must be trained on their use | Fire fighting equipments installed  
 Number of fire accidents avoided | Fire fighting equipments installed  
 Number of fire accidents avoided | During operation phase | Bakhresa  
 National Police  
 Local Authority | The cost of the fire fighting equipment to be incorporated in the contract  
 The costs for maintenance and training of the staff: USD12000/yr |
8.2. Emergency plan in case of accident or fire

The plan of emergency in case of fire or accident has been proposed for the implementation in the case of the grain milling factory for the construction and operations phases of the project. It consists into two parts:

- Availability of a workforce and the materials;
- An Alarm system and organization of the first aid.

The Fire fighting equipments should be available at all workshops and warehouses of the factory and should be kept in good working state.

The use of these fire-fighting equipments should be one of the key points during the training of the project staff. The personnel technician in charge of the maintenance and plant management should regularly check these equipments and ensure that they are always ready to be used.

During construction, first aid equipment should be available at the site. A number of the permanent personnel on the site should have the skills necessary to use the equipment.

A contract should be signed between the construction company and the nearest dispensary or hospital for taking care of injured staff.

The insurance should be contracted for all the personnel during the construction phase and for those who will be employed in the factory during the operation phase.
9. CONCLUSION AND RECOMMENDATIONS

9.1. It is concluded that;

- The total odour emission rate for the flour mill would not have significant incremental or cumulative odour impact at the Kigali industrial site and should equate to less than 0.1% of the existing total odour emissions.
- Odour emissions from the flour mill would be likely to have a neutral hedonic tone, i.e., that odour would be regarded to be neither unpleasant nor pleasant.
- All exhaust discharge points would be equipped with airjet filters which are capable of achieving particulate concentrations.
- The additional greenhouse gas emissions associated with the proposed flour mill would be kept at a minimum level possible.
- The development and rigorous implementation of appropriate environment management measures throughout the construction period would minimise environmental impacts associated with the construction process.

9.2 Recommendations

It is recommended that;

- Post commissioning testing be undertaken to assess the compliance of the airjet bag houses with standard of particulate matter concentration prescribed under the clean air regulations once developed.
- All appropriate environmental management measures detailed in this report, together with any other environment management commitments should be implemented throughout the entire life of the project.
REFERENCES


4. EIA Guidelines, REMA 2007

5. www.minitere.gov rw

APPENDICES

1. Terms of Reference,

2. The layout plan of the factory

3. Land ownership document
PLOT ALLOCATION CERTIFICATE

The Kigali Industrial Park Limited (KIP Ltd) hereby certifies that BAKHRESA GRAIN MILLING (BGM) (Rwanda) Limited has purchased the Plot number 149 with an area of 33,358 square meters, within the Kigali Industrial Park in GASABO District (Bumbogo/Kinyaga). The Plot has following coordinates:

<table>
<thead>
<tr>
<th>Units: Meters</th>
<th>Station</th>
<th>+ X (Eastings)</th>
<th>+ Y (Northings)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KIP31</td>
<td>516841.52</td>
<td>9786584.29</td>
</tr>
<tr>
<td></td>
<td>KIP32</td>
<td>516858.71</td>
<td>9786261.92</td>
</tr>
<tr>
<td></td>
<td>KIP30</td>
<td>516804.19</td>
<td>9786277.64</td>
</tr>
<tr>
<td></td>
<td>KIP34</td>
<td>516740.32</td>
<td>9786266.13</td>
</tr>
<tr>
<td></td>
<td>KIP35</td>
<td>516726.66</td>
<td>9786528.76</td>
</tr>
</tbody>
</table>

KIP Ltd is therefore pleased to avail this certificate to BGM (Rwanda) Ltd. The certificate will help the owner to get other documents required by Gasabo District and other Rwandan Institutions.

We recommend the holder of the present certificate to liaise with Rwanda Development Board (RDB) for the facilitation of important documents such as "Contract de Location", Building Permit, Occupation Permit, Land Title, EIA Certificate, Investment Certificate and others. In addition, the holder is strongly advised to comply with all land regulations and Laws of Rwanda.

On Behalf of KIP LTD
Fiacre G. BIRASA
Acting Director General of RIG S.A.