REPUBLIC OF RWANDA

RWANDA ENVIRONMENT MANAGEMENT AUTHORITY

GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR MINING PROJECTS IN RWANDA

Final Report

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Foreword

Mining is increasingly becoming an important source of foreign exchange for Rwanda, thanks to recent efforts at prospecting and a shift from artisanal smallholder operations to more formal and commercial-oriented mining activities. The Government of Rwanda (GoR) recognises the need to undertake economic investments in ways that promote sustainable development. It is in this respect that the Organic Law No. 04/2005 on modalities for protection and conservation of environment was enacted. It requires all projects to be subjected to environmental impact assessment (EIA) in line with its long-term vision of a green economy and sustainable development. Recognising the potential environmental impacts that mining activities have on various components of the ecosystem, and the specialised nature of EIA in mining activities, the GoR through Rwanda Environment Management Authority (REMA), is putting in place subsidiary legislation and other instruments, including sector specific guidelines for EIA.

This document is intended to serve as a guideline, which provides recommended approaches and formats for the preparation of a comprehensive EIA report for Mining projects. These Guidelines for conducting EIA for mining projects will cover all project phases from research, exploration, exploitation (actual mining), processing, decommissioning and restoration activities. They recognise and aim to contribute to the GoR efforts to streamline mining activities and ensure that they comply with environmental standards and regulations, and are in line with the green economy vision. The process of developing these guidelines has been participatory, with stakeholders' views and concerns considered as far as possible. We are optimistic that these guidelines will bring tremendous improvement in the conduct of EIA in all mining activities – from research to post-mining restoration, ensure safety and welfare of mine workers and contribute positively to the local economy and ecosystems.

This guide should be used together with other EIA instruments developed by REMA i.e. the general guidelines, the regulations and standards, as well as other sector-specific guidelines. These guidelines have been made at a time when Rwanda is preparing its third Second Economic Development and Poverty Reduction Strategy (EDPS-II), and the GoR has renewed its commitment to a green and equitable development agenda. I'm optimistic that these guidelines will serve as useful tools for all stakeholders in the mining sub-sector to contribute towards sustainable development in Rwanda.

Dr. Mukankomeje Rose
Director General, REMA

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ACRONYMS AND DEFINITIONS

CESTRAR	Central Trade Union
COTRAF	Labour Congress and the Brotherhood-Rwanda
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FECOMIRWA	Association on Miners and Federation of Mining Companies
GoR	Government of Rwanda
HEMM	Heavy Earth Moving Machines
IL	Impact Level
LCA	(Project) Life Cycle Assessment
MINAGRI	Ministry of Agriculture
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance
MINEDUC	Ministry of Education
MINICOM	Ministry of Commerce
MININFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
MINIRENA	Ministry of Natural Resources
MINISANTE	Ministry of Health
ODSs	Ozone Layer Depleting Substances
RBS	Rwanda Bureau of Standards
RCA	Rwanda Cooperatives Agency
RDB	Rwanda Development Board
REMA	Rwanda Environment Management Authority
RNRA	Rwanda Natural Resources Authority

GLOSSARY OF TERMS

Authority means the national body responsible for commissioning, supervising and approving the EIA report and issuing the EIA Certificate to the Developer.

Beneficiation refers to a process **w**here mined ore is either concentrated for further processing or graded for sale before metallurgical processing and refining.

Deposit: any natural concentration of mineral or fossil substance;

Environmental impact study: evaluation report of the impact of a planned activity on the environment;

Exploitation: extraction of mineral and fossil substances in a bid to use them, and a set of operations which prepare, precede and accompany it or are subsequent to it.

Developer: means a person, group of persons or agency developing a new mining project or proposing to refurbish or extend an existing mining project which is subject to an environmental impact assessment process.

Leaching: In mining, the use of cyanide in water, or other chemical, that is applied on top of finely crushed ore to dissolve and extract the desired metal (typically gold).

Lead Agency; Means any public office or organisation including every Ministry or Government department which has functions for the protection of any segment of the environment and the conservation and sustainable use of natural resources.

License: prospecting license, search license and mine exploitation license.

M**ineral** is a substance normally occurring naturally as part of the earth's crust; or dissolved or suspended in water on or within the earth's Crust. The Mining Act provides a detailed list of what does and does not constitute a mineral. In accordance with the Law on Mining, sand, gravel, stones, rock, clay and peat are categorized as minerals.

Mine: area where mining and quarry exploitation is carried out.

Ore: economic production from mineral or fossil substances

Project Brief is a summary statement of the likely environmental effects of a proposed development and it includes description of the site and proposed development in sufficient detail to enable the Authority to determine whether an EIA is required or not.

Prospecting: exploratory operations which based on general geological features, consist in carrying out superficial or profound investigations in a bid to discover and provide information on the indications or concentrations of mineral or fossil substances.

Quarry: mineral or fossil substance not concerned with concession from the legal point of view. Technically, it is an open cast mine.

Research: any set of superficial or profound works and scientific, technical and applied studies executed in a bid to identify mineral ore, its economic potential and how to exploit it.

Small mine: exploitation of which the size is considered small in relation to the reserves, investments, and production and mechanisation level.

PART 1 – INTRODUCTION AND CONTEXT

1.1 Mining, Socioeconomic Development and Environment

Rwanda's mineral potential has been explored and exploited since the colonial times. However, its real value to the economy and its contribution to gross domestic product (GDP) did not materialise until recently. In 2011, Rwanda's mining sector fetched over $150 million in foreign earnings, approximately 3 times the USD 54.6 million earned in 2009 (MINIRENA, 2010; www.minirena.gov.rw) and more than the traditional exports of tea and coffee combined.

The Government of Rwanda (GoR) has realised this potential, and as part of the strategy for exploit diversification, it has made strategic interventions to increase the value and returns from mining. As a result, the present strategic plan (MINIRENA, 2009) focuses on mapping and exploration of mineral potentials, intensifying research to attract investors in the mining sector; iimproving the capacity of small miners and developing the knowledge base and infrastructure capacity for value addition.

The increasing trend towards large scale commercial mining activities implies that the potential environmental degradation from mining activities is likely to increase – from prospecting and extraction to processing. Hence there is need to strengthen the regulatory framework for EIA with a focus on enhancing the tools for sector-specific EIA for mining projects.

1.2 Overview of the Mining Industry in Rwanda

The Rwandan mining industry has transformed in a short period from predominantly artisanal, economically insignificant sub-sector to the second largest foreign exchange earner after tourism.

Presently, the most common minerals mined and traded in Rwanda are cassiterite (a tin ore); colombo-tantalite (commonly called coltan1 - an ore that is the source of niobium and tantalum); wolfram (a tungsten ore); and Gold mined from Gicumbi and Nyamasheke districts. Other key minerals include ambrigonite, beryl and semi-precious stones such as tourmaline, topaz, corundum, chiastorite, amethyst, sapphires, opal, agate and flint (MINIRENA, 2009).
Construction materials which can be used in their primary state or processed include amphibolites, granites and quartzites, volcanic rocks, dolomites, clay, kaolin, sand and gravel.

The licensing is done by the Minister of Natural Resources, who issues permits after assessing their application including environment protection, action plan and business plan. Each license is required to pay an environmental caution fee depending on whether the license given is for research, exploration or exploitation.

A total of 240 mining concessions/ groups are presently operational, and many other applications are undergoing reviews (June 2012). These concessions are owned by companies, cooperatives and individuals and are spread throughout the country. The key actors in the industry are private investors and artisanal miners (MINIRENA, 2009).

The size of mining area varies from as small as 0.0528 Ha owned by Amizero in Rubavu to as large as 308,000 Ha owned by Kivu Gold Corp in Burera. The main methods of techniques used are open pit mining where large tracts of ground and rock are excavated.

Dominance by smallholder operators imply that operations are characterized by inefficient basic equipment, wastage of resources, limited skills, and that production potential may be under-exploited, resulting in negative environmental impacts. Field observations confirm this. Although the sector is dominated by smallholder entities, the sector is now attracting large scale investors in extraction, processing and export, since the privatization of the state owned mines in the late 1990s. The GoR is encouraging small scale miners to form cooperatives to raise their technical, organisational and financial capacity for productive mining. This also makes it possible to provide technical support and monitoring for environmental compliance.

Although Rwanda's environmental management regime is fairly strong, the informal nature of most mining activities; dominance my smallholder actors using undeveloped technologies for exploration, exploitation and processing; and the ecological sensitivity of Rwandan ecosystems, make environmental impacts from mining even more serious. Undertaking effective and high quality EIA and ensuring that post-EIA activities are environmentally sound in all mining projects necessitate very specific EIA guidelines.

1.3 Objectives and Scope of the EIA Guidelines

The main objective of these guidelines is to guide REMA and partners in making decisions and approval of proposed projects related to mining activities in the framework of EIA process.

The specific objectives of these guidelines are to:

- ✓ provide sustainable strategies for implementing natural resources management approaches leading to environmentally and socially sound mining projects in Rwanda;
- ✓ provide criteria for mining projects classification according to their impacts;
- ✓ determine roles and responsibilities of all stakeholders in the EIA process for the mining sector;
- ✓ provide guidance to environmental impact assessment of mining projects;
- ✓ promote good environmental practices in the conceptualization, design and implementation of mining projects;

- ✓ promote the ecological development of the mining sector;
- ✓ improve the involvement of all partners in mining sector.

These guidelines are intended to be used especially by the following:

i) Project Developers (Mining permit applicants or holders), investors and sub-leases;
ii) Mining permit assessors/issuers in MINIRENA, RNRA and other agencies as applicable;
iii) Independent consultants undertaking EIA studies and preparing EIA reports for mining;
iv) Investment Facilitators and EIA Assessors in RDB and REMA;
v) Environmental compliance and enforcement officials at REMA;
vi) Land use Planning/zoning functions at RNRA
vii) Local Government Authorities;
viii) Standards and Certification officials at RBS
ix) Stakeholders affected by the mining projects;
x) Community representatives and/ or interested persons.

2. POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

2.1 Policy framework

Mining projects vary according to the type of ores or materials to be extracted from the earth. Extraction of these resources affects a range of development domains, including land, water, industry, transport, energy, labour and employment, environment and natural resources. With regard to EIA for mining projects, the main policies are summarized in table 1.

Table 1: Some key Policy instruments for Mining Projects

	Policy Instrument	Important Provisions for Mining projects EIA
1	Mining Policy 2009	✓ Reduce environmental impact by outlawing/discouraging artisanal treatment in rivers and streams; ✓ Developing industrial mining activities to increase productivity and efficiency; ✓ Increasing investments and value addition implies more downstream activity with implications on resource use; ✓ Strengthening regulation
2	National Environment Policy, 2005	✓ Provides for conservation and protection of the environment, emphasising the precautionary principle and EIA;
3	National Land Policy, 2004	✓ Guarantees secure tenure of land that facilitates development; Promotes productive and sustainable land use through land use planning and zoning based on suitability assessments; and promotes efficiency in land use and management; ✓ The Land Policy recognises the need to protect the biotic environment and biodiversity, putting a firm foundation to efforts at environment management and pollution control.
4	National Investment Strategy	✓ Provides modalities and incentives for private sector investment in Rwanda including in the areas of mining
5	Land Policy, 2005	✓ Secure land ownership, including modalities for exploitation of earth resources-minerals; ✓ Provides modalities for sustainable and productive land use based on suitability assessment and zoning.

2.2 Regulatory framework for Mining Projects

Mining activities affect a range of sectors- from land, agriculture, wildlife and natural resources, to public health, safety and social welfare, infrastructure and governance. The legal and regulatory instruments that guide mining projects therefore include laws, regulations, ministerial orders, ordinances and guidelines on environmental protection; mining; water; land use and tenure; public health and sanitation; labour and employment; industrial relations; occupational health and safety. These generally apply in all mining situations but specific provisions apply in different mining situations.

Chapter 2 of the Law No. 38/2008 of 11/08/2008 states explicitly in Article 99 thus "*A certificate of the study of environmental impact shall accompany the application for license of research,*

exploitation, screening and smelting of mineral substances and its residues in accordance with environmental Laws". This, however, does not clarify the categories of mining projects that require EIA or how EIA processes in mining should be conducted leading to the Certificate. Hence, these guidelines complement the provisions of Law No. 38/2008 and others.

The key laws and regulatory instruments that guide mining EIAs in Rwanda are:

- Organic Law No. 04/2005 of 08/04/2005 'Determining the Modalities of Protection, Conservation and Promotion of Environment in Rwanda' is the principal environment law in Rwanda. It highlights the key environmental attributes, and the duty of all stakeholders in their protection and conservation.
- Law nº 37/2008 of 11/08/2008 on mining and quarry exploitation provide modalities for exploitation of minerals and a strong framework for the creation of an effective and competitive regulatory environment.
- Ministerial Order No. 004/2008, Official Gazette of the Republic of Rwanda of 15 Nov. 2008: List of Works, Activities and Projects that have to undertake an Environmental Impact Assessment lists including mining projects.
- Ministerial Order determining the modalities of application of the law n°37/2008 of 11/08/2008 concerning the exploitation of mines and quarries;
- Ministerial Order determining the fees applicable to mining and quarrying activities;
- Ministerial Order concerning the sale and purchase agreement conditions of minerals in Rwanda;
- Ministerial Order Determining the modalities for management of the environment applicable to the law Relating to mines and quarries*;*
- Ministerial Order relating to the mining convention
- Ministerial Order relating to the use of explosives.
- Ministerial Order No. 008/16.01 of 13/10/2010 'Establishing the List of Swamps and their Limits and Regulating their Management and Use' defines the limits of swamps in which development of any kind must undergo a full EIA process.
- The Rwanda Water Law No. 62/2008 of 10/09/2008 'Putting in Place the Use, Conservation, Protection and Management of Water Resources' Regulations gives the State and the local communities the duty to protect water resources and use them in the natural and balanced manner. It states the polluter-pays principle that is internationally accepted and specifies penalties for intentional pollution of surface or groundwater.
- Ministerial Order (N°01 of 17/05/2012**)** determining modalities of establishing and functioning of occupational health and safety committees;
- Ministerial Order (N°02 of 17/05/2012**)** determining conditions for occupational health and safety. Developers must pay attention to Article 4 that requires employers to ensure the health, safety and welfare at workplace for all persons working in his/her workplace.
- Ministerial Order No. 006/2008 of 15/08/2008 'Regulating the Importation and Exportation of Ozone Depleting Substances (ODS), Products and Equipment Containing such substances' gives the list of substances that are deemed to be ozone

unfriendly and penalties for violating the Orders. Leachates used in mineral processing must conform to the regulations relating to ODSs.

- Ministerial Order No. 003/16.01 of 15/07/2010 '*Preventing Activities that Pollute the Atmosphere*' gives the order to prevent activities that can pollute the environment by regulating open burning of substances; exhaust emissions; emissions from factories and similar emissions. It gives the national tolerance limits for emissions of gases and gaseous suspensions into the atmosphere.
- The Law Relating to Companies No. 07/2009 of 2009 gives the requirements for registration of companies as legal bodies. Mining companies must first register as legal businesses before seeking mining permits.
- The Ministerial Order Relating to Companies No. 01/09 of 2009 allows for registration of small enterprises with an annual turnover of less than 150,000 Rwanda Francs. This allows for smallholder mining entities to incorporate and operate formally.
- Organic Law No. 08/2005 of 14/07/2005 'Determining the Use and Management of Land in Rwanda' provides for issuance of land titles by the Registrar of Titles.
- The Labour Law No. 13/2009 of 27/05/2009 regulates employment and labour issues in Rwanda. This Law consolidates all laws relating to labour, employers, trade unions and industrial relations. It provides for protection of employees from unfair labour practices including those that affect their welfare, occupational health, safety and environment.

2.3 Institutional Framework

The principal national institutions for developing and regulating the mining industry and their main roles are:

i) *Ministry of Natural Resources (MINIRENA)* that sets policy, legal framework and for licensing the research, exploration, exploitation, processing and sale of minerals;

ii) *Ministry of Trade and Industry (MINICOM*) that promotes internal and export trade, including support to private sector in mineral value addition;

iii) *Rwanda Natural Resources Authority (RNRA)* whose Department of Geology and Mines, is responsible for development, regulation and monitoring of mining activities;

iv) *Rwanda Utilities Regulatory Authority (RURA*) which regulates transport and infrastructure – in this regard, use of heavy earth moving machines (HEMM), construction of roads within mining areas;

v) *Rwanda Development Board (RDB)* that licenses the investments and approves the Environmental Impact Assessment, as part of the investment facilitation process, and follows up on environmental conditions stipulated in the investment licenses;

vi) *Rwanda Environment Management Authority (REMA)* – which monitors and ensures that developments comply with the country's environmental laws, including follow-up on the implementation of the Environmental Management Plan (EMP);

vii) *Local government authorities* which issues land ownership/lease permits as a delegated responsibility from the Registrar of Land titles (RNRA).

In the context of EIA, the key institutions with particular roles in the mining projects' EIA are outlined in table 2.

Table 2: Key Institutions in the EIA for Mining Projects.

	Institution/ Agency	Roles / Responsibilities in the EIA processes for Mining Projects
1	Ministry of Natural Resources (MINIRENA)	Formulating policies, laws and standards for land administration and land use planning; environmental protection and natural resources utilisation.
2	Rwanda Natural Resources Authority (RNRA)	Department of Geology and Mines is responsible for policy implementation-research, minerals mapping, and technical support to and regulation of miners.
3	Rwanda Environmental Management Authority (REMA)	National authority responsible for environmental regulations and standards setting, and overseeing the implementation of EIA guidelines. REMA is responsible for monitoring the implementation of EMPs for approved projects as part of the compliance enforcement; and ensuring that the EIA process is undertaken as per the law and established standards.
4	Rwanda Development Board (RDB)	RDB One Stop Centre issues licenses to investors, commissions and approves EIA in collaboration with REMA. In the EIA process, RDB reviews the EIA reports, organises site visits and public hearing; and ensures that due diligence is made in the EIA process before the certificate is issued.
5	Ministry of Disaster Management (MIDMAR)	Policy, planning and coordination of disaster prediction and response in mining activities/ areas.
6	Ministry of Trade and Industry (MINICOM)	Trade policy especially policies and laws relating to value addition to and export of mineral products
7	Local Authorities	Issuance of land licences/leases; implementation of land use zoning, mining standards including adherence to EIA guidelines; local revenue from mines;
8	Rwanda Bureau of Standards	Mineral testing, standards setting and certification of minerals and mineral products
9	Ministry of Health (MINISANTE)	Responsible for setting policy and guidelines for environmental and public health and sanitation.
10	Ministry of Public Service and Labour	Setting the labour and employment policies/laws, inspection of mines to ensure that labour laws are respected.
11	Private Sector Federation	Mobilising and sensitising members involved in the business of mining at different levels
12	Rwanda Cooperatives Agency (RCA)	Mobilisation, registration and capacity building of small scale mining cooperatives
13	Workers' Union (CESTRAR)	Ensuring that the Mine workers rights are upheld with respect to remuneration and welfare; occupational health and safety;
14	EIA Experts	Require tools and information conduct EIA in a professional and independent manner; advise Developers to follow the standards and regulations of EIA.
15	Construction firms	Mining sand, gravel and stones for housing and road construction.

3. PROJECT CYCLE FOR MINING PROJECTS

This section describes the cycle of a typical mining project, and identifies key environmental impacts in each phase.

3.1 Phases of a typical Mining Project

Mining projects are location-specific as they are based on resources that are immovable, often underground. The project cycle starts with finding whether there are resources of commercially exploitable value, then explore the extent, and prepare ground for exploitation. Depending on the ore or mineral being exploited, environmental impacts are usually associated with phases beginning with exploration.

3.1.1 Exploration

A mining project can only commence with knowledge of the extent and value of the mineral ore deposit. Information about the location and value of the mineral ore deposit is obtained during the exploration phase. This phase includes surveys, field studies, and drilling test boreholes and other exploratory excavations. For large scale mining, the exploratory phase may involve clearing of wide areas of vegetation, to allow the entry of heavy vehicles mounted with drilling rigs, or even manual excavation in open pit mining. Because of the extensive opening up of earth during this phase, projects in this phase should also be subjected to EIA depending on the area covered.
Separate EIA is required for the exploratory phase because the license for exploration is different from that of exploitation, and in case sufficient quantities of high-grade mineral ore deposits, the environmental impacts from exploration are different.

The main steps in Exploration are summarized as follows:

1. *Preliminary assessment of area*, usually a large area: possibly known to be mineral bearing (old mines, historical records etc), application of remote sensing, aerial photography etc: identify areas with good prospects. In Rwanda, most prospective investors rely on the geological maps provided by the Geology and Mines Department in RNRA;
2. Preliminary *ground exploration to identify smaller scale targets* as priorities for exploration effort: geochemical sampling, geophysics, develop more detailed exploration plans (eg drilling programmes);
3. *Initial drilling programmes*: widely spaced points of information seeking a mineralisation discovery. It may or may not be easy to demonstrate continuity of geology/grade.

4. *Infill drilling*: more closely spaced drilling and sampling: sufficient to confirm geology/grade continuity. Sampling for metallurgical tests, environmental impact assessment etc are conducted.
5. *Detailed exploration designed* to optimise the mine design e.g. pit slopes, water modelling, slope design etc. Focus on initial years of mining to reduce uncertainty.

3.1.2 Construction phase (Preparation)

The construction phase relates to the development of the entire mining facility, including the mine, processing plant (mill), and other related infrastructure, in preparation for the operation. If the mineral ore exploration phase proves that there is a large enough mineral ore deposit, of sufficient grade, then the project proponent may begin to plan for the development of the mine. This phase of the mining project has several distinct sub-components notably site preparation and clearing and construction of access roads.

Apart from the mine and process plant[1], mining infrastructure development includes all facilities needed to support the operation such as staff houses. This stage requires most of the project funding, provides the bulk of the jobs, and creates significant environmental impact. A company does not usually commit to construction until the details of all regulatory requirements are complied with. Common activities during construction include:

- Site preparation;
- Clearing and initial preparation for mining (i.e., overburden removal);
- Construction of accommodations;
- Construction of process and site facilities (i.e., mills, offices, houses, water supply/pumping facilities, etc.);
- Building roads and airstrips (installation of power lines and railway);
- Training programs for personnel; and
- Installation of environmental protection equipment.

As mining is usually done in remote areas that lack infrastructure. In Rwanda, it is a labour-intensive activity especially medium and large scale mining activities which involve construction of access roads and houses for project personnel and equipment. This sub-phase is usually associated with some impacts as it involves vegetation clearance and landscaping. However, the impacts vary depending on the plans, location and types of infrastructure (e.g. are housing structures temporary or permanent" are they located on slopes? Are the roads being constructed earth or paved?). Depending on the intensity of activities, some of the clearance may have been undertaken during exploration.

The construction of access roads can have substantial environmental impacts, especially if access roads cut through ecologically sensitive areas or densely populated areas. Most mining

[1] As most mining entities in Rwanda are small-scale operators, processing is usually done in Laboratories/facilities in Kigali city, far away from most mines. Hence transport of materials is the main inter-phase issue.

areas in Rwanda are located in ecologically and topographically sensitive areas because of the terrain. If a proposed mining project involves the construction of any access roads, then the project EIA must include a comprehensive assessment of the environmental and social impacts of these roads.

3.1.3 Exploitation phase (active mining)

Environmental impacts depend to a considerable extent on the mining methods to be used. The range of methods used for mining are described briefly as follows:

1. ***Open-pit mining:*** This is the most common type of mining in Rwanda. Open-pit mining is a type of strip mining in which the ore deposit extends very deep in the ground, necessitating the removal of layer upon layer of overburden and ore. In many cases, logging of trees and clear-cutting or burning of vegetation above the ore deposit may precede removal of the overburden. The use of heavy machinery, usually bulldozers and dump trucks, is the most common means of removing overburden. Open-pit mining often involves the removal of natively vegetated areas, and is therefore among the most environmentally destructive types of mining, especially within tropical forests. Because open-pit mining is employed for ore deposits at a substantial depth underground, it usually involves the creation of a pit that extends below the groundwater table. In this case, groundwater must be pumped out of the pit to allow mining to take place. A pit lake usually forms at some point in time after mining stops and the groundwater pumps are turned off. In Bugesera for example, one of the mining companies pumps water from the lake into a pit from which water is pumped for various mine activities.

2. ***Placer mining:*** Placer mining is used when the targeted ore or product is associated with sediment in a stream bed or floodplain. Bulldozers, dredges, or hydraulic jets of water (in a process called 'hydraulic mining') are used to extract the ore. Placer mining is usually aimed at removing gold from stream sediments and floodplains. Because placer mining often occurs within a streambed, it is an environmentally-destructive type of mining, releasing large quantities of sediment that can impact downstream surface waters.

3. ***Underground mining:*** this is the more environmentally friendly and more permanent of the mining techniques where a minimal amount of overburden is removed to gain access to the ore deposit. Access to this ore deposit is gained by tunnels or shafts. Tunnels or shafts lead to a more horizontal network of underground tunnels that directly access the ore. Although underground mining is a less environmentally-destructive means of gaining access to an ore deposit, it is often more costly and entails greater safety risks than strip mining, including open-pit mining. Many scale-scale miners may not afford to invest in this technique.

4. ***Reworking inactive or abandoned mines and tailings:*** In some projects, a major mining activity may involve reworking of waste piles (often tailings) from inactive or abandoned mines, or older waste piles at active mines. Typically, this is proposed when more efficient methods of metal beneficiation have made it economical to re-extract metals from old mining waste, certainly not economically viable with artisanal mining. The material from the piles may be sent to processing facilities on-site or off-site. Mining projects that only involve the reworking of abandoned mine waste piles avoid the environmental impacts of open-pit mining but still entail environmental impacts associated with purification (beneficiation) of metals from the waste piles.

5. ***Disposal of overburden and waste rock*:** In most projects, mineral ores are buried under a layer of ordinary soil or rock (called 'overburden' or 'waste rock') that must be moved or excavated to allow access to the ore deposit. For most mining projects, the quantity of overburden generated by mining is enormous. The ratio of the quantity of overburden to the quantity of mineral ore (called the 'strip ratio') is usually greater than one, and can be much higher. For example, if a proposed mining project involves the extraction of 100 million metric tons of mineral ore, then the proposed mining project could generate more than one billion metric tons of overburden and waste rock. These high-volume wastes, sometimes containing significant levels of toxic substances, are usually deposited on-site, either in piles on the surface or as backfill in open pits, or within underground mines. Therefore, the EIA for a proposed mining project must, therefore, carefully assess the management options and associated impacts of overburden disposal. It should investigate how adequately the research and exploration phase have been conducted.

6. ***Ore extraction:*** After a mining company has removed overburden, extraction of the mineral ore begins using specialized heavy equipment and machinery, such as loaders, haulers, and dump trucks, which transport the ore to processing facilities using haul roads. This activity creates a unique set of environmental impacts, such as emissions of fugitive dust from haul roads, which an EIA for a proposed mining project should assess separately.

3.1.4 Decommissioning (Closure and Rehabilitation)

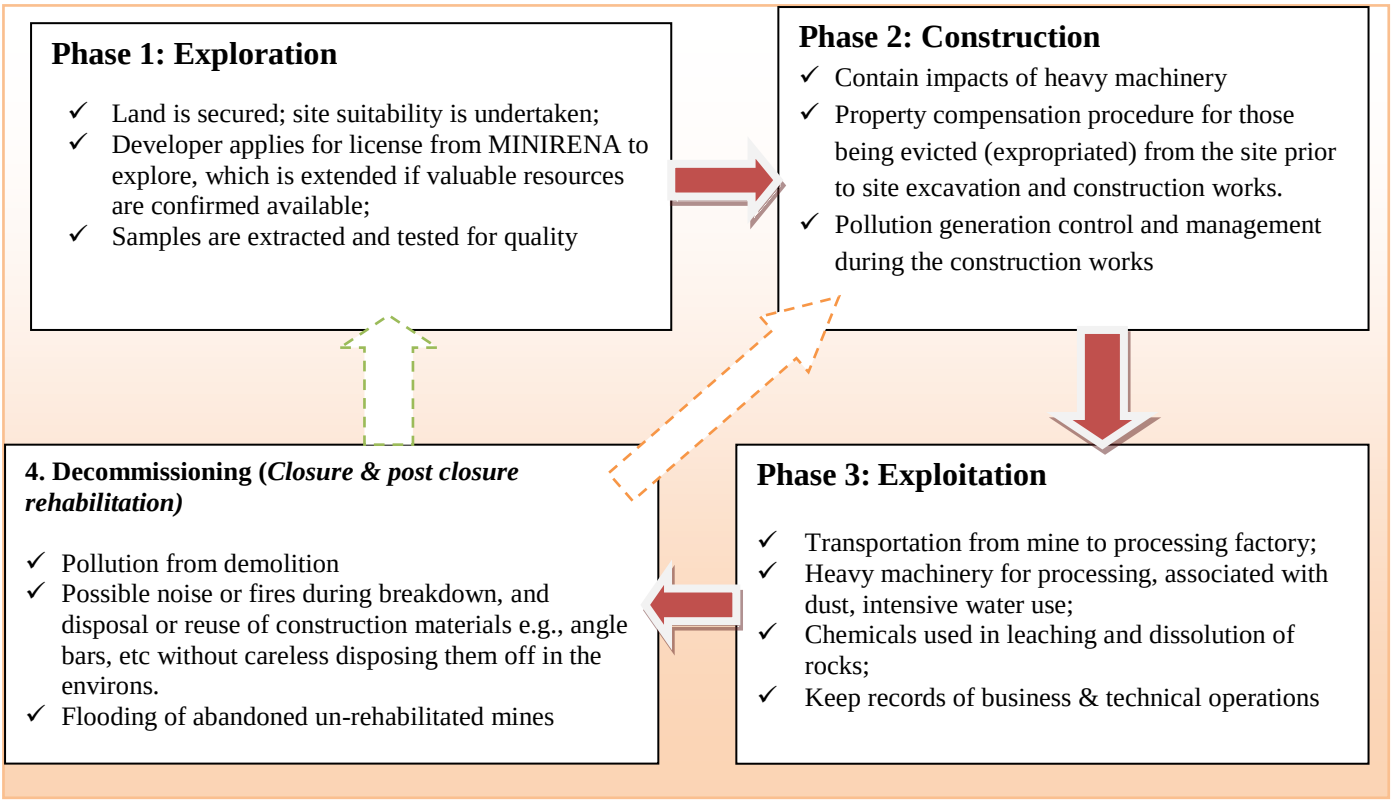
The closure of a mine should be anticipated and planned for prior to the end of mining operations. For a large mine, this should be at least 5 years before the operational period ends. The objective of the final closure plan is to ensure that the mine area is left in a functioning status with respect to the ecological, physical and chemical characteristics, with the pre-mining status as the reference. The underlying aim is to make it available and ready for future land uses. Mine closure and post-closure rehabilitation should be planned well in

advance, at least 3-5 years before the anticipated time of closing as it usually involves a lot of costs in land rehabilitation, equipment boarding-off or transfer, staff layouts, etc.

A key part of the closure plan is a commitment to progressive rehabilitation of the mine area, taking advantage of available personnel and equipment, minimizing the potential for contamination, and reducing final closure costs or the need for complex or sizable financial assurance. In this respect, the effort needed to rehabilitate the mine area should determine the environmental caution fee levied on prospective developers. Ongoing rehabilitation work will typically include:

- ✓ Demolishing buildings and physical infrastructure;
- ✓ Closing open pits;
- ✓ Stabilizing and preventing public access to underground workings and shafts;
- ✓ Reclamation of slopes;
- ✓ Ensuring that water draining from the mine site and waste deposits are not a risk to human health and the environment.

The project phases and some associated environmental impacts are summarised in figure 1:



The main types of mining activities relevant for and common in Rwanda

3.2.1 Open Pit Mining

The most common in Rwanda, under this, large, near-surface ore bodies are excavated by forming an open pit. The ore and non-ore materials (which include topsoil, overburden and

rock) are excavated using surface mining equipment, generally trucks and shovels. The dimensions and size of each open pit are unique and depend upon the ore grade and geometry, geologic structures, rock strength and topography. The pit slopes are commonly designed in a system of steep slopes, which may be up to 30 meters high, between horizontal benches. The height of each individual slope depends on the size of excavation equipment, geologic structures, and rock strength.

There are a number of environmental implications: Many open pits are excavated below the water table causing changes to the groundwater flow pattern during operation and in some instances during post-closure of mines. Surface drainage patterns may also be disrupted. Often an underground mine is developed below the open pit and there may be connections to underground mine workings. Open pits are typically partially filled with water from surface and groundwater following completion of mining operations.

3.2.2 Underground Mining

This generally requires a complex system of access, service and "stoping" excavations to recover the ore. Ore bodies can be continuous or discontinuous, occurring in small volumes with large barren (no ore) zones in between. Mines generally attempt to remove as much of the economical ore material as possible and this can result in very large underground excavations. These excavations will have different levels of stability. The larger excavations may be backfilled or allowed to collapse.

Most underground mining methods fall within the following broad categories:

- *Concurrent caving*: Ore is extracted and the underground workings are allowed to collapse, and the overlying rock therefore must cave (collapse) concurrently with extraction of the ore. Consequently, surface disturbances are likely to occur rapidly, depending upon the depth of the mine workings.
- *Post caving*: Extraction of the ore takes place without backfill and caving could occur at some time after the ore has been extracted. Surface disturbances are likely to occur in the future.

Open stopping with pillars: Pillars are left to maintain stability while ore is extracted. Collapse and surface disruption could occur in the future.

3.2.3 Fill mining

The openings left by the extraction of the ore are backfilled with material, which may be waste rock, tailings or tailings paste. Fill mining greatly reduces the potential for surface disturbances.

3.2.4 Industrial Mineral Mining

The term "Industrial Mineral" is often used to refer to non-fuel, non-metal minerals such dimension stone (e.g. limestone, Granite, slate, among others); crushed and broken stone; sand and gravel; clay, ceramic, and refractory minerals (e.g. kaolin, bentonite, shale); and

chemical and fertilizer materials (e.g. potash and phosphate). This wide range of materials can be mined using a variety of techniques.

3.2.5 Solution Mining and In Situ Leaching

Solution mining (often referred to as *In-situ leaching*) because of the common feature of dissolving and collecting the valued mineral[2] in solution form, is mostly applicable to gold and copper. Solution mining focuses on the dissolution of salts through injection of water into the deposit and creation of a pressurized subsurface cavern of brine that is returned to the surface. In situ leaching involves addition of various reagents to water and a network of injection wells to inject the solution into a subsurface mineral deposit to effect dissolution, followed by pumping to recapture the dissolved minerals (pregnant solution) via a network of collection wells. The intensive use of volatile chemicals implies it potentially has high environmental impacts.

3.3 Classification of Mining Projects

Mining and mineral processing projects have varying impacts on the environment depending on a range of factors. For purposes of making rational decisions regarding which projects should be subjected to what level of EIA, such projects are categorized into 3 classes i.e.: IL 1, IL 2, and IL 3.

These categories are based on a set of criteria according to the potential impact levels as follows:

- *Stage of project*: Generally, research and prospecting activities are associated with lower environmental impacts compared to construction and operational activities (actual mineral extraction);
- *Size of mining area*: Licenses covering 1000 Ha or more will automatically be categorised as IL 3, even if they are at prospecting stage, while those covering less than 10 Ha will be subjected to environmental review. The potential for displacement, land and water use and socioeconomic change, among other environmental impacts, is higher with land size;
- *Project location*: all projects located in ecologically sensitive areas (forests, wetlands, steep slopes, wildlife habitats), legally protected by national or international law (trans-boundary ecosystems, international riverbanks and lake shores, national parks, archaeological sites), and socio-culturally sensitive areas (densely populated, national monuments, memorial sites, burial grounds/cemeteries), are automatically categorised in IL 3 (high impact areas);
- *Number of people employed*: All projects that employ more than 100 people for an extended period of time are categorised as high impact and therefore fall in IL 3.

[2] In Rwanda, this is particularly common with gold mining and processing.

- *Nature of the ore being extracted*: Copper, gold is associated with intensive use of chemicals and leaching; tin ores (cassiterite), the most commonly mined ore in Rwanda is associated with low value high volumes i.e. a lot of rock material has to be excavated to generate a little amount.
- *Project design and layout*: the extent to which raw materials and rock ores are transported, stored, sold, disposed of, over a long distance. Are all mining and processing activities etc., in the same location? Do the processes produce acid, mercury? Are the ores or materials used potentially volatile, inflammable, toxic, corrosive, poisonous, persistent in the environment, non biodegradable or otherwise have negative impacts on any component of the environment, people or economic activities?

4. THE EIA PROCESS FOR MINING PROJECTS

4.1 Environmental and Social Impacts of Mining Activities

4.1.1 Environmental Impacts of Exploration and Feasibility Study Phases

Exploration activities encompass all actions in the field which precede feasibility studies. This might include initial reconnaissance flights and geophysical surveys, stream sediment studies and other geochemical surveys, construction of access roads, clearing of test drilling sites, installation of drill pads and drilling rigs, benching, trenching/pitting, erection of temporary accommodations, and power generation for exploratory drilling.

Most initial exploration activities are relatively non-intrusive and have limited, short-term impacts on the environment, particularly when compared to impacts associated with other phases of the mine life cycle. Exploration activities in Rwanda are, however, associated with relatively intense drilling and other activities associated with significant environmental impacts. The EIA process must identify and analyse them. For instance, aerial surveys may be associated with noise while the collection of bulk samples may result in the release of contaminants to water and air, as well as noise and vibrations that may affect wildlife. Drilling requires preparation of drill sites; transportation, storage and handling of fuel; and the establishment of campsites for drilling and geological crews, facilities to deal with drilling waste, and an infrastructure to manage and supply the camp.

A summary of potential environmental effects associated with exploration and feasibility phase(s) of the mining projects are summarised in table 3.

Table 3: Potential Environmental issues in the Exploration and Feasibility Phase

Activity	Potential Environmental Concerns
Access/Line Cutting	• Possible concerns with terrestrial/wildlife habitat and stream crossings
Geophysical Surveys	• Possible impacts on wildlife from airborne surveys
Field Camps	• Sewage and garbage disposal, water supply, fuel storage • Impacts on terrestrial/wildlife habitat, access to remote areas
Trenching/Pitting	• Physical scarring/land disturbance • Acid generation from exposed sulphide minerals • Metal leaching • Sediment erosion • Impacts on wildlife of blasting
Drilling	• Water supply, drilling fluid disposal, fuel storage/risk of spills, groundwater contamination • Physical scarring/land disturbance • Acid generation from exposed sulphide minerals • Release of metal-bearing groundwater
Bulk Sampling	• All of the above but potentially greater impacts are possible, and reclamation needs to be considered • Dewatering of historic mine workings may have impacts on receiving water quality

4.1.2 Environmental Impacts Associated with Mining Activities

Mining involves extraction of earth resources which are usually underground. Therefore all mining activities – whatever the scale – are associated with significant environmental impacts. The table 4 presents some key potential environmental impacts usually associated with each phase.

Table 4: Sources of Potential Environmental Impacts by phase

	Project Phase	Activity likely to result in environmental impacts	Notes/ Possible remedies
1	Exploration and Feasibility study	✓ Construction of new access routes	-Use of helicopter access for personnel & equipment if practicable -Rehabilitate abandoned exploration sites
		✓ Drill sites may affect surface waters (particularly those used for potable water abstraction	
		✓ Ecological significance of affected habitat, and the extent to which access has been improved as a result of exploration	-Restrict land clearance to the minimum required
		✓ Proximity to and intrusion upon existing settlements or resources utilized by local or indigenous people	-Develop plans for managing contact with local communities -Disable access infrastructure
		✓ Extent to which local or indigenous communities are voluntarily isolated, or have been exposed to diseases prevalent among exploration workers.	
2	Construction	✓ Road construction for mineral transportation and access to waste sites	
		✓ Preparation of area for the solid waste deposit. Storage of the production plant and leach waste deposit	
		✓ Construction of deviation channels	
		✓ Construction of the foundations for the production plant	
		✓ Preparation of area for heap leach	
		✓ Soil removal and storage	
		✓ Preparation of area for domestic wastes disposal	
		✓ Preparation of area for domestic waste water treatment facility	
		✓ Installation of campsites, offices, workshops, storage facilities.	
		✓ Preparation of open pit area	
3	Operation	✓ Exploitation of open pits	
		✓ Transportation of mineral to the leach pad	
		✓ Expansion and elevation of the leach pad	
		✓ Mineral leaching	
		✓ Transportation and disposal of materials in waste sites	
		✓ Reception and storage of mineral in the production plant	
		✓ Management of solutions at the production plant	
		✓ Storage of ground mineral at the production plant	

	Project Phase	Activity likely to result in environmental impacts	Notes/ Possible remedies
		✓ Process of mineral recovery at the production plant	
		✓ Waste disposal from the production plant	
		✓ Management of industrial and domestic waste water	
		✓ Management of hazardous materials	
4	Decomissioning (Closure and Post-closure)	✓ Closure of open pits	
		✓ Closure of solid waste piles	
		✓ Closure of heap leach pads	
		✓ Backfill waste dump sites	
		✓ Closure of storage sites	
		✓ Closure of water and electricity sources	
		✓ Land reclamation	
		✓ Restoration of internal roads	
		✓ Re-vegetation	

4.2 Basic Steps in the EIA for Mining Projects

4.2.1 Application and Development of Terms of Reference (ToRs)

The first step of the EIA process is a developer submitting an application for EIA of a proposed project to the Authority in form of a Project Brief. This brief is considered to be the developer's formal application for an EIA. The purpose of a Project Brief, is to provide sufficient information on the project to enable RDB and Lead Agencies establish whether or not the proposed activities are likely to have significant environmental impacts, and also enable to determine the level of EIA required (screening). If adequate mitigation measures are identified in the Project Brief, the need for conducting full EIA may be waived and a project may be approved with minimal implementation conditions.

4.2.2 Screening

Screening is the initial process undertaken to determine whether the proposed project warrants preparation of an EIA. The types of projects requiring EIA are identified from the screening process in accordance with Law No. 4/2005, Law No.38/2008 and the categories of projects according to IL 1, IL 2 and IL 3 categories respectively.

Screening enables early identification of environmental issues of major concern and incorporation of appropriate mitigation measures; identification of potential impacts on the different aspects of the environment; and enables categorisation of projects according to their Impact Level (IL). Mining projects are classified into 3 categories according to Environmental Impact Levels as follows:

a) Impact Level 1 (IL 1): Projects not requiring limited environmental analysis

Projects in this category are considered to have a low risk of serious environmental impacts, which can easily be identified through a Project Brief. For potential impacts of these projects,

mitigation measures can be integrated in the project design without necessarily requiring a detailed EIA. Hence, after a period of public input the project passes directly to decision-making level.

Mining projects in this category are believed to have minimal adverse impacts, which can easily be identified in a Project Brief. They are classified as small mining projects and include:

- Research and prospecting projects on land surface area not exceeding 100 Hectares;
- the mining activities will not disturb more than 10ha of land or 5 ha of riverine area;
- the mining activities are not, or will not be, carried out in environmentally sensitive areas; mining activities for alluvial; clay pit; dimension stone; hard rock; opal or shallow pit mining.
- Small scale (artisanal) mining activities in less ecologically sensitive areas;
- Limited exploitation of sand, stones, clay and gravel in non-ecologically sensitive areas.

Mining projects will be categorised under impact level 1 (IL 1) if the screening process determines that the proposed project fulfils the following conditions:

1. Potential residual impacts on the environment are likely to be minor, of little significance and easily mitigated.
2. Reliable means exist for ensuring that impact management measures can and will be adequately planned and implemented.
3. The project will not displace significant numbers of people, families or communities.
4. The project is not located in, and will not affect:
   a) environmentally-sensitive areas such as: National parks; Wetlands; Important archaeological, historical and cultural sites; habitats of rare or endangered flora or fauna species; natural forests;
   b) Productive agricultural land
   c) Areas protected under legislation
   d) Areas containing unique or outstanding scenery
   e) Mountains or developments on or near steep hill slopes
   f) Lakes and rivers;
   g) Areas important for vulnerable groups such as fishing communities;
   h) Areas near high population concentrations or industrial activities where further development could create significant cumulative environmental problems
   i) Ground water re-charge areas or drainage basins.
5. The project will not result in and/or:
   a) Policy initiatives which may affect the environment
   b) Major changes in land tenure
   c) Changes in water use through irrigation, drainage promotion or dams, changes in fishing practices.
6. The project will not cause:

a) Adverse socioeconomic impact
b) Land degradation
c) Water pollution
d) Air pollution
e) Damage to wildlife and habitats
f) Adverse impact on climate and hydrological cycle
g) Creation of by-products, residual or waste materials which require handling and disposal in a manner that is not regulated by existing authorities.

7. The project will not cause significant public concern because of potential environmental changes. The following are guiding principles:
   a) Is the impact positive, or harmful?
   b) What is the scale of the impact in terms of area, numbers of people or wildlife affected?
   c) What is the intensity of the impact?
   d) What will be the duration of the impact?
   e) Will there be cumulative effects from the impact?
   f) Are the effects politically controversial?
   g) Have the main economic, ecological and social costs been quantified?
   h) Will the impact vary by social group or gender?
   i) Is there any international or trans-boundary impact due to the proposed projects?
8. The project will not necessitate further development activity, which is likely to have a significant impact on the environment.

IL 1 project applications should be accompanied by an EMP stipulating what the developer believes are the potential environmental impacts of the mining project and how s/he intend to address them.

b) IL 2: Projects not requiring a full EIA but necessitate further level of assessment

This category represents projects believed to have adverse, but not irreversible environmental impacts and mitigation and management measures can be readily designed and incorporated into the project. Mining projects in this category are classified as medium sized. The EIA process for these projects is similar to that of IL3 projects. Projects classified as IL 2 should have the following characteristics:

- Sand and gravel mining
- Stone/rock quarries located outside 25 Km radius of a residential or settled area;
- Stone or rock quarries using predominantly manual techniques (i.e. in which electro-mechanical or chemical blasting or rock crushing techniques/ equipment are to be used).
- Cover an exploration area no more than 1000 Ha and exploitation area not exceeding 100 Ha;
- Mining projects likely to employ between 25 – 100 people at the site;

- rehabilitation or re-operationalisation of an existing mine, the closure or decommissioning of which may not have been for security or environmental reasons;

c) IL 3: Projects requiring a full EIA

This category involves projects for which it is evident that there will be significant and adverse environmental impacts whose mitigation measures cannot readily be prescribed, and thus, must undergo through a complete EIA process. Mining projects in this category are regarded as high risk. This category involves projects for which it is evident that there will be significant and adverse environmental impacts whose mitigation measures cannot readily be prescribed, and thus, must undergo detailed EIA process.

- All mining projects at exploitation level or involving excavation and located on hillsides;
- Projects located within at least 1 Km of a river or lake;
- Projects likely to result in displacement and permanent resettlement of at least 25 households or more than 50 people;
- Involving installation of industrial machinery;
- All projects within an ecologically sensitive area such as habitats for endemic species, high biodiversity
- Mining projects likely to include construction of permanent residential quarters for at least 10 households;
- All projects involving use of chemicals in the processing;
- Construction of houses

4.2.3 Scoping

Mining projects are usually associated with a range of environmental impacts, but it may be difficult to determine how far EIA should go. The purpose of scoping is:

- To consider the main environmental problems to be studied, alternatives and to ensure that the spatial and temporal scopes and extent of the environmental assessment is compatible with the size of the project.
- To determine appropriate EIA methods relevant to the project's potential environmental and socio-economic impacts.
- To provide information to communities in areas affected by the project on environmental problems and alternatives so that they may take part in identification and assessment of the project's environmental and socio-economic impacts.
- Scoping enables formulation of detailed ToR for impact assessment by the developer.

At the end of the scoping exercise, a scoping report shall be produced and submitted to the RDB for review. Any relevant comments raised by the public after review of Project Briefs will also be incorporated in the ToRs. Upon approval by the Authority, the ToRs are sent to

the Developer as authorisation to commence the EIA studies. A Scoping and screening checklists for mining projects is attached as Annex 3.

Table 4 presents a framework for linking the key environmental attributes affected by mining projects with associated environmental impacts.

Table 4: Environmental Attributes and Associated Environmental Impacts in mining:

	Environmental attribute	**Environmental Impact**	
		Positive	**Negative/Adverse**
1	Land use	Land reclamation/restoration of mined out lands may give rise to beneficial land uses e.g. recreation, agric.,	• Direct impacts are removal of vegetation & top soil; and resettlement of people
2	Landscape	Reclamation/restoration may create better land use and landscape with considerations for environmental management	• Visuals (unsightly dumps, mine structures, voids, mine structures, subsidence, mine fires, etc.; change in land forms and associated impacts-soil erosion, loss of top soil, change in complete geology,
3	Water quality		Water pollution due to erosion, oil & grease; contamination of water bodies due to discharge of mine water/effluents; pollution from domestic and sewage effluents; sedimentation of rivers and other stored water bodies; leachates from wash-off from dumps, solid waste disposal sites, broken rocks, toxic wastes, salinity from mine fires, acid mine drainage, etc
4	Water resources/ hydrology		Changes in ground water flow patterns; lowering of water table, changes in the hydrodynamic conditions of river/underground recharge basings; reduction in volumes of subsurface discharge to water bodies e.g. rivers; diversion of water courses/drainages; contamination of water bodies affecting yield of water from bore wells, land subsidence, etc.
5	Socioeconomic	Change in employment, incomes; infrastructure n; communication; community development; transport; educational; commercial, recreational; medical facilities	Displacement and rehabilitation; resettlement of affected people disrupt culture & social relations; crime and illicit activities
6	Air and dust		High intensity of dust nuisance problems such as visuals, soiling and degradation of materials;

	Environmental attribute	Environmental Impact	
		Positive	**Negative/Adverse**
			Gaseous emissions; HEMM & other transport vehicles
7	Risks/hazards	Noise may cause migration of birds and other species which could be a nuisance to community e.g. birds, bats, predators and vermins	Blasting affects mine workers as well as people in proximity
8	Noise and vibration		Generation of obnoxious levels of noise and vibrations which also spread to neighbouring areas; occupational health hazards; damage to structures; disruption of wildlife
9	Ecology (flora & fauna)	Restoration may improve ecosystem	Loss of habitat; biodiversity; rare flora & fauna; fisheries; migration of species; overall disruption to the ecology of the area.
10	Public health & safety	Health care amenities	Respiratory & water borne diseases due to dust and pollution of water bodies; safety due to blasting &explosions

4.2.4 Environmental Impact Study and Reporting

The EIS which is a research and investigation phase of the EIA process is the main stage of intervention. For mining projects, it involves a three-step process:

1) *Potential impacts of a project and their magnitude are identified*. Also included in this step is the Analysis of Initial State. IL-3 projects start the EIS process at step 1 while IL-2 projects start the process at Step 2. IL-1 projects are not subjected to EIS, and instead they go directly to the Decision-making and Authorization stage. IL-1 projects are however subjected to a period of public review during which stakeholders may submit written views to the Authority.
2) An Environmental Impact Report including an Environment Management Plan (EMP) is drafted on completion of the investigations. The main objective of an EMP is to streamline environmental issues into the business and operational plans of the project. An EMP is incorporated into the Environmental Impact Report and submitted to the developer who may, if necessary, append an addendum (*Environmental Impact Report Addendum)* to the EIA report. The developer then submits the EIA report to the Authority, which checks for completeness before passing them on to Lead Agencies and stakeholders for review (Step 3).
3) The EIR is subjected to a formal public hearing and post-hearing consultation. Output of the public hearing is a Public Hearing Report, written by the presiding officer (RDB staff). The public hearing report, EIR and the developer's response, constitute the basis for decision making regarding approval or disapproval of the project. The EIA Experts

should be present at public hearings to assist the developer in providing technical description of the project, potential impacts and justification of proposed mitigation recommendations.

Some key tasks that must be performed by the EIA experts during impact study are:

- **Analysis of the initial state:** During environmental impact study, EIA Experts should undertake an analysis of the initial state of the environment performed to create a comparative basis of impacts after project implementation commences. Analysis of Initial State should include a record of baseline environmental conditions considered to be threatened by the project. It may utilise scientific data, photographs of the area, or any other geophysical records. This information will be kept on record at the Authority for historical reference.

- **Identification and Analysis of Impacts:** This involves prediction and analysis of potential socio-environmental impacts that would result from developing, operation and decommissioning of the project.

- **Mitigation Measures, Alternatives and Monitoring:** This entails identification and assigning responsibilities and duties related to impact mitigation, alternative project options and requirements for monitoring. After mitigation measures have been identified, viable alternatives considered, details and schedule for monitoring during project implementation identified, the EIA Experts shall include this information in the Environmental Impact Report.
    - **Mitigation Measures:** Mitigation measures are intended to prevent or minimize negative impacts of a project and enhance the positive ones. EIA Experts shall develop mitigation measures for IL-3 projects, basing on findings of the environmental impact study. Mitigation measures for IL-2 projects will be based on nature of the project, its components and input of the review committees. The EIA experts shall prioritise mitigation measures, organizing them into a hierarchy of importance with highest priority given to measures that prevent highly significant adverse environmental or socioeconomic impacts.
    - **Review of Alternatives:** During EIA studies, the EIA experts shall undertake an analysis of alternatives with the view of finding feasible ways to prevent or minimize negative impacts while maintaining project objectives. Alternatives suggested will be evaluated by the Technical Committee during the decision-making process. The EIA experts shall make a systematic comparison of the proposed investment design, site, technology, and operational alternatives in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and institutional, training and monitoring requirements. For each alternative, the environmental costs and benefits should be quantified to the extent possible, economic values should be attached where

feasible, and the basis for the selected alternative should be stated. The *"No project*" option which implies that the project may not be implemented should also be analysed especially in view of the fact that mining sites are location inflexible.

- **Preparation of EIA Report:** The EIA experts shall compile results of an impact study into a report termed an *Environmental Impact Report (EIR)*. This document should provide the Authority with sufficient information to objectively appraise and either approve or disapprove of a proposed project. The EIR shall be forwarded to the developer who shall sign it and submit it to the Authority. An EIA report shall have the content outlined Annex 1. While there is no limit to number of pages required, EIA Report should be concise, addressing only the relevant issues based on logical assumptions and simulations.

4.2.5 Submission of EIA Report to the Authority

After a developer has reviewed the EIA report and, if necessary, written an addendum, these documents, which should be signed by the EIA experts, are submitted by the developer to REMA. The developer shall submit at least five copies of the EIA report to the Authority.
When submitting EIA documents to the Authority, developers shall indicate any information, which they wish to remain confidential. All such confidential information shall only be privy to the developer, EIA experts and the Authority.
The Authority shall ensure that for any project ready for review, three principal documents are available, namely:

i) Environmental Impact Report (EIR) including Environment Management Plan (EMP),
ii) ii) Developer's Environmental Impact Report Addendum (where applicable),
iii) Public Hearing Report.

REMA cannot start the review process if any of the above documents is missing.

4.2.6 EIA Report Review, and Decision-Making

Review of EIA documents submitted to the Authority enables subsequent decision-making on either approval or disapproval of a project.

a) Public Hearing

RDB is responsible for conducting public hearings during the EIA process. The purpose of a public hearing is to furnish interested and affected parties and the public with an opportunity to comment on, or raise issues relevant to an application for environmental authorization. Participants to the public hearing will include: Government agencies with responsible for licensing, regulating or facilitating mining activities (RDB, REMA, RNRA, RBS, MINICOM, MINIRENA, MININFRA, MIFOTRA, FECOMIRWA), concerned Local

Authorities; Private sector Federation; National Police Fire Brigade; Professional Associations including Impact Assessors and Engineers' Body (if and when registered); Local community representatives; non-governmental organisations and the developer.

During the public hearing, the developer will be given time to deliver a presentation to stakeholders, describing the project, perceived impacts and proposed mitigation measures. For completeness, the developer may also discuss findings of the EIA. If a public hearing is held during scoping, the developer should be available to describe the project, potential impacts and proposed mitigation measures to stakeholders. Developers may co-opt their legal counsels or EIA experts as either principal or secondary speakers during presentation at public hearings. A public hearing report is then compiled.

4.3 Key Areas of Focus in the EIA for Mining Projects

4.3.1 Occupation Health and Safety

All over the world and especially in Rwanda, mining activities are associated with landslides, floods, fatal accidents and other related disasters which undermine the potential of the sector to contribute to poverty reduction and economic transformation. Ensuring the safety of miners and all operational and non operational activities within and around the mine is the primary responsibility of the developer. In Rwanda's mining sector, human health and safety is especially paramount because of the high risks resulting from geo-technical, technological and skill levels and other factors. It is important to ensure that the mining area (both in the mine and surrounding areas are safe for operation).

A safe operational environment is one where people are able to work without being injured and where the health of the workforce is promoted. Facility–specific occupational health and safety hazards should be identified based on job safety analysis or comprehensive hazard or risk assessment using established methodologies such as a hazard identification study (HAZID), hazard and operability study (HAZOP), or a quantitative risk assessment (QRA). As a general approach, health and safety management planning should include the adoption of a systematic and structured approach for prevention and control of physical, chemical, biological, and radiological health and safety hazards.

Occupational health and safety issues occur during all phases of the mine cycle and can be classified according to the following categories:

- General workplace health and safety
- Hazardous substances
- Use of explosives
- Electrical safety and isolation
- Physical hazards
- Ionizing radiation
- Fitness for work

- Travel and remote site health
- Thermal stress
- Noise and vibration
- Specific hazards in underground mining (Fires, explosions, confined spaces and oxygen deficient atmospheres).

*For hazardous substances***,** the acceptable working area is one with adequate ventilation and dust/fume extraction systems to ensure that inhalation exposure levels for potentially corrosive, oxidizing, reactive or siliceous substances are maintained and managed at safe levels. Eye wash and emergency shower systems should be provided in areas where there is the possibility of chemical contamination of workers and the need for rapid treatment.
Materials Safety Data Sheets (MSDSs) should be available for all hazardous materials held on a mine or processing site.
Use of Explosives: Blasting activities that may result in safety impacts are typically related to accidental explosion and poor coordination and communication of blasting activities.

4.3.2 Environmental Impact on Water Resources /Hydrology

Some of the most important areas where mining has significant impacts are land/soil, air quality, biodiversity and water resources – both surface and ground water.

1) Land/soil and Biodiversity: Mining activities are known to significantly disturb land and soil as well as vegetation and wildlife. This disturbance affects ecosystem composition and health. To minimize the area and duration of disturbance to land and biodiversity the following measures or similar measures can be used:
   - Clearing large areas should be avoided;
   - Selective clearing of trees should be employed to avoid causing damage to surrounding vegetation;
   - Where possible the rootstock should be left intact to promote regeneration and regrowth.
2) Air quality: The developer must comply with RS 544:2010. To prevent causing an unreasonable release of emissions; the following measures or similar measures can be used:
   - Altering work practices to avoid or minimise the generation of dust;
   - Scheduling activities for times when they will have least impact;
   - Spraying water on roads and tracks;
   - Re-vegetating disturbed areas as soon as practicable;
   - Leaving or creating wind breaks or screening; and
   - Installing pollution control equipment (e.g. fitting bag filters or a cyclone to dust generating equipment).

3) Aquifer properties: Pump tests are necessary to define aquifer properties. The purpose of the testing is to define aquifer properties within the affected area, especially hydrologic boundary conditions, layering effects, directional permeability, and the vertical confinement

of the production zone. Transmissivity data of sufficient detail is necessary to confidently identify axes of directional transmissivities in the production zone.

Documentation of groundwater use within the area that may be affected by mining is essential in order to identify competing interests for groundwater allocation.

Parameters to be considered are:

- Hydraulic conductivity
- Transmissivity
- Storage coefficient
- Total porosity
- Effective porosity
- Aquifer thickness
- Piezometric surface
- Hydraulic gradient
- Permeability
- Ambient temperature (seasonal variations)

5) Abandoned drill holes: Documentation of all known pre-mining wells and drill holes in the proposed mining and adjacent areas will help to ensure that proper abandonment procedures are used; plugging of each abandoned well or hole needs to be verified.

4.3.3 Mining Concerns Related to Wildlife and Plant Diversity

The main environmental impacts of mining are probably more felt in the destruction of plants and plant diversity.

For plants, the stripping of outcrops during exploration and the clearing of sites for mine construction can have significant local effects on resident plant communities. These communities also represent wildlife habitat, and destroying habitat can lead to the loss of local breeding grounds and wildlife movement corridors or other locally important features. Mining activity may also contaminate terrestrial plants. Metals may be transported into terrestrial ecosystems adjacent to mine sites as a result of releases of airborne particulate matter and seepage of groundwater or surface water.

In some cases, the uptake of contaminants from the soil in mining areas can lead to stressed

For wildlife, mining activities lead to habitat loss and habitat degradation. For example, mining activity may affect migration routes, breeding grounds, or nesting areas. Mining activity may also affect species that carry special cultural significance to local communities. As a minimum, most large mammals are dislocated from mine sites and associated facilities. Some large species may not be affected in the long term by such dislocation, but dislocation could affect others, depending on the species and the significance to that species of the lost habitat.

Conversely, some wildlife species may be attracted to mine sites, particularly if food wastes and other wastes that may attract wildlife are not properly managed. This may lead to

increased interactions between humans and wildlife, and it could result in animals that pose a risk to persons on site having to be relocated or destroyed.

Terrestrial wildlife, like plants, may also be affected by contamination associated with mining activity. In particular, food sources for animals may become contaminated, and some contaminants, particularly metals, can magnify up the food chain.

4.3.4 Environmental Impacts Related to Air Quality

Air quality impacts from mining are mainly associated with the releases of airborne particulate matter. Operation of vehicles and generators can also lead to releases of greenhouse gases and various air contaminants, including sulphur oxides, nitrogen oxides, carbon monoxide and particulate matter.

Releases of airborne particulate matter can result from various activities, including blasting, crushing, loading, hauling, and transferring by conveyor. Open pits, waste rock piles, tailings management facilities, and stockpiles are potential sources of wind-blown particulate matter.

Common methods to minimize releases of airborne particulate matter include:

- spraying water to maintain sufficient surface moisture;
- using environmentally acceptable chemical sprays to stabilize the surface;
- revegetating the parts of the mine site that will not be disturbed in the future;
- controlling dumping or transfer rates of materials;
- covering dump trucks or rail cars to minimize releases during the transportation of material;
- establishing speed limits on unpaved surfaces that are low enough to minimize dust from vehicle operations, considering local weather conditions;
- storing ore or concentrate in storage bins, hoppers or other buildings to eliminate dusting concerns and position the material for loading or transfer;
- covering or enclosing conveyor lines;
- using bag-houses or precipitators for point sources of releases such as stacks from ore concentrate driers;
- covering stockpiles or other material that may be a source of releases; and
- temporarily ceasing operations if weather conditions are such that the risks of significant releases of airborne particulate matter are unacceptably high.

4.3.5 Waste Collection, Storage and Disposal

All mining wastes should be managed taking into consideration the Ministerial Order No. 003/16.01 of 15/07/2010 Preventing Activities that Pollute the Atmosphere', which gives the environment police and REMA the powers to enter the polluting entity, seize equipment and close the entity. That Ministerial Order also has tolerances of certain gaseous emissions.

Key wastes of particular interest in large scale ore mining are summarized in the following text:

1. **Tailings Disposal**

Tailings generated by mining activity should first be stored in a Tailings Management Facility specially designed for the purpose and approved by the Authority, after which management should dispose them off using appropriate measures. The EIS should include detailed information regarding the proposed method for safe and effective storage of tailings generated by the mining facility. This should, inter alia, include:

- Period (in years) and tonnage capacity of the tailings storage facility;
- Proposed methods to optimize storage capacities both at the mining facility and within the region (if different mines in the proximity can use the same Tailings storage facility);
- any changes that would be required in the present management procedures for the Mining facility and how it relates with the Water treatment facilities;
- Investigations of potential options for siting and operation of new tailings storage facilities.
- A description of any changes related to environmental management procedures during operations, water balance and containment of potential contaminants in the tailings disposal system following reclamation and decommissioning.

2. **Liquid Effluent**

The EIS should demonstrate that the project would not lead to contaminants and loadings in aquatic receiving systems in excess of the system's assimilative capacity. The EIS should identify where and how contaminant levels would meet the national Surface and Ground Water Quality Guidelines especially downstream from the facility and provide an evaluation of any environmental impacts.

In addition, the EIS should address:

- quantities and quality of contaminated liquid effluents;
- treatment processes, including total loadings for treatment and process chemicals; proposed pipelines/surface works;
- anticipated quality and quantity of effluents to be released to the environment and their contribution to current assessments of waste loadings and dispersion in the aquatic receiving system(s);
- quantity, quality and final disposal of slimes, sludge and precipitates from sumps, sedimentation ponds and treated water holding ponds (monitoring ponds);
- proposed points for control, monitoring and final discharge to the environment; and contingency plans for malfunctions or accidents.
- Sewage treatment and/or disposal of sewage domestic wastewater;

3. **Surface Drainage:** this will entail:
   - surface diversion and drainage works;
   - collection, storage, sampling, treatment and release of runoff from ore and waste rock stockpiles; and
   - design criteria for all drainage and leachate/runoff collection systems.
   - Ensure that and indicate how any water not meeting the National Mining *Mineral Industry Environmental Protection Regulation* limits and the *Federal Metal Mining Effluent Regulations* will have to be treated prior to release.

4. **Atmospheric Emissions**
   - quality and quantity of all airborne emissions e.g., SO_x, NO_x, dust;
   - potential entry of contaminants of concern in liquid and airborne waste streams, e.g., heavy metals into food chains, and the terrestrial or aquatic environment; and
   - operational monitoring programs for air quality parameters.

5. **Hazardous Waste**

Mining activities especially those that use chemicals are generally characterized by generation, emission of use of hazardous substances, some of which are highly toxic or volatile. These must be managed or disposed of in a proper way in accordance with environmental laws. The EMP must provide details on the proper disposal. However, the choice of sites must exclude those in the following categories:

- l areas with unstable geological features like;
- Unstable or weak soils: organic soil, soft clay or clay-sand mixtures, soils that lose strength with compaction or with wetting, clays with a shrink-swell character, sand subject to subsidence and hydraulic influence;
- Subsidence: e.g. owing to subsurface mines; water, oil or gas withdrawal; or solution-prone subsurface;
- Wet lands;
- historical migration zones e.g. for birds and wildlife;
- flood prone areas;
- Areas within 500 metres from water supply zone and within 200 meter from property line. For property proximity, possibility of relocation and compensation should be explored;
- natural depression and valleys where water contamination is likely;
- areas of ground water recharge and extremely high water table zone;
- unique habitation areas, close to national parks with scenic beauty and formerly used landfills.
- areas with high population, unique archaeological, historical, paleontogical and religious interests;
- Agricultural and forest lands and existing dump sites.
- Atmospheric conditions that would prevent safe dispersal of an accidental release

- Major natural hazards : e.g. volcanic activity, seismic disturbance and landsites
- Sensitive locations: e.g. storing flammable or explosive materials; airports.

Table 5: Some Potential sources of contamination in Mining Wastewater

	Source of pollutants	Description
1	*Acidic Drainage*	Sulphide minerals are ore minerals for many base metals, such as copper, lead and zinc, and are ubiquitous in ore deposits. Sulphides may also occur in host rock for ore deposits, and as a result they are common in waste rock. Sulphides are important from an environmental perspective because, in the presence of water and oxygen, they can oxidize to create sulphuric acid, a process commonly known as acidic drainage and also known as acid mine drainage or acid rock drainage. The result is the generation of metal-laden effluents of low pH. Acidic drainage can have very significant impacts on aquatic ecosystems unless it is carefully managed, and it can lead to long-term liability and effluent treatment costs for the mine owner/operator.
2	*Alkaline Effluents*	Many ore separation processes, particularly flotation separation, are most efficient at an alkaline pH, and chemical additives are used to ensure an alkaline pH, sometimes as high as 10 or 11, during processing. As a result, effluents from ore processing facilities are frequently alkaline, even at the point of final effluent discharge. At some sites, pH adjustment is required to lower the effluent pH prior to discharge.
3	*Metal Leaching*	Wastewater from mining and ore processing facilities can contain metals that naturally occur in the rock. Most metals are more soluble in water at low pH, so the concentrations of metals are frequently elevated in acidic drainage. However, metal leaching can also occur in cases where acidic drainage is not a concern.
4	*Cyanide*	Cyanide is used in the recovery of gold in many facilities that process gold ore. Some cyanide is reused in processing but some is discarded in tailings. As a result, wastewater from facilities using cyanide mills may contain cyanide and a number of cyanide compounds. Cyanide is also used in small amounts in some flotation separation circuits. Thus, cyanide compounds may also occur in wastewater from tailings from some base metal flotation mills.
5	*Ammonia:*	Ammonia may be present in wastewater from mining operations as a result of the use of ammonium nitrate and fuel oil (ANFO) as a blasting agent. Any ammonium nitrate spilled in preparation for blasting or left over after a blast may contribute to increased ammonia concentrations in wastewater. In addition, ammonia may occur as a decomposition product from cyanide wastes.
6	*Suspended Solids*	Wastewater may contain suspended solids ranging from colloidal (non-settleable) to settleable materials. The discharge of effluents with high levels of suspended solids can cause a range of problems in aquatic environments that include impeded oxygen intake by fish and reduced light availability for aquatic plants. Depending on the composition of the solids in suspension, the settling of these sediments can also result in the contamination of sediments,

		particularly with metals.
7	*Thiosalts*	Thiosalts are sulphur oxide compounds, including thiosulphate ($S_2O_3^{2-}$) and polythionates ($S_xO_6^{2-}$) formed when partial oxidation occurs during the milling, grinding and floatation of some sulphide ores under alkaline conditions. Thiosalts are a concern because they can oxidize in water to form sulphuric acid, which lowers the pH of the receiving water and affect metal mobility. Both of these aspects could have significant effects on resident aquatic organisms.

4.3.3 Socioeconomic issues

Mining projects have the impact of disrupting the local economy and social well-being, and the arguments for environmental trade-offs is the economic returns that very often accrue to the private mining entities and the economy at macro level. A focus on local economy is very important in the EIA. The GoR has defined 2 main goals for mining i.e.: increasing in foreign exchange receipts and ii) increasing the number of people productively employed in the mining sector, with specific attention to women. A key socioeconomic indicator of a mining project is the number and quality of employment created as shown in table 6.

Table 6: Tool for Assessing Project employees by Job category

Level of Job category	Education, age & other requirements	Status (No. of)	Local (e.g. district)**
Unskilled/Porters	Grade 12 education or equivalent; Minimum 18 years of age	• Porters Trades helpers • Miners • Cleaners • Guards	How many from the locality?
Semi-skilled	Grade 12 education or equivalent Some work experience	• Heavy equipment operators • Housekeeping services • Warehouse technicians • Administrative assistants • Trades occupations	Local (preferred); national if expertise is lacking – commitment to train locals
Skilled	Technician's Certificate	• Mining technicians • Lab. Assistants	National
	College Degree/ Diploma	• Managers • Mining Engineers • Geologists • Scientists • Accountants	National/regional: commitment to increase local skills

*** It is important to identify workers by their area of origin since many people may be employed at a site when they come from outside the locality or district*[3].

Note: The issue of providing a minimum education and age requirements is important to avoid use of under-age workers (contrary to child-labour laws) and encouraging the local

[3] In one of the Cassiterite mining sites visited in Bugesera, most miners (semi-skilled and unskilled) were reportedly coming from the Gisenyi area since they are the ones with interest in mining and able to identify the valuable rocks.

community to send and keep children in school at least to complete basic education. If a community does not meet this, and there are very many people out of school, then this requirement (especially for education) can be waived. Under no circumstances should child labour issues be ignored by the EIA.

4.3.5 Project Alternatives

Geological, engineering and technical constraints determine the technology to be used in the area. But in Rwanda, smallholder miners dominate the sector, often using rudimentary technologies. Technological innovations in research, prospecting, operations and post closure management of mines (abandoned mines) should be a key issue mitigation issue and a key factor in assessing whether the EIA effectively identify the environmental impacts, and the Developer is able to mitigate them.

Mining projects are site specific and the location of the project site is restricted to the geology and mineral deposits in the area. The resource being mined cannot be relocated, and often destruction has to be done to access them. This location inflexibility is a challenge to mitigating environmental impacts as it affects the consideration of alternatives to the project.

The Project Description should analyze alternative ways to undertake the project and identify the least environmentally-damaging practical alternative. The alternatives section of an EIA should answer the question: *Is the preferred alternative the least environmentally-damaging practical alternative?*

The following alternatives should be considered to ensure that the best environmental management practices are recommended for the project as far as possible: technology; mine locations; methods for obtaining the mineral; mining methods; site configuration (e.g. mine residue disposal sites; housing sites; domestic and industrial waste disposal sites); land use for site after mining operations have ceased and even mitigation measures.

1. *Location/siting sites for Mining facilities:* The location of facilities for ore processing, waste disposal, etc should be chosen to protect public safety and minimize impact on critical resources, such as surface waters, groundwater, or ecologically important wildlife habitat. E.g. a tailings impoundment should not be located near critical water resources and should be located at a safe distance (called a ‘setback’ or ‘buffer zone’) from residences and public buildings. A key question to ask is “*Are mine facilities located in the least environmentally-damaging locations?”*

2. *Mining technique/method:* A mining company may be able to change from an open-pit extraction method to an underground extraction method, to preserve surface resources. An underground mine might displace fewer human inhabitants and better protect surface waters, groundwater, or ecologically important wildlife habitat.

3. *Ore beneficiation methods*: Mining companies often have a choice of 'beneficiation' methods to concentrate the desired metals in the metallic ore they have mined. Some ore beneficiation methods have less serious impacts than others. For example, gravity concentration of gold ore is less dangerous to the environment and public health.

4.4 Mitigation Measures and Environmental Management

The purpose of conducting EIA for mining is to ensure that any environmental damages resulting from the extraction and use of precious earth resources, are minimized, contained or avoided altogether. Thus, EIA experts must recommend appropriate, realistic yet effective mitigation measures. For typical mining projects in Rwanda, the following mitigation measures can be considered, weighed against the extent of environmental impact, size of project and time:

4.4.1 Mitigating Runoff/Storm water, sediment and Erosion

The effect of soil erosion, wastes from mines can particularly be adverse to water quality. The impacts on water quality can be mitigated by means of appropriate working procedures as follows:

i) *Constructing sedimentation ponds* at the site to regulate runoff and trap sediments. A *sedimentation pond* is a basin and barrier made either of earth, rock or concrete designed to trap and store sediment eroded from the mine, processing and stockpiling site. The design of sedimentation pond depends on several factors, including (i) size of the operation particularly amount of water used for sand/stone washing; (ii) project locality which relates to rainfall intensity of the area; and (iii) the operational physical area. Three main important criteria for effective pond design are holding volume (sufficient size to hold wastewater and runoff); retention time (sufficient time to allow for silt deposition within pond prior to discharge); and location (appropriate location to capture all discharges from the processing area).

   The following criteria should be applied when constructing sedimentation ponds at mines and mineral processing sites:

   a) Ponds should be properly designed to sufficiently trap and accommodate sediments transported by surface runoff
   b) Two ponds should be built in parallel to allow cleaning operations
   c) Ponds should be regularly maintained by removing the deposited material at appropriate intervals;
   d) Sediments removed from the ponds should not be placed or disposed near waterways;
   e) It is more effective in terms of trapping sediment to construct a series of small sedimentation ponds rather than one large pond e.g. to accommodate 100 m^3, 5 ponds of 20 m^3 in series are better than 2 ponds of 50 m^3;

f) To facilitate the settling of larger particles, the length of the pond should be eight times the width;
g) Ponds should not be constructed on natural waterways or streams.

ii) *Preparation of drainage ways* (network of perimeter and feeder drains) and outlet to handle concentrated runoff;
iii) *Slope protection and turfing* on exposed slopes to minimise soil erosion, reduce of prevent off-site sediment transport.

4.4.2 Mitigating hazardous materials

All mining operations involve the use of liquid petroleum fuels. Many mining operations involve the use of cyanide and the co-production of mercury. The EMP should include well-designed measures for preventing serious impacts that releases of cyanide, mercury, and petroleum fuels have on the environment.

The main concerns regarding cyanide do not end when mining is discontinued. Rather, cyanide is generally oxidized to nitrate following mine closure, and high nitrate concentrations are often observed in process fluids that drain from tailings facilities and heaps, in addition to other salts. These fluids should be managed in such a manner that nitrate, in particular, and salts, in general, are not released to receiving waters, or have been treated to remove the salts, prior to release.

Of particular concern are the use of mercury and the release of cyanide in mining and mineral processing operations such as of gold ores. Cyanide is potently toxic to humans and wildlife.

As part of mitigation, the EMP should include the following:

i) Consistent and more mercury measurements should be required. Because of the complexity of the mercury emission sources, a systematic evaluation of the methods used to determine mercury emissions rates and concentrations should be undertaken. Also, more precise measurements of mercury in the ore, mercury in the process fluids, and mercury sent out to the tailings facilities should be required.

ii) Project life-cycle assessment (LCA) should be undertaken in which the amount of mercury in the ore should be accurately accounted for. Byproduct mercury production and sales processes should be explained.

4.4.3 Mine Waste Disposal

The key concern in the management of mine waste is the prevention or control of the release of contaminants that could have significant environmental impacts. Groundwater seepage is also a concern for both waste rock piles and tailings management facilities, in that seepage into the groundwater could result in the release of contaminants through a permeable foundation layer or other instability. Failure of dams or other containment structures for tailings management facilities can lead to severe environmental impacts and significant risks to human health.

In planning the disposal of waste rock and tailings, the risks of metal leaching and acidic drainage can be predicted and the results considered in the design of waste rock piles and tailings management facilities.

Acid Drainage: If there is a risk of acidic drainage, there are several methods that may be used to prevent or control it, with subaqueous disposal as the most effective. Disposal of waste rock or tailings under water significantly reduces the exposure of the material to oxygen. The avoidance of oxidation reactions results in substantial reduction in the risk of acidic drainage and the associated metal leaching problem.
If prevention of acidic drainage is not possible, several methods may be used, alone or in combination, to control or limit it, including:

- dry covers consisting of alternating layers of material of different porosity to limit water infiltration;
- dry covers using innovative materials such as sewage sludge stabilized by lime or sludge from pulp and paper mills;
- impermeable geomembrane liners to prevent infiltration of acidic drainage into underlying materials;
- waste rock or tailings maintained in a frozen state (in permafrost areas);
- direct addition of lime or other alkaline substances;
- raising of the water table to inhibit acid generation of materials disposed of below the water table; and
- use of tailings as mine backfill, or disposing of tailings in mined-out open pits.

Waste Rock and Tailings Disposal: Mine tailings are high-volume wastes that often contain toxic substances in high concentrations. The production of waste rock and tailings continues throughout the mine operations phase, and effluents originate from both. Effluent from waste rock is often sent to the tailings disposal area for treatment prior to final discharge, but it may also be directed to a separate treatment facility. This needs to be investigated by the EIA.
There are three main alternatives for the disposal of tailings:

1) use of a wet tailings impoundment facility or ‘tailings pond;
2) dewatering and disposal of dry tailings as paste backfill or ‘dry tailings disposal’; and
3) the release of tailings into the deep sea via a long pipeline or ‘submarine tailings disposal.’

This latter one is not relevant for Rwanda.

Of these alternatives, dry tailings disposal (dewatering) is almost always the environmentally preferable alternative, because of the numerous environmental and economic advantages it offers. For instance, it helps avoid dealing with wet tailings impoundment in the EMP.

Treatment Sludge Disposal: A common method to prevent/control acidic drainage from mines is lime treatment, with sludge as a by-product. The composition of sludge varies, and

sludge may contain a wide range of metals. The volumes of sludge produced are large, and in some cases they may exceed the volume of tailings produced over the life of an operation. Sludge is generally disposed of on site, but it may also be sent to smelters for recycling.
There are uncertainties about the long-term chemical stability of much sludge, and there are risks that sludge could become an additional source of releases of metals.

4.4.4 Open pits and pit lake prevention

This is particularly important because open pit mining is the most common technique used, and water is often pumped over a long distance.
Because pit lakes can cause substantial environmental impacts, mining companies should not allow a lake to form in an open pit. Open puts should be backfilled, but this is often not the case as many pits remain when the mine is abandoned and enforcement is difficult, especially for smallholder mining entities. The EMP should include a discussion of how the open pit would be managed in a manner that would allow for its backfilling and eventual re-contouring and re-vegetation, to re-create pre-mining conditions.

4.4.5 Water quality Monitoring

All mining activities have a profound effect on the quality of surface and ground water. Thus, the EMPs of all mining projects should include how the impact on water quality is going to be mitigated and monitored over time, given the cumulative effect.
The following parameters should be accurately measured and monitored against established national (RBS set) and international (WHO) standards:

i) PH (alkalinity and acidity)
ii) Conductivity
iii) Total suspended solids
iv) Total dissolved solids
v) Hardness;
vi) Heavy metals (cadmium, calcium, arsenic, aluminum, molybdenum, nickel, zinc);

The following management strategies to protect water quality from mine waste (e.g. tailing disposal) should be considered:

i) "Any diversion drains, ditches, and stream channels to divert water from surrounding catchment areas away from the tailings structure should be built to the flood event recurrence interval standards;
ii) Seepage management and related stability analysis should be a key consideration in design and operation of tailings storage facilities. This is likely to require a specific piezometer based monitoring system for seepage water levels within the structure wall and downstream of it, which should be maintained throughout its life cycle;
iii) Consideration of zero discharge tailings facilities and completion of a full water balance and risk assessment for the mine process circuit including storage reservoirs.

4.4.6 Securing General Workplace Health and Safety

Considering that all mining activities are potentially life-threatening and environmentally disastrous, any mining EIA report would be incomplete without assurances on health and safety of operators. Strategies to mitigate workers' exposure and susceptibility to physical injury, infectious diseases, corrosive and dangerous chemicals, gases and dust, must include the following depending on the circumstances:

1. Develop a comprehensive health and safety management plan incorporating the following aspects:

- Preparation of emergency response plans specifically applicable to exploration and production activities (considering the often geographically isolated nature of mining sites) and including the provision and maintenance of necessary emergency response and rescue equipment;
- Sufficient number of first aid trained employees to respond to emergencies. Ensure that each mining site has a basic first aid kit;
- Implementation of specific personnel training on worksite health and safety management including a communication program with a clear message about corporate management's commitment to health and safety. The communication program should also include regular meetings such as daily talks prior to initiation of work shifts;
- Integration of behavioral considerations into health and safety management, including on- the-job behavioral observation processes;
- Training of employees on the recognition and prevention of occupational hazards specifically applicable to work in remote areas such as safety with respect to wildlife; protection against the elements; thermal stress; acclimatization; disease exposure; and navigational aids to avoid becoming lost;
- HIV/AIDS Prevention/ control strategy: this should entail sensitization and awareness raising for both the local community and mine workers; prevention and treatment services such as Voluntary counseling and testing (VCT) services; access to HIV/AIDS treatment (antiretroviral therapy, etc.);

2. Illumination systems should be adequate and safe for the working areas: This applies in travel paths, mine working areas, and within and around surface facilities and dumpsites of mines. Other guides on illumination include adherence to local standard requirements for illumination for mobile equipment operating above ground and on public roads;

3 Hazardous and risky areas, installations, materials, safety measures and emergency exits. These and other such areas should have clear signs and practices, conforming to national and international standards (including standards of cleanliness, visibility and reflectance in areas of potentially poor illumination or sources of dust and pollution), be known and easily understood by workers, visitors, and as appropriate the general public;

The EIA should ensure that the project has in place the following measures:

a) Adequate personal protective equipment (PPE) for workers and visitors: These include uniforms, safety boots, helmets, gas/dust masks, goggles, gloves and overalls when at work. PPE can fall in the following categories:

- ✓ *Head protection:* This includes safety caps or hats which are approved in the jurisdiction in which the mine operates. The cap or hat should be equipped with a lamp bracket and cord holder to permit mounting of a miner's cap lamp. In areas of the mine where permanent lighting is not installed, the miner's cap lamp is essential to permit the miner to move and work effectively and safely.
- ✓ *Foot Protection:* The mining work boot should be of either leather or rubber construction, depending on whether the mine is dry or wet.
- ✓ *Eye and Face Protection:* Mining operations require the miner to wear safety spectacles, goggles, face shields or a full face piece respirator, depending on the operations being performed and the combination of hazards to which the miner is exposed.
- ✓ *Respiratory Protection:* The respiratory protection needed in mining activities include face masks, half face respirators, air filter units.
- ✓ *Hearing protection:* machinery and vehicles, most especially underground may generate high ambient noise levels which can create long-term damage to human hearing. Ear muff type protectors mounted on the miner's cap can provide the protection.
- ✓ *Skin Protection:* Mining activities may cause skin irritation. Work gloves to protect hands and should be provided.
- ✓ *Clothing:* reflective material to make miners visible to drivers, rain suits to protect against spray of oils and fluids that leak from various equipment.

b) Adequate training and regular drills in emergency responses to fires and accidents. Clear and regular instruction and monitoring to ensure proper application and regular maintenance.

c) Sufficient understanding of the nature and frequency of accidents and the proper maintenance of register of accidents occurring in the mining area. This assists in the identification of actual and potential hazards in the work place

d) Occupational health assessments should be conducted for employees on a regular basis, based on exposure to risk; Access to first aid facilities and services at the site so that in case of injury, they are quickly responded to;

e) Medical and life insurance that is not bureaucratic so that they can access treatment in case of injury or sickness; or in case of death, their families can be compensated.

f) Keep proper medical and public health records for the workplace, and should be retained for at least 10 years, and avail them for inspection whenever required.

4.4.7 Mitigating Land Subsidence

Land subsidence may occur as a result of underground or solution mining activities. Land subsidence may leave land prone to flooding and may otherwise damage property if it leaves farmland unsuitable for further use. To minimize and/or control changes in terrain due to land subsidence, recommended management measures include the following:

a) Developing the mine with consideration of the location/size of the ore body, overlying strata, and required well depths for extraction (e.g. there is generally less potential for subsidence associated with increased extraction depth s);
b) Monitoring the size and shape of mined caverns using well logging devices and operating techniques (e.g. solution pressures and pumping rates over time, flow volumes, temperatures, and specific gravities);
c) Filling shafts, raises, stop openings, adits, and drifts opening to the surface with reinforced concrete or other material to prevent or reduce subsidence in high risk areas;
d) Subsidence areas should be managed to ensure adequate drainage and re-established to previous land use or other use acceptable to the community. Roads in such areas should be adequately sign-posted.

4.4.8 Mitigating Ecosystem degradation through re-vegetation

A typical mitigation measure that all mining projects should consider in the Reclamation and Closure Plans is restoring vegetation. Re-vegetation is easier stated in the EMP than actually done, and a realistic and elaborate plan for execution and monitoring are needed.

Invoking the Polluter Pays Principle, the authority should ensure that mining projects covering at least 5 Ha have the following in their re-vegetation strategies:

a) A biologically diverse vegetation cover is effectively established and there are mechanisms to ensure that its long-lasting and is capable of self-regeneration without continued dependence on irrigation, soil amendments or fertilizer, and is at least equal in extent of cover to the natural vegetation of the surrounding area;
b) With the exception of areas where alternative post-mining land uses have been approved by the authority (e.g. where landscape change favours other land use or cover), the use of species native to the region shall be emphasized. Greater emphasis on non-native species may be proposed for intensively managed forestry and range uses.
c) Vegetation restoration plans should include assurances of successful restoration (i.e. trees and plants survive) by considering environmental factors (seasonal precipitation patterns, temperature and wind; soil texture and fertility; slope stability; and direction of slope faces) and good agronomic and silvicultural factors such as proper inoculation of legume seed, appropriate seeding and transplanting practices, care of forest planting stock, pruning and protection from destructive activities. It’s not enough to report that so many trees have been/will be planted.

d) The Developers are required to employ appropriate techniques of site preparation and protection such as mechanical soil conditioning by discing and ripping; mulching; soil amendments and fertilizers; and irrigation.

4.4.9 Energy Use

Energy use in mining is a significant environmental impact, often ignored because of being over-shadowed by the more "visible" damages to vegetation and landscape. Among the most significant energy consuming activities in mining are:

- Transport- both transport vehicles and machinery
- Exploration activities;
- Drilling and Excavation
- Extraction
- Grinding, Crushing and Milling
- Pumping, and Ventilation processes.

Recommended energy conservation measures that should be included in the mitigation strategies and EMP are:

a) Use of non-invasive technologies such as remote sensing and ground-based technologies to minimize exploratory digging and drilling;
b) Correctly sizing motors and pumps used in the excavation, ore moving, ore crushing, and ore handling process, as well as using adjustable speed drives (ASDs) in applications with highly varying load requirements.

4.4.10 Mitigating Noise

There are several mitigating measures that can be used to reduce noise:

i) *Operating hours*: Consideration should be given to controlling the times of mining and processing operations. Activities shall be planned accordingly to take into account noise tolerance (i) at night time (resting and sleeping period), (ii) at day time (schooling period);
ii) *Notification*: Awareness is an important factor in reducing noise-related annoyance. It leads to preparedness and tolerance. Residents surrounding the mining and processing sites should be notified in advance of the operational activities;
iii) *Design control*: Noisy fixed plant should be located away from noise-sensitive boundaries, as should haul routes. Baffle mounds or fencing can be used to screen noisy o operations. Haul roads to be kept as smooth and well graded as possible;
iv) *Transportation control*: Haul roads to be kept as smooth and well graded as possible. Transportation vehicles shall maintain appropriate travelling speeds along the haul roads and should avoid the running of engines for long periods of time when in a stationery position at the project site.
v) *Noise reduction measures*: Construct and maintain noise barriers and enclosures around noisy equipment or along the noise transmission path; provide and maintain

low noise equipment; carry out routine maintenance on fans to minimise bearing noise; and repair or replace defective mufflers of vehicles and plant with new, effective ones.

vi) *Proximity to residential areas:* In residential areas adjacent to mine sites, the equilibrium sound pressure level (Leq) from mining activities should not exceed 55 dBA during the day and 45 dBA at night (as per Bureau of Standards, 2010).

4.4.10 Controlling dust

Dust control should be fully integrated into underground operating procedures, particularly associated with blasting, drilling, and material transport and dumping. Minimization of dust is key to improved visual clarity at the mine site, particularly so in an underground setting. For a start, the operations should ensure that fugitive dust emissions from the dry surfaces of tailings facilities, waste dumps, stockpiles and other exposed areas should be minimized.

Depending on the mining activity, the area and season, the following dust management strategies should be reflected in the EMP:

i) Dust suppression techniques (e.g. wetting down, use of all weather surfaces, use of agglomeration additives) for roads and work areas, optimization of traffic patterns, and reduction of travel speeds;
ii) Exposed soils and other erodible materials should be re-vegetated or covered promptly;
iii) New areas should be cleared and opened-up only when absolutely necessary;
iv) Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
v) Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
vi) Loading, transfer, and discharge of materials should take place with a minimum fall height, be shielded against the wind, and consider use of dust suppression spray systems;
vii) Conveyor systems for dusty materials should be covered and equipped with measures for cleaning return belts.

4.4.12 Mitigating Fires and Explosions

Mines and mineral processing activities where fires and explosions are a potential hazard should prepare and implement plans to prevent, detect, and combat the outbreak and spread of fires. Strategies and measures to prevent and control fires and explosions include:

i) Conducting fire hazard assessments on a recurrent basis for early identification and minimization of areas where risks of “rapidly escalating fires” occur (e.g. areas using trackless diesel powered machinery);
ii) Identifying fire hazard areas using warning signs, and prohibiting all persons from smoking, using open flame lamps, matches or other types of ignition sources in the designated fire hazard areas, unless under strict protocols (e.g. welding protocol);
iii) Avoiding use of oil filled transformers underground;

iv) Inflammable materials should be stored in fireproofed facilities equipped for containment of leaks and spills. Appropriate fire detection and extinguishing systems should be installed at each such storage location;
v) Ensuring that all storage for inflammable or hazardous materials including explosives are located, designed, equipped and operated in accordance with relevant national or internationally recognized fire and safety codes. Explosives stores should be placed on surface except where local conditions justify (e.g. security or extreme cold);
vi) Avoid and control conveyor belt fires by ensuring fire hoses are operational and readily available along conveyor lines.

4.5 Public Participation in the EIA Processing for Mining Projects

4.5.1 Why Public participation?

Although projects for which EIA processes may often be private, public participation in the EIA process is very important. Public participation is undertaken to ensure that the public have a say in decisions about actions that could affect their lives.

Public participation in EIA processes is important because it:

- ✓ promotes sustainable decisions by recognizing and communicating the needs and interests of all participants, including decision makers.
- ✓ includes the promise that the public's contribution will influence the decision.
- ✓ seeks out and facilitates the involvement of those potentially affected by or interested in a decision.
- ✓ seeks input from participants in designing how they participate.
- ✓ provides participants with the information they need to participate in a meaningful way.
- ✓ communicates to participants how their input affected the decision.

4.5.2 Public Consultation

Public consultation[4] is only part of public participation, a very important component of the EIA process. Public consultation entails a dynamic process of dialogue between individuals or groups, based upon a genuine exchange of views. The main objective is to engage, inform and influence the decision processes and outcomes, and is based on the concerns that stakeholders may have on the potential negative impacts of the proposed project.

In the mining sector, there are various interests that must be identified and addressed in the EIA processes, including:

- ❖ *Land owners and users*: mining affects vast areas of land both on which the ore is being extracted, proximate areas which may be affected by noise or chemical pollution; areas which are likely to be otherwise be affected by the mining infrastructure like access roads, tailings disposal dam, water pipes, etc.;

[4] The terms "**public**" which espouses stakeholder representation and "**consultation**" which focuses on interactive constructive dialogue, must not be misused in the EIA process.

- *Workers*: mining workers issues range from living wage to social welfare issues such as family benefits to occupational health and safety;
- *Investors and business people*: potential investors in the mining project (if shares are likely to be floated) and those with economic interests in the opportunities likely to be brought about by the mining project e.g. transporters or food providers where a processing plant is located; or those or those
- *Local communities* – these include those living in the proximity of the site and those with interests in the area;
- *Civil society activists*: especially those involved in environmental pollution control, water quality and social welfare for the citizens e.g. Labour Unions.
- *Financing agencies*- e.g. international finance institutions (World Bank, African Development Bank/AfDB, International Finance Corporation/IFC); regional and local lending institutions, insurance companies, etc.;

4.6 Conducting Public Hearings: Purpose, Procedure and Participation

This section provides the *Why*, *How*, *Who*, *When* and *Where*, of organising and conducting public hearings, and incorporating the resulting views and resolutions into the EIA report and EMP for mining projects. Public hearings are a special phase of public consultations in that:

h) *they are organised by the Authority* prior to approval of the EIS unlike other forms of consultations which are conducted by the Developers and/or their EIA experts;
i) *the scale is wider and more public*. The consultative process must be widely publicised to enlist as much participation as possible;
j) the recommendations are made to the Authority which must consider them in approval decision-making;
k) public hearings cap the EIA process and are in a way an audit of whether the EIA process has been adequately consultative;

Thus, all parties to the EIA process – the Developers (and their EIA experts), the Authority, Mining Agencies, and the concerned public must prepare adequately to ensure that the EIA reports and the resulting EMP are of good quality.

4.6.1 Purpose of a Public Hearing

Public participation in EIA is a systematic way to obtain public involvement in the planning, development and decision making process. Public participation is considered as a valuable source of information on potential impacts, mitigation measures and viable alternatives, especially since local communities often have better knowledge of the local environment and have vested interests that need to be taken into project design.

4.6.2 Who should be involved and How?

The fact that environmental issues are of public concern even though the project may be private, has been emphasized since the Rio Conference in 1992, and section (e) of Principle 10 of the Rio Declaration states that environmental issues are best handled with participation of all concerned citizens. According to this Principle, at least 3 factors are essential to effective public involvement, and these have been integrated in the relevant national laws, viz:

a) ***Access to information***: After submitting an EIA report to the Authority, it shall be a public document and any person can access it, except for that information which a developer asked to be maintained confidential. The EIS and especially the environmental impacts identified and mitigation measures proposed shall be publicized widely to enable access by all concerned stakeholders.

b) ***Opportunity to participate in the decision-making process***: the dates, venue and time of public hearings shall be notified to all stakeholders to enable their participation. Even those that cannot participate physically should be facilitated to make comments on the project or communicate their concerns. In particular, ensure that non social, economic, cultural or legal limitations constrain the right of stakeholders to participate in the project's EIA.

c) ***Effective access to administrative and judicial proceedings***: the decisions made regarding approval (including the conditions under which EIA certificate is issued) and the EMP shall be accessible to interested parties for effective monitoring and enforcement.

However, the participatory process must not be restricted to discussion around the EIA Report but should start right from scoping to the EIA approval process.

The range of individuals, agencies and organizations to be involved in public hearings should include as a minimum: government ministries likely to have their areas of responsibilities affected by the proposal, local government bodies responsible for the area where a project is proposed, private sector organizations such as Mining Associations, Federation of Mining Companies (FECOMIRWA), Trade Unions (such as CESTRAR, Labour Congress and the Brotherhood-Rwanda (COTRAF), local communities and NGOs.

4.6.3 Mechanisms for Public participation

Public participation must take place right from scoping for example to ascertain if the Developer owns the land or if there conflicts between the proposed project and existing land uses; and will be crowned with public hearings to verify if the impacts identified are actual or

if the public is convinced that the proposed mitigation measures are appropriate or sufficient. The following are considered appropriate mechanisms for effective public consultations:

i) Public review of Environmental Impact Report;
ii) Proxy submissions of petitions and issues by interest groups or their representatives;
iii) Informal group meetings with local community groups and leaders,
iv) Workshops and formal meetings;
v) Public displays or bulletin boards posted in communities,
vi) Public notification and calls for written comments on proposed project/activities,
vii) Participation in scoping processes;
viii) Survey of a groups or individuals who are representative of the various interests being affected by a proposal;
ix) Consultation with focus groups to identify issues specific to certain stakeholders,
x) Comment and review of the EIA;
xi) Distribution of relevant documents to the interested members of the public.

4.7 Environmental Compliance Monitoring and Reporting

Approval of all mining projects must be conditional to the Developer's commitment to satisfactorily mitigate the environmental impacts including post-closure rehabilitation of the land. For purposes of monitoring the implementation of EMP, the developer is obliged to prepare regular environmental reports on the mining operations and how the environmental impacts are mitigated. This will be done through regular environmental audits. Failure to comply with the agreed actions will attract administrative or legal disciplinary measures, including halting the mining operations. Table 7 outlines the environmental and social issues in mining projects.

Table 7: Summary of Key Environmental and Social issues in Mining projects

This Checklist may be used to assess compliance by Mining Concessions.

	Environmental aspect to monitor	**Checklist of key issues to guide monitoring**
1	Surface water quality	✓ Discharge or seepage exiting on-site sources. ✓ Discharge or seepage exiting the mine or mineral processing plant. ✓ On-site water bodies and water bodies downstream from the site. ✓ Background reference sites
2	Vegetation and soil quality monitoring	✓ How would alterations of land be reported? ✓ Which methods would be used to quantify the excavated and/or disturbed lands? ✓ How would erosion and disturbance to surface soils be recorded and reported?
3	Monitoring of key species	✓ Evaluation of habitat loss. ✓ Key species should be previously identified in the baseline section. ✓ Conduct surveys to assess the reduction or alteration of key species populations. ✓ Overview of changes in the ecosystem and potential exposure of key species to hazardous pollutants.
4	Air quality	✓ Does the EIA have a detailed air quality monitoring plan? ✓ What equipment and methods are used? ✓ What are the criteria that were used to select the location of the monitoring points? ✓ How frequently will data be collected? ✓ Is an independent agency going to assess the calibration and implementation of the air quality monitoring plan? ✓ Will the results be available to the public?
5	Illumination	*How do the measurement of these indicators compare with the standard threshold?* ✓ Emergency lighting ✓ Walkways and passages ✓ Dynamic locations – production and development areas ✓ Areas with occasional and simple manual tasks ✓ Workstations and areas with medium to high precision manual tasks
6	Fuel and liquid substances	✓ Absence of containment facilities; ✓ Quality of construction and/or containment facilities; ✓ Appropriateness of equipment maintenance operations; ✓ Presence and effectiveness of "housekeeping' practices; ✓ Signs of accidental damage; deliberate vandalism.
7	Community health(in areas affected by mining activities)	✓ Incidence of pollution related diseases and deaths. ✓ Assessment of water quality and availability for domestic use, agriculture, and other productive activities. ✓ Results of air quality assessments in populated areas. ✓ Records of regular or episodes of high air pollution (*check compliance with the local, national, or international guidelines and standards*). ✓ Incidence of alcoholism, prostitution, and sexually transmitted diseases related to the presence of mining workers in the area.
8	Promised local investments	✓ Local development plans- Do DDPs & local IMIHIGO reflect what the project promised to undertake for the community? ✓ Are there transparent mechanisms for planning and execution of proposed benefits? ✓ Land acquisition processes – have people been consulted ✓ Communication- Is there rapport among representatives of community, mining company and local authorities and NGOs?
9	Community development and socio-cultural	✓ Child labour; ✓ Employing and remunerating local people; ✓ Ensuring respect for local cultural norms;

	Environmental aspect to monitor	Checklist of key issues to guide monitoring
	relations	✓ Controlling negative social impacts like prostitution
10	Mine closure and post-closure management	✓ Are future public health and safety are likely to be compromised; ✓ Is the after-use of the site beneficial and sustainable to the affected communities in the long term? ✓ Adverse socio-economic impacts minimized and socioeconomic benefits are maximized?

4.8 Environmental Management Programme

Whenever a significant impact has been identified the proponent must describe how the impact will be managed. Once approved, the environmental management programme set out in this Part will be legally binding in terms of Law on Mining and Quarry Exploitation and its Regulations. Once the approved programme has not been complied with, Director General, REMA, may issue a closure certificate.

4.8.1 Construction and Operation Phase

Using the checklist of items in Table 4, describe how each significant impact identified in pre-construction phase will be managed. It is also important to document the various activities within the construction

Describe how significant impacts, identified in construction phase in Table 3, will be managed during the exploitation phase up to when decommissioning activities begin. Some of the proposed measures described in this Part will require maintenance after they have been implemented and up to the time decommissioning activities begin. This will be site-specific but the proponent should consider where appropriate, the maintenance of at least the following:

- ✓ Rehabilitated land.
- ✓ Water pollution control structures.
- ✓ Rehabilitated residue deposits.
- ✓ Climate variability and Climate change

Therefore, if the EIA report does not propose dry tailings disposal, it must clearly demonstrate that dry tailings disposal is not feasible in the specific instance and, if feasible, that a wet tailings impoundment has clear, site-specific environmental advantages over dry tailings disposal.

4.8.2 Decommissioning phase and closure

Under decommissioning, the EIA report should briefly describe how the project will be decommissioned and closed. It should address the management of the potentially significant impacts identified in tables 3 and 4.

If aspects of the decommissioned site require maintenance up to the time that closure is approved, these should be described. The aspects to consider are those listed in Table 3.

For typical mining projects, decommissioning activities start immediately a mine, or part of it ceases production. In case of pre-mining work, this occurs when prospecting activities cease. This phase continues until closure. If the EMP for the construction and operational phases has been implemented successfully, there should be only a few outstanding impacts left to manage. The nature of these impacts should be assessed and the potentially significant impacts described using the headings in the Report Outline (Annex 2) and the environmental checklist for mining projects to assist in their identification.

1. Partial closure.

If the mine closure is expected to be progressive, then the developer may apply for a closure certificate in respect of a portion, part or section of a mine In this respect, the EIA should describe the impacts associated only with that portion, part or section of the mine likely to be the subject of such an application. Furthermore, the assessment should concentrate on those aspects that may have significant impacts on, or be impacted by, the remainder of the mine, so that measures to mitigate such impacts can be identified and described.

2. Dealing with Residual impacts after closure

There may be some significant residual impacts resulting from the construction, operational or decommissioning phases, which persist after these activities have ceased and a closure certificate has been issued. These impacts are termed "residual" and should, as much as possible, be identified at least qualitatively so that they can be addressed when the closure objectives are being defined and when the environmental management programme is being formulated.

The EIA process shall have highlighted the major issues on which to focus. However, the potential impacts resulting from the closed operation, listed below, should be considered in any event. It is recognised, nevertheless, that quantification of these impacts could be imprecise, or even not feasible.

i) The potential for acid mine drainage or poor quality leachates emanating from the mine or residue deposits.
ii) The long-term impacts on surface & ground water.
iii) The long-term stability of rehabilitated ground and residue deposits. Consider the use to which the land will be put when considering long-term stability.
iv) The long-term impacts arising from river diversions.

The main environmental issues to deal with in the mine closure plan, especially those related to the mining infrastructure, are summarised in table 8.

Table 8: Mine Components to be addressed in the Closure Plan

	Mine components	Aspects to be Addressed
1	Underground Mines	• Sealing of shafts, inclines and declines, or ventilation raises to prevent unauthorized access • Effects of seepage from backfill • Mine water drainage • Formation of potentially unstable ice plugs
2	Open Pit Mines	• Slope and bench stability • Groundwater and rainwater management • Security and unauthorized access • Wildlife entrapment • Effects of drainage into and from the pit
3	Ore Processing Facilities	• Removal of buildings and foundations • Clean-up of workshops, fuel and reagent • Disposal of scrap and waste materials • Re-profiling and re-vegetation of site
4	Waste Rock Piles	• Slope stability • Effects of leaching and seepage on surface and groundwater • Dust generation • Visual impact • Special considerations for some types of mines such as uranium mines
5	Tailings Management Facilities	• Dam stability • Changes in tailings geochemistry • Effects of seepage past the dam and from the base of the facility • Surface water management and discharge • Dust generation • Access and security • Wildlife entrapment • Special considerations for some types of mines such as uranium mines
6	Water Management Facilities	• Restoration or removal of dams, reservoirs, settling ponds, culverts, pipelines, spillways or culverts which are no longer needed • Surface drainage of the site and discharge of drainage waters • Maintenance of water management facilities
7	Landfill/Waste Disposal Facilities	• Disposal or removal from site of hazardous wastes • Disposal and stability of treatment sludge • Removal of sewage treatment plant • Prevention of groundwater contamination • Prevention of illegal dumping • Security and unauthorized access
8	Infrastructure	• Removal of power and water supply • Removal of haul and access roads • Reuse of transportation and supply depots

4.9 Risk Management

Risk management, as a good environmental practice, is an iterative process that encompasses:

- systematically applying policies, procedures and practices to the identification of hazards;
- identifying the consequences of those hazards;
- estimating risk levels, either quantitatively or qualitatively;

- assessing those levels of risk against relevant criteria and objectives; and
- making decisions about, and minimizing, the identified risks.

In mining projects, risk management involves the identification of risk and the application of control measures to reduce or eliminate risks that are not acceptable, such as frequent accidents at mining sites; lack of first aid facilities.

Site-specific environmental risk management procedures or plan should be developed, tested and implemented in a manner consistent with the General EIA Guidelines, the labour and mining laws, and other relevant legislation.

Common issues relating to the project management procedures, which can manifest failure to recognise technical risks, include:

i) **Mineral resource/reserve issues**: are some of the most likely technical problems to account for failure of mining projects. Rwandan prospective investors use the geological map developed by the Mining and Geology Department which may have scanty information requiring further research. A key risk measure is to ensure that mineral resources are audited, defined and reported according to the relevant code of practise *before* each relevant phase of the project begins.
ii) **Mining Rates**: Problems occur when the mining rate prediction model is not defined and agreed before commencement of the study project. There can be temptation to 'crank up' the mining rate to unrealistic levels in order to exceed the financial hurdle for the project. Check if the feasibility study has realistic information as this is an important source of information for the EIA; ensure that the chances of failure to find substantial resource amounts do not exceed 25%.
iii) **Modelling**: Models tend to oversimplify the level of complexity involved in mining, especially in the early phases of the project. Whilst the level of accuracy is not always high, each phase of the study process often involves a complex series of iterations. For each operating scenario, costs are derived and resources optimised to generate preliminary mine shells. The characteristics of the mine shell in turn generate ideas to reduce costs or risks. These new ideas are then costed and mineral resources re-optimised in each case.
iv) **Avoiding or skipping important steps**: mining developers tend to skip some steps such as the prefeasibility and scoping studies, yet these can lead to costly delays in the definitive feasibility study. Scoping studies are relatively short and inexpensive when compared to prefeasibility and definitive feasibility studies. If the scoping study proves that an option or the entire project is not viable, then significant expense in pursuing a non-viable option or project through the definitive feasibility stage can be avoided.
v) **Unrealistic time frames:** Technical studies required for bring mining operations into production are expensive and time consuming; certainly so for small scale miners. The

entire mining project from scoping to completion of the definitive feasibility study, including inter-study work plans for a world-scale mining operation, may take up to ten years. If business needs suggest that shorter time frames than what is optimal are required, then the corresponding increase in risk profile needs to be understood and communicated. *Unrealistic time frames and budgets often result in projects being rushed to completion and failing to achieve their objectives. This may result in delaying recognition of major issues until after commitment to significant capital expenditure.*

ANNEXTURES

ANNEX 1: Format of the Project Brief for Mining Projects

The project brief should be no more than 10 pages, and should cover the following aspects:

- Title: *E.g*. Proposed Project for Prospecting, Research and Exploitation/Extraction of.... (Insert type of mineral ore or product) in … (Insert location).

- Name and address of the applicant for, or holder of, prospecting/mining license of mineral concession.

- License No. indicating whether it's for prospecting, research or exploitation and for how long

- Name of Mineral(s) covered by the Prospecting/mining License.

- Name and Address of the Owner of the Land and The Title Deed Description of the Land

- Location details: (*including Plan, Topographical Maps or Aerial Photographs*): This includes district and sector services; direction and distance of neigbouring towns and major settlements; surface infrastructure within 2 km radius of the project area (such as power lines, roads, piped water and communication facilities); land tenure and use of adjacent land; the name of river catchment and the hill, valley or village in which the mine is situated.

- **Description of the proposed mining project:**
  - Describe the mineral deposits, mine product(s) or prospecting target mineral(s); extent of target area and estimated reserves;
  - Describe the proposed prospecting or mining method(s) (e.g. Open pit, underground, filling, industrial mineral, solution mining); estimated life of the mining project, planned production rate, estimated capital required and expected employment.
  - Indicate what aspects of the mining and mineral value chains will be undertaken in the area (e.g. whether rock will be transported and transported elsewhere or whether mineral processing plant will be located on site;

Description of the potential Environmental Impacts of the Projects

- What are the likely impacts on land use and land cover in the mining area and beyond? Quantify the land area likely to be affected in Ha or sq Km of forest, grazing land, arable land;
- What are the likely impacts indicate specific whether its upstream;

ANNEX 2: Outline of an Environmental Impact Assessment Report/ Statement

- Executive Summary – highlight potential impacts and mitigation measures

- Introduction – overview of the Project; developer's profile; company and experience in mining;
- Detailed Project description; including site details, maps; area of influence (spatial and temporal); location, layout; description of land use;
- Economic information on the project – including financial analysis; investment plans (take care to ensure confidential info is not disclosed);
- Project rationale and its sustainability;
- Analysis of Alternatives; justification of selected alternatives;
- Stakeholder Analysis/Engagement plan; Summary of Public Consultation Programme;
- Summary of Environmental Impacts – Description of the likely Environmental Impacts of the project, resulting from the existence of the project;
- Description of waste production (sewage, waste rock, tailings, refuge, low grade ore, hazardous wastes, used oil and lubricants,..); mine waste characteristics (chemical & physical properties, acid generating characteristics); management plans and conceptual details,
- Statement of the degree of irreversible damage and an explanation of how it was assessed;
- Description of Water treatment process, rationale for selection, description of the best available technology, treatability studies, Conceptual design of the facilities and the quality of treated water.
- Description of transportation methods, storage and handling of all materials transported on-site and off-site
- Environmental Management Plan – including timelines and statement of expected results for each action
- Emergency Response Plan for Containing and Cleaning up any Pollution or spill of any contaminant
- Conceptual Plans for Progressive and Final Site Reclamation/Restoration – proposed future land use and residual impacts; possible residual hazards and land use restrictions. Include estimates of financial costs for site reclamation, closure and post-closure management;
- Narrative of the Challenges/ difficulties encountered in the EIA (technical difficulties, lack of knowledge or expertise, access to information, hostility or lack of cooperation of some stakeholders);
- Conclusion and Recommendations
- Annexes (ToRs, Profile of EIA team; Document References; Public Consultation Notes; Field Observations; Analytical Results; Maps).

ANNEX 3: The Terms of Reference for Mining Project EIA

The Terms of Reference (ToRs) for a mining project will generally include the following:

1.0 Introduction

…….. (Name of Company) has submitted a brief profile of a planned mining project in ……. (area) and applied for Authorisation and terms of reference to undertaken in accordance with Law No. 4/2005, the Environmental Impact Assessment Regulations, The Ministerial Order Relating to the Requirements and Procedure for Environmental Impact Assessment (2008).and other applicable laws of the Republic of Rwanda. These terms of reference are issued with the objective of guiding ….. (Insert Company or Developer's name) and their EIA experts in the investigation and preparation of the EIA and submitting an Environmental Impact Statement. The ToRs are issued to conduct an Environmental Impact Assessment for the construction and development of a (insert the specific mineral or product) mine (or quarry) at (specify location) in the district of …….. The product(s) (insert mineral materials) comprise of ……. which will be mined and processed at the site/ transported to (location of processing plant).

In accordance with the provisions of the law, the Authority is proposing the following Terms of Reference, which the EIA team shall adhere to in the field investigation and preparation of the EIA Report.

In accordance with these ToRs, the EIA must cover the key areas of the mining project as outlined in the following sections.

2.0 Project Description

Project Concept

The Project involves two main components; viz: a) prospecting phase following a reporting of the research and exploration, to confirm existence of commercial quantities of ---------ore and b) exploitation to extract the ore and undertake preliminary processing.

The operations will essentially produce one product i.e. semi-processed ore which shall be packed and transported for further processing in ….(insert area where product will be further processed). It is estimated that ….Metric tons of rock will be processed per week/month and an estimated … Metric tons of ……ore produced. The project is estimated to run for …….(insert period e.g.15 years) after which it will be decommissioned and the mine closed.

The Project site consists of …….. (insert description of size, location and nature of land – whether separate or together) , located within a region rich with limestone and zone for mining within ….(insert distance to nearest main road or public infrastructure and main town) Indicate if the present ToRs cover the exploration, actual mining/extraction and post operation phases or components e.g. expansion, rehabilitation of the existing mine.

The proposed mining technology is summarized as follows:

a) Subsurface Open Cast Mining: Overburden or waste materials will be removed prior to exposing the mineral bedrock which is approximately 2 to 5 m below surface. During the mine (*or quarry*) operation, mining of (insert ore) will be carried out in a (insert the extraction approach or pattern) on the quarry face slope. The …….(insert blasting technology) will be utilized with strict adherence to the blasting regulations and blasting procedures. The loosened (ore rock) will be fed to the crushing plant which will be located (*state if within the mining area or outside*).

b) Crusher Plant: A crushing plant will crush the rocks to smaller sizes before being conveyed to the rock processing plant (alternatively insert if manual labour will be used). The crusher plant is able to crush up to (insert processing capacity per hour of plant) Tons of rock per day. ……(*insert technology to be used*) and how the rock will be transported to the next level for further processing.

Pollution Control

Pollution control measures and safeguards are a key feature in the implementation of any mining project. The EIA should indicatge how such measures were selected after identifying emissions of various pollutants, particularly air pollutants from the different stages of the mining operations.

a) Air Pollution Control: Air pollutants generated during the project operation consist primarily of particulates from quarrying, raw and finished materials as well as fuel combustion by-products.

For other emissions, a sufficient number of standardized bag filters will be installed at all transfer points at hopper, bins or silos as well as dust producing machinery (crushers, loading equipment, conveyors etc.) for de-dusting purposes.

b*) Noise Control*: The Project is likely to generate significant noise levels during blasting and from operation of the cement plant. The principal noise emission sources are impulsive noise during blasting and those associated with the operation of heavy equipment. In-plant shielding of noise emissions will be adopted to ensure that noise levels at the boundaries are within the regulatory limits.

All equipment to be employed will be designed to operate with low noise levels, and will not exceed the maximum allowable noise level for the surrounding receiving land use.

c) Drainage: Drainage will be provided to take storm water into nearby river course to avert flooding arising from changes to the topography of areas being quarried.

d) Access to quarry: Access will be sought along the local road from the most western end from the Bodles facilities. This access point will prevent any disruption of the adjoining local residential communities, while providing easy access to the public and large traversing from either ends of the country along the Highway 2000.

Manpower: Indicate how staff will be recruited, trained, tooled and remunerated. It must be emphasized that they will be given appropriate training in order to educate them on the

specific job tasks to be performed; safety procedures; and the concepts of quarrying and blasting.

3.0 Project Location

The proposed project site for the quarrying activity is on lands located at …… (*insert location including village and any landmark*) . Its owned/leased by (insert owner) since (the period of lease as per land documents). The proposed site for the ore processing plant is on (insert size of land and location coordinates).

The administrative offices: will be located on the premises of the plant in (insert location), and will be sited (describe as per the site layout drawings).

Indicate the level of ore deposits and how the land and mineral royalties have been acquired, including community engagement in the process. Indicate how long with the estimated mineral deposits support the mining facility.

Community projects or programmes:

Indicate what facilities or health benefits the project developer plans to undertake (e.g. building a modern health facility for the community; meeting health insurance for the poor members, etc). In addition, the company will support education of talented but poor children in the community especially girls.

4.0 The Terms of Reference

The Environmental Impact Assessment will provide a comprehensive evaluation of the site, in terms of predicted environmental impacts, needed mitigation strategies, potentially viable alternatives to the development proposed and all related legislation.

The following issues related to the specific project site will be identified and given special consideration:

Upland Areas: Issues such as slope stability, available public transportation, access to basic amenities such as potable water and electricity; impact of drainage from the site on pre existing drainage patterns and its effect on the neighbouring communities and by extension the aquatic environment; air and noise pollution from quarrying and associated activities; the presence of prehistoric and historic sites etc. will be examined.

Sites located within, adjacent to or in the vicinity of areas listed as protected (e.g. designated Ramsar Sites) or having protected species: The main issue(s) to be considered are determined by the statutes of the legislation or convention in question and what the convention speaks to. The impact of the development on the specific sensitivities of the protected area will be identified and be highlighted as is applicable (e.g. diversion of water flows, extraction of water, pollution) Biological diversity: loss/impact on population of a species/ecosystems; ecosystem functions; direct or indirect impacts on endemic, protected, and endangered species (e.g. habitat reduction/modification affecting survival; introduction of invasive alien

species, and predators); impact on migratory species (e.g. fish and birds); impact on breeding grounds.

The Environmental Impact Assessment will include but not limited to the following:

1) Objectives of the project

2) A complete description of the existing site proposed for development will be done.

3) Significant environmental issues of concern will be identified through the determination and presentation of baseline data which will take into consideration social, cultural and heritage information. An assessment of the public perception of the proposed development will be done through public consultations and the use of social survey instruments such as questionnaires.

4) Identification of Policies, Legislation and Regulations relevant to the project.

5) Prediction of the likely short, medium and long term impact of the development on the environment, including direct, indirect and cumulative impacts, and their relative importance to the design of the development's facilities.

6) Identify any mitigation action to be taken to minimize predicted adverse impacts and provide associated costs where applicable and practical.

7) Develop an Environmental monitoring Plan which will ensure that the mitigation measures are adhered to during the implementation phase.

8) Describe the alternatives to the project that were considered, including the consideration of alternative sites.

9) Conclusions

The EIA experts should ensure that a thorough and comprehensive environmental impact is carried out by executing the following tasks:

Task # 1: Description of the Project.

i. A comprehensive description of the project and the surrounding environment specifying any information necessary to identify and assess the environmental and social effects of the project.

ii. Detailed project objectives and information on the following:

a. nature, location/ existing setting, timing, duration, frequency, general layout and size of facility including ancillary buildings

b. pre-construction activities, construction methods, works and duration, and post construction plans.

iii. Detailed description of raw material inputs, technology and processes to be used as well as products and by-products generated.

iv. Areas to be reserved for construction and areas to be preserved in their existing state as well as activities and features which will introduce risks or generate impact (negative and positive) on the environment will be highlighted.

v. Outline of Sewage treatment system including treated effluent disposal as well as solid waste disposal option.

vi. Outline plans for storm water collection and disposal as well as plans for providing utilities and other services. This will involve the use of maps at appropriate scales, site plans, aerial photographs and other graphic aids and images, as appropriate.

If any aspects of the projects are to be done on a phased basis all phases will clearly defined the relevant time schedules provided and phased maps, diagrams and appropriate visual aids will be included.

Task # 2: Description of the Environment/Baseline Studies Data Collection and Interpretation.

A detailed description of the study area/geographical boundaries, and methodology to be utilized for baseline and other data as well as the length of the study will be done. This task involves the generation and presentation of baseline data which is used to describe the study area as follows: i) Physical environment ii) Biological environment iii) Socio-economic and cultural constraints.

(A) Physical

i) A detailed description of the existing **soil and geology and geomorphology, landscape, aesthetic values** and **hydrology.** Special emphasis will be placed on storm water run-off, drainage patterns, aquifer characteristics, effect on groundwater and availability of potable water. Any slope stability issues that could arise will be thoroughly explored.

ii) **Water quality** of any existing wells, rivers, ponds, streams or coastal waters in the vicinity of the development. Quality Indicators will include but not necessarily be limited to nitrates, phosphates, faecal coliform, and suspended solids iv) **Climatic conditions and air quality** in the area of influence including particulate emissions from stationary or mobile sources, NO_x, SO_x, wind speed and direction, precipitation, relative humidity and ambient temperatures,

v) **Noise levels** of undeveloped site and the ambient noise in the area of influence.

vii) Obvious sources of existing **pollution** and extent of contamination.

viii) Availability of **solid waste** management facilities.

(B) Biological

The EIA will examine and present a detailed description of the flora and fauna (terrestrial) of the area, with special emphasis on rare, threatened, endemic, protected and endangered species. Migratory species, wild food crop plants and presence of invasive alien species should also be considered. There may be the need to incorporate micro-organisms to obtain an accurate baseline assessment along with nocturnal species such as bats. Generally,

species dependence, habitats/niche specificity, community structure and diversity will be considered and whether the area acts as a roosting or foraging area for species.

(C) Socio-economic & cultural

Present and projected population; present and proposed land use; planned development activities; issues relating to squatting and relocation; (housing demand and supply) community structure; economic base /employment; distribution of income; goods and services; utilities; recreation; public health and safety; cultural peculiarities, aspirations and

attitudes will be explored. The historical importance (heritage, archaeological sites and feature) and other material assets of the area will also be examined. While this analysis is being conducted, an assessment of public perception of the proposed development will be conducted. This assessment may vary with community structure and may take multiple forms such as public meetings or questionnaires/surveys as deemed most appropriate. An assessment will be done of the current quarry operating in the community and the people perception of it including the potential expansion. Issues such as future land use plans for the area and those adjacent will also be assessed.

Task # 3. Policy, Legislative & Regulatory Considerations

i. The pertinent regulations and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, siting and land use control at the national and local levels will be outlined.

ii. The examination of the legislation will include at minimum, legislation such as the Law on Environmental Conservation and protection; mining; land tenure and land use; expropriation; Building Codes and Standards, Local Development Orders and Plans and other applicable laws of the Republic of Rwanda, in addition to EIA and Environmental and Social Safeguards for mining projects, and the appropriate international convention/protocol/treaty where applicable.

Task # 4. Identification and Assessment/Analysis of Potential Impacts

Identification of the significant environmental and public health/safety issues of concern will be done along with indication of their relative importance.

Identify the nature, severity, size and extent of potential direct, indirect and cumulative impacts (for terrestrial and aquatic environments) during the preconstruction, construction and operational phases of the development as they relate to the following:

- change in drainage patterns
- flooding potential
- landscape impacts of excavation and construction
- loss of and damage to geological and palaeontological features
- loss of species and natural features
- habitat loss and fragmentation species
- biodiversity/ecosystem functions
- pollution of potable, coastal, marine, surface and ground water
- air/ dust pollution and air quality issues
- blasting and the potential damage to infrastructure
- noise, vibration and traffic impact
- impact of the development on Old Harbour and the surrounding areas.
- capacity and design parameters of proposed sewage treatment facility
- socio-economic and cultural impacts.
- Impact of flooding, loss of natural features, excavation and construction on the historic landscape, architecture and archaeology of the site.
- risk assessment and natural hazard vulnerability

- solid waste
- soils
- carrying capacity of the proposed site

Identify the interaction between different impacts and impacts of other projects will also be considered. In addition, the impacts that have occurred and those impacts which could still occur as a consequence of the clearing works that were conducted on the site prior to the preparation of the TORs will also be identified and analyzed

Distinguish between significant positive and negative impacts, reversible or irreversible direct and indirect, long term and immediate impacts as well as avoidable and irreversible impacts.

Characterize the extent and quality of the available data, explaining significant information deficiencies, assumptions and any uncertainties associated with the predictions of impacts. A major environmental issue will be determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It will also be determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts will be represented in matrix form with separate matrices for pre and post mitigation scenarios.

Task # 5. Drainage Assessment

An assessment of Storm Water Drainage will be conducted. The EIA Report will cover, but not be limited to:

i. Drainage for the site during construction, to include mitigation for sedimentation to the aquatic environment

ii. Drainage for the site during construction, to include mitigation for impact on settlements

iii. Drainage for the site during operation, to include mitigation for the impact on settlements

iv. Drainage for the site during operation, to include mitigation for sedimentation to the aquatic environment

v. Drainage control for the gully traversing the site, to include impacts that this drain will have on the aesthetics, settlements, water quality and sedimentation of the beach area, etc.

Task #6 Mitigation

Preparation of guidelines for avoiding or reducing (e.g. restoration and rehabilitation), as far as possible, any adverse impacts due to proposed usage of the site and utilizing of existing environmental attributes for optimum development. Quantify and assign financial and economic values to mitigating methods. Identify of suitable personnel to implement effective mitigation.

Task #7 Environmental Management and Monitoring Plan

A plan will be designed for the management of the natural, historical and archaeological environments of the project to monitor implementation of mitigatory or compensatory measures and project impacts during construction and occupation/operation of the

units/facility. An Environmental Management Plan and Historic Preservation Plan (if necessary) for the long term operations of the site will also be prepared.

An outline monitoring programme will be included in the EIA, and a detailed version submitted to the Authority for approval after the granting of the permit and prior to the commencement of the development. At the minimum the monitoring programme and report will include:

- Introduction outlining the need for a monitoring programme and the relevant specific provisions of the permit and/or licence(s) granted.
- The activity being monitored and the parameters chosen to effectively carry out the exercise.
- The methodology to be employed and the frequency of monitoring.
- The sites being monitored. These may in instances, be pre-determined by the local authority and should incorporate a control site where no impact from the development is expected.
- Frequency of reporting to the Authority
- The Monitoring report should also include, at minimum:
- Raw data collected. Tables and graphs are to be used where appropriate
- Discussion of results with respect to the development in progress, highlighting any parameter(s) which exceeds the expected standard(s).
- Recommendations
- Appendices of data and photographs if necessary.

Task #8 Project Alternatives

Examine alternatives to the project including the no-action alternative. This examination of project alternatives will incorporate the use history of the overall area in which the site is located and previous uses of the site itself.

Task #9 Public Participation/Consultation Programme

- Conduct a public presentation on the findings of the EIA to inform, solicit and discuss comments from the public on the proposed development.
- Document the public participation programme for the project.
- Describe the public participation methods, timing, type of information to be provided to the public, and stakeholder target groups.
- Summarize the issues identified during the public participation process
- Discuss public input that has been incorporated into the proposed project design; and environmental management systems;

Task #10 Statement on Energy Conservation

This section should speak to any energy saving devices or practices to be employed in the operations.

Submission of Reports

All findings will be presented in the **EIA report** and will reflect the headings in the body of the ToRs, as well as references.

The Developer shall submit Five (5) hard copies properly bound (two copies perfect bound) and an electronic copy of the EIA report to the Authority. The report shall include Appendices such as maps, site plans, photographs, the List and short profiles of the study team and other relevant information. The Developer and/ or the Leader of this EIA team should be readily available for discussions or clarifications about any issues in the EIA report should the authority request for it.

Annex 4: Screening Checklist for Mining and Mineral Processing Projects

Prior Information on Project

Please complete as appropriate

Project Nature		**Mining type**	
New Development	Yes/No	Surface Mining	Yes/ No
Extension or modification of existing development	Yes/ No	Under-ground mining	Yes/ No
Is it Existing Development	Yes/ No	River-bed mining	Yes/ No
		Under-water mining	Yes/ No

SECTION 1.0: General Information on the Project

1.1 Project Name and Title: _____

1.2 Purpose and Brief Description of the Project

(*Outline all elements of the project and off-site ancillary developments to be included in this application (e.g. buildings, plants, roads, pipelines, wells, camps, etc*).

1.3. Developer/Company: _____

Address: _____

(*Complete address: street, city/municipality, province*)

_____

Tel/Fax:_____E-mail: _____

Company Registration No. _____

1.4 List all permits or licenses held by the Developer for the same location and/or related operations (*e.g. Research, Exploration, mineral extraction,..).*

1.5 Project Location: _____

(*complete address: street, city/municipality, province*)

(Attach location map with important landmarks and access points1; attach a copy of land registration or lease agreements, maps, layout plans, photographs and other info)

Indicate:

a) Reasons for selecting this area;
b) Other locations (alternatives) considered for the same project
c) Distance to the nearest residential area or public facilities (e.g. roads, schools,)

4.5 Area of Land required for the Project and existing land uses

(Farm land, residential, industrial, recreational, etc)

a) Area required during research and/ or exploration (Ha)
b) Area required during operation (Ha)
c) Area reserved for future development (Ha)
d) Area required for ancillary development, housing and recreation (Ha)

e) Area required for new roads and amenities (Ha)

4.6 Project schedule

a) Estimated date of the beginning and end of construction
b) Estimated date of the beginning of operation
c) Estimated date of the end of the project or decommissioning
d) Other significant dates

4.7 Number of people utilizing the site

	Skilled	**Unskilled**	**Total**
During Construction			
During exploitation/ operation			
Foreigners			
Nationals			

4.8 Types and number of equipment to be used

a) On-site
b) Off-site

SECTION 2.0: PROJECT DETAILS

2.1 Project Area/size, construction method and appearance of buildings and installations

i. Architectural Design and/ or Site Plan:
ii. Geo-physical information:
iii. Describe landscaping if applicable:

2.2 Approximate location of:

i. Construction camps
ii. Temporary access roads
iii. Material storage sites

(Please attach maps)

2.3 Describe the Project's infrastructure and utilities' requirements. Indicate whether they exist or need to be developed

i. Water
ii. Electricity
iii. Fuels (Quantity/ types):
iv. Roads, airports, etc

2.4 Describe associated projects and off-site development which are <u>not included</u> in this application.

(*Roads, power plans, desalination plants, waste water treatment plans, crushers, borrow pits, quarries, housing and recreational facilities, etc.*)

2.5 Describe production processes/ services

i. Production processes/ services:
ii. Products and production rates:

Please attach production flow process diagrams/sketches, flow plans with machinery layout, list of machinery and machinery catalogues)

2.6 Periods of operation
(*Seasonal, shifts, business hours*)

2.7 Raw materials, chemicals, fuels:
Scientific and commercial names, types, quantities, chemical composition, sources of raw materials or energy consumed, and attach Material Safety Datasheets)

2.8 Describe methods of transportation, handling and storage of raw materials (including rock outputs), chemicals, fuels, and final products:

3. ENVIRONMENTAL IMPACTS
(This includes direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary and temporary impacts of the project

3.1 Expected impacts on people, building and man-made structures

3.2 Expected impacts on plants, animals
- Loss or damage to habitats of trees and other plant species, animal species, including aquatic species);
- Endangered species

3.3 Expected impacts on land:
(Topography, soil or beach erosion; land use, natural drainage, etc.)

3.4 Solid, non hazardous waste/hazardous waste:
(During construction and operation phase)
i. Source and nature:
ii. Quantities:
iii. Methods treatment/control:
iv. Final disposal site/methods:

3.5 Expected impacts on water:
(*Impacts on surface, underground/aquifer; coastal/river bank/shore line waters; and estuarine hydrology, impacts of pollutants on water quality*)

3.6 Wastewater, drainage and surface runoff (during construction and operation phase)
i. Sources and nature of air emissions
ii. Quantities
iii. Methods treatment/control
iv. Final discharge (Indicate the proposed physical stack height and location):
v. Monitoring/modeling of air emissions

3.7 Identify and quantify noise and vibration sources
i. Public environment (outdoors)
ii. Working environment (indoors and outdoors)

3.8 Toxic and hazardous materials

i. Sources and nature:
ii. Quantities
iii. Methods treatment/control
iv. Final disposal site/method:
v. Bulk storage tanks and facilities:

(Provide information as per the statutory requirements of REMA, RBS and other Government regulatory Agencies)

3.9 Explosives

Type, name and purpose of using:
Quantities:
Name and duration of use:

3.10 Radioactive materials

Do you intend to use any radioactive materials? Yes ( ) No ( )

3.11 Other impacts

Provide information on any other impacts specific to this development

i. Displacement/ Resettlement of the people:
ii. Health issues:
iii. Social issues:
iv. General Environmental issues:

4. SUMMARY OF ISSUES

EIA Aspect	Verification questions	Yes ✓	No ✓	Additional info required
Sources of Impact	Does it require significant land conversion for superficial excavation, mineral processing or waste disposal (e.g. more than 20Ha)?			
	Does it require housing services to support the labour force (e.g. more than 50 miners)?			
	Does it require significant quantities of local raw material, water or energy (the significance depends on availability, conflict with other users, operation sensibility, e.g. dredging for gravel)?			
	Does it generate significant quantities of waste from construction, mining or eroded material (the significance depends on the type of waste and the precipitation)?			
	What chemicals will be used in the mining?			
Impact receptors	Does it require excavation or dredging from: - a conservation area or area of cultural or archeological importance? -1000 metres from a beach or lake shore?			

	Does it require compensation or relocation of the local people?			
	Does it consist of superficial or deep mining in areas prone to high recurrence of flooding?			
Environmental impact	Does it pause a threat to labour force, human settlements, land and water ecosystems, flora and fauna, or commercial fish species due to: - *Runoff of residual waters from mining activities?* - *Excessive noise or vibration?* - *Deposit and subsequent leaching of contaminated material?* - *Emission of contaminated particles and gases due to the process?* - *Accidents caused by the use or transportation of dangerous materials?* - *Impacts associated with sedimentation?*			
	Does it induce secondary development (e.g. access roads, agricultural developments, settlements, mineral processing, commercial services, etc.)			
Mitigation measures	Does it require significant levels of management and training to establish or sustain the project e.g. at long-term; over 2 years; intense training; regulation of dangerous materials; water basins)?			
	Could it require mitigation measures that could result in the project being socially and economically unacceptable			
Comments:				

5. Describe mitigation measures and monitoring programs
(Measures which have been incorporated into the project to reduce environmental impacts during all phases of the project)

i. List the attachments and supporting documents

ii. Additional information (if required, please attach the relevant pages)

6. Declaration by the Applicant

I hereby declare that the above mentioned information is complete and true:

Signature of Applicant:

Name (in Print):

Date:
Official stamp/ Seal

7. DETERMINATION

(To be completed by the Authority responsible for commissioning and approving EIA report)

On the basis of this initial evaluation:

1. It is determined that the proposed project may not have significant impacts on the environment. Accordingly, a letter of environmental clearance can be granted for a limited period.

2. It is determined that the proposed project may have some significant impacts on the environment but which can be mitigated for easily. Hence, an Environmental Compliance Plan (ECP) should/can be developed and signed before a letter of environmental clearance can be granted.

3. It is determined that the proposed project may have significant impacts on the environment, and it qualifies under the types of projects under the types of projects that cannot be entertained pursuant to Law No. 4/2005 of 2005.

4. It is determined that the proposed project could have potentially significant impacts on the environment, and as per the Ministerial Order on EIA, a limited Environmental Impact Study is required.

5. It is determined that the proposed project may have significant impacts on the environment. An environmental impact assessment is required to determine if the project can be cleared or not and under what conditions.

   Signature:
   Printed Name:
   Designation:
   Date and official stamp:

Annex 5: Checklist of Questions for Mining EIA Reviewers

Mining projects are some of the most complicated projects to review, even when the projects are of small scale nature. This is because often very complicated and obscure terminologies are used; processes and tests may be difficult to verify quickly in a review, and this is made worse when reviewers only have executive summaries of reports. Yet the Environmental Impact Statement (EIS) is supposed to provide clear, simple and impartial information about the project's potential environmental and social impacts.

Questions to consider when reviewing an EIA for mining projects include:

No	Questions	Yes/No
A	**Exploration and research phase**	
1	Does the license holder have exclusive rights to land on which the mining will take place?	
2	Have the community members been informed?	
3	Have they consented to the project/ endorsed the project?	
4	Have the community interests/concerns been	
5	Is the scope of dos and don'ts during the exploration clearly stipulated?	
6	Have all key steps been followed in determination of mineral resources?	
7	Have sufficient precautions been made in discussing and agreeing loyalties with the community/local Governments/ concerned resource owners?	
8	Have all appropriate measures been undertaken to ensure that available mineral deposits are commercially viable?	
9	Has the developer considered the most appropriate technology to minimize potential environmental impacts in the area?	
10	Will the exploration/ research team set up a residence camp for more than 14 days?	
11	Will the residence camp accommodate more than 10 people?	
12	Are there sufficient	
13	Do the exploration/ research activities involve extraction of bulk samples?	
14	Will the exploration/research work involve use of heavy earth moving equipment/ vehicles?	
Development Phase and post-closure		
B	**Location of Mining Projects**	
1	Does the proposed location of the project conform to existing policies, plans, laws and regulations?	
2	Does the EIA focus on the issues that most concern the community?	
3	Does the description of the existing environment reflect actual conditions? Is the information sufficient?	
	Verification:	
1	Is there enough information about alternatives to the project?	
2	Is the EIA clear and easy to understand?	
3	Does it acknowledge limitations and difficulties?	
4	Does the EIA describe how the project would implement proposed mitigation and management measures (including pollution control measures and closure)?	

C	**Significant impacts:**	
1	Is there a clear statement of significant beneficial/adverse impacts?	
2	Is the impact analysis clear about the extent and significance of the impacts? Is the analysis rigorous enough?	
3	Have the risks been evaluated?	
4	Has the EIA defined the area of indirect and cumulative influence of the project?	
5	Does the EIS reveal unacceptable environmental impacts?	
6	Does the EIS include sources of information to support the conclusions?	
D	**Mitigation measures:**	
1	Do the proposed mitigation measures sufficiently address the impacts?	
2	Are the proposed mitigation measures and alternatives technically feasible?	
3	Is adequate consideration given to provision for compensation for loss or damage of property, or for resettlement?	
4	Are the proposed mitigation measures precise and clear enough to provide sufficient basis for decision making?	
5	Do the proposed mitigation measures address the aggregate public and stakeholder concerns particularly of those likely to be directly affected?	
6	Have the concerned parties/stakeholders consented to the proposed mitigation measures?	
E	**Technical soundness and validity of the EIS:**	
1	Consistency of presentation: are there no contradictions of facts and issues in the document?	
2	Was the scope of the project accurately described to provide sufficient basis for the study?	
3	Are the recommendations and mitigation measures proposed in the EIS technically sound and adequate to address identified mining impacts?	
4	Does the EIS conform to requirements in the national EIA guidelines?	
F	**Procedures:**	
1	Has the EIA procedure complied with national l guidelines and regulations?	
2	Were concerned populations and stakeholders adequately involved/consulted?	
3	Was the scoping procedure adequate?	
G	**Implementation:**	
1	Are institutional arrangements adequate to implement recommended mitigation measures	
2	Does the EIS specify who will be responsible for the monitoring and the standards enforcement programme?	
3	Are the proposed mitigation measures administratively acceptable and implementable by the developer?	
	3.1:Noise control	
	3:2: Sludge and mine tailings management	
	3.3: Protection of workers and communities from pollution-related health problems	
	3.4: Controlling mine waste	
	3.5: Post-closure rehabilitation of the land	
	3.6: Biodiversity protection/ conservation	
	3.7 Resettlement of the displaced/ affected people	
4	Are sufficient risk management measures in place to control accidents in/around the mine?	

5	Did mitigation measures follow the following hierarchy (in descending order of priority):	
	Avoiding *impacts by modifying a proposed mine or existing operation in order to prevent or limit a possible impact?*	
	Minimizing *impacts by implementing decisions or activities that are designed to reduce the undesirable impacts of a proposed activity on biodiversity?*	
	Rectifying *impacts by rehabilitating or restoring the affected environment?*	
	Compensating *for the impact by replacing or providing substitute resources or environments (which should be used as a last resort and might include offsets?*	

Annex 6: National and International Standards Applicable to Mining Projects

A. CHEMICAL AND ENVIRONMENTAL STANDARDS

SN.	IStandard Ref.	Title	Scope of Coverage
1	RS 461:2009	Water quality— Tolerance limits of discharged industrial wastewater	This standard gives permissible limits of some common parameters tested in industrial wastewater effluent
2	RS 462:2009	Water quality—Tolerance limits of discharged domestic wastewater	This standard gives permissible limits of some common parameters tested in domestic wastewater effluent
3	RS 465:2009 ISO 6878	Water quality — Determination of phosphorus — Ammonium molybdate spectrometric method	This standard specifies methods for the determination of orthophosphate, orthophosphate after solvent extraction, hydrolysable phosphate plus orthophosphate, total phosphorus after decomposition
4	RS 466:2009 ISO 6778	Water quality—Determination of ammonium—Potentiometric method	This standard specifies a potentiometric method, using an ammonia-sensing membrane probe, for the determination of ammonium in raw and wastewater and sewage
5	RS 467:2009 ISO 5663	Water quality—Determination of Kjeldhal nitrogen — Method after mineralization with Selenium	This standard specifies a method for the determination of nitrogen by Kjeldhal type method. Only trivalent negative nitrogen is determined.
6	RS ISO 14001:2004	Environmental management systems — Specification for guidance for use	Specifies requirements for an environment management system, to enable an organization to formulate a policy and objectives taking into account legislative requirement and information about significant environmental impacts
7	RS ISO 14004: 2004	Environmental management systems— General guidelines on principles, systems and supporting techniques	Provides guidance on the development and implementation of environmental management systems and principles and their coordination with other management system
8	RS ISO 14015:2004	Environmental management systems— Environment assessment of sites and organisations (EASO)	Provides guidance on how to conduct an EASO through a systematic process of identifying environmental aspects and environmental issues and determining, if appropriate, their business consequences
	RS ISO 14050:2004	Environmental management systems— Vocabularies	Contain definitions of fundamental concepts related to environmental management
	RS 435:2009 EAS 12:2000	Drinking (Potable) water—Specification	This prescribes quality requirements for drinking water. This standard applies to physical, bacteriological, radiological and chemical quality criteria of water. It also applies to organoleptic requirements of water. The standard as well as applies to the water used in the food industry and the water for domestic and catering purposes.
	RS 481:2009 EAS 343 :2008	Ball point pens — Specification — Part 1: General use	This standard establishes minimum quality requirements for ball point pens (retractable and non-retractable) and refills for general use

B. **CIVIL ENGINEERING STANDARDS**

SN.	IStandard Ref.	Title	Scope of Coverage
12	RS EAS 18-1:2004	Cements — Part 1: Composition, specification and conformity criteria for common cements	This standard defines and gives the specifications of 27 distinct common cement products and their constituents.
13	RS EAS 18-2:2004	Cement—Part 2: Conformity evaluation	This standard specifies the scheme for the evaluation of conformity of cements to their corresponding product specification standards, including certification of conformity by a certification body.
14	RS EAS 180:2004	Specification for aggregates from natural sources for use in concrete	This standard specifies the quality and grading requirements for aggregates obtained by processing natural materials for use in concrete
15	RS 80:2005	Building lime — Specification	This Standard covers four grades of hydrated lime and two grades of quicklime intended for use in plastering and rendering. The limes may be either high-calcium limes or dolomitic limes.
16	RS 82:2005	Precast reinforced box culverts— Specification	This Standard specification applies to precast reinforced concrete rectangular box culverts primarily intended for conveying water not under pressure, and for carrying highway vehicle loadings
17	RS ISO 6935-1: 2005	Steel for reinforcement of concrete — Part 1: Plain bars	This part specifies technical requirements for plain bars to be used as reinforcement in concrete. This standard covers nine steel grades not intended for welding which are B240A-P, B240B-P, B240C-P, B240D-P, B300A-P, B300B-P, B300C-P, B300D-P and B420D-P, and one steel grade intended for welding which is B420DWP.
18	RS ISO 6935-2:2005	Steel for reinforcement of concrete — Part 2: Ribbed bars	This specifies technical requirements for ribbed bars designed for reinforcement in ordinary concrete structures and for non pre-stressed reinforcement in pre-stressed concrete structures.
19	RS ISO 6935-3: 2005	Steel for reinforcement of concrete — Part 3: Welded fabric	This part specifies technical requirements for factory made sheets or rolls of welded fabric, manufactured from steel wires or bars with diameters from 4 mm to 16 mm and designed for the reinforcement of concrete structures and the ordinary reinforcement of pre-stressed concrete structures.
20	RS 230-1:2007 ISO 6934-1:1991	Steel for the pre-stressing of concrete — Part 1: General requirements	This part specifies requirements for high tensile strength steel to be used in pre-stressed concrete. It applies only to material in the condition as supplied by the manufacturer. It does not cover requirements for materials and anchorage devices used in conjunction with' the pre-stressing steel in structural components.
21	RS 230-2:2007 ISO 6934-2:1991	Steel for the prestressing of concrete — Part 2: Cold drawn wire	This part specifies requirements for round, cold-drawn, high-tensile steel wire, either plain, indented, ribbed or crimped. The product is supplied as mill coil wire or straightened and stress-relieved wire in coils or cut lengths, according to the general requirements specified in IS0 6934-l.
22	RS 230-3:2007 ISO 6934-3:1991	Steel for the prestressing of concrete — Part 3: Quenched and tempered wire	This part specifies requirements for round wire made of quenched and tempered high tensile steel, with a surface which is either plain, ribbed, grooved or indented. The

			product is delivered in coils, according to the general requirements specified in IS0 6934-l.
23	RS 230-4:2007 ISO 6934-4:1991	Steel for the pre-stressing of concrete ▬ Part 4: Strand	This part specifies requirements for high tensile steel strand which has been given a stress relieving heat treatment according to the general requirements specified in ISO 6934-l.
24	RS 230 -5:2007 ISO 6934-5:1991	Steel for the pre-stressing of concrete ▬ Part 5: Hot rolled steel bars with or without subsequent processing	This part specifies requirements for round high tensile steel bars. The bars may be supplied either hot-rolled or in a hot-rolled and processed condition, according to the general requirements specified in ISO 6934-l. The surface may be plain or ribbed. The bars are delivered in straight lengths.
25	RS ISO 10544:2004	Cold reduced steel for reinforcement of concrete and the manof welded fabric	This standard specifies technical requirements for cold-reduced steel wire designed for the reinforcement of concrete or for use in welded fabric.
26	RS 87:2005	Carbon steel for reinforcement of concrete ▬ Specification	This Standard specifies requirements for carbon steel bars for the reinforcement of concrete. It covers hot worked and cold worked bars that are plain and wieldable, plain and non-wieldable, deformed and wieldable, or deformed and non-wieldable.
27	RS 91: 2005	Galvanized plain and corrugated steel sheets▬ Specification	This standard specifies requirements for galvanized plain and corrugated steel sheets for roofing, cladding, fencing, fabrication and general use.
28	RS 92: 2005	Steel for building and construction	This standard specifies the requirements for the supply of materials used for the manufacture of: (i) Hot rolled steel product (ii) Cold formed steel products (iii) Hard drawn steel wire and steel sections.
29	RS ISO 630-1 :2006	Structural steels ▬ Part 1: Plates, wide flats, bars, sections and profiles	This standard specifies qualities for the general purpose structural steels. This Standard applies to steel plates with thicknesses of 3 mm and over, wide strip in coils with widths greater than or equal to 600 mm, and greater than 6 mm in thickness, wide flats, bars and hot-rolled sections generally used in the as-delivered condition and normally intended for bolted, riveted or welded structures.
30	RS ISO 4995: 2006	Hot rolled steel sheets of structural quality▬ Specification	This standard applies to hot-rolled steel sheet of structural intended for structural purposes where particular mechanical properties are required. It is generally used in the delivered condition and is intended for bolted, riveted or 50 welded structures.
31	RS ISO 4998: 2006	Continuous hot dip zinc▬ Coated carbon steel sheets of structural quality	This standard applies to continuous hot-dip zinc- and zinc-iron-alloy-coated carbon steel sheet of structural quality.
32	RS ISO 5954: 2006	Cold reduced carbon steel sheet according to hardness requirements▬ Specification	This standard applies to cold-reduced carbon steel sheet and corresponding hardness requirements. It is suitable for applications where surface is of prime importance.
33	RS ISO 4997 :2006	Cold reduced steel sheets of structural quality	This standard applies to cold-reduced steel sheet of structural quality in grades CR220, CR250, CR320 and CH550. The product is intended for structural purposes where particular mechanical properties are required.
34	RS ISO 4422-1:2006	Pipes and fittings made of un-plasticised	This part specifies the general aspects of pipes, joints, fittings (post-formed and

		poly(vinyl chloride) (PVC-U) for water supply— Specification — Part 1: General requirements	moulded) and ancillaries, made of un-plasticized poly(vinyl chloride) (PVC-U), for a piping system intended to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.
35	RS ISO 4422-2:2006	Pipes and fittings made of un-plasticised poly(vinyl chloride) (PVC-U) for water supply— Specification — Part 2: Pipes with or without integral sockets	This part specifies the characteristics and properties of extruded pipes made of un-plasticized poly(vinyl chloride) (PVC-U), with or without socket(s) (integral or not), and intended to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.
36	RS ISO 4422-3:2006	Pipes and fittings made of un-plasticised poly(vinyl chloride) (PVC-U) for water supply — Specification — Part 3: Fittings and joints	This part specifies the characteristics and properties of fittings (injection-moulded and post-formed) and joints made of un-plasticized poly(vinyl chloride) (PVC-U), to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.
37	RS ISO 4422-4:2006	Pipes and fittings made of un-plasticised poly(vinyl chloride) (PVC-U) for water supply — Specification — Part 4: valves and ancillary equipment	This part specifies the characteristics and properties of valves and ancillary equipment made of un-plasticized poly-(vinyl chloride) (PVC-U), to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings. The valves and ancillary equipment covered by this part are intended for the conveyance of cold water under pressure at temperatures up to 20 °C, for general purposes and for the supply of drinking water. This part is also applicable to water up to and including 45 °C
38	RS ISO 4422-5:2006	Pipes and fittings made of un-plasticised poly(vinyl chloride) (PVC-U) for water supply— Specification — Part 5: Fitness for purposes of the system	This part specifies the requirements for the determination of the fitness for a purpose of a piping system composed of pipes, joints, fittings and auxiliaries made of un-plasticized poly(vinyl chloride) (PVC-U), to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.
39	RS 197 -1:2006	Methods of test for aggregates— Part 1: General requirements for apparatus and calibration	This standard gives definitions and symbols and specifies common equipment and calibration procedures for the RS 197 series. It also specifies general requirements for apparatus and methods of calibration to be used when testing aggregates for compliance purposes.
40	RS 261:2009 ISO 13006:1998	Ceramic tiles — Definition, classification, characteristics and marking	This Standard defines terms and establishes classifications, characteristics and marking requirements for ceramic tiles of the best commercial quality
41	RDS 263-1:2009 ISO 13007-1:2004	Ceramic tiles— Grouts and adhesives— Part 1: Terms, definitions and specification for adhesives	This standard is applicable to ceramic tile adhesives for internal and external tile installations on walls and floors
42	RS 263-3:2009 ISO 13007-3:2004	Ceramic tiles— Grouts and adhesives Part 3: Terms, definitions and specifications for grouts	This standard is applicable to ceramic tile grouts for internal and external tile installations on walls and floors.
43	RS 446 :2009	Specifications for Building sands	This Rwanda Standard relates to naturally occurring sands, crushed stone sand and crushed gravel sands used for external renderings and internal plastering using mixes

			of lime and sand (with or without the addition of cement), cement and sand (with or without the addition of lime).
44	RS 448-1:2010	Mortar for masonry ▬ Part1: Specification	This Standard specifies requirements for masonry mortars (bedding, jointing and pointing) for use in masonry walls, columns and partitions (facing and rendered masonry, load bearing or non-load bearing masonry structures for building and civil engineering).
45	RS 445:2010	Loading for building▬ Code of practice for dead and imposed loads	This standard gives dead and minimum recommended imposed loads for use in designing buildings. It applies to: new buildings and new structures; alterations and additions to existing buildings and existing structures; existing construction on change of use
46	RS 359:2009 EAS 54:1999	Burnt building bricks ▬ Specification	This Standard specifies building bricks of burnt clay, shale or brick earth for use in buildings for decoratives, structural and non-structural purposes. It also specifies sampling and testing methods.
47	RS 360:2009 EAS 94:1999	Burnt clay building blocks▬ Specification	This Standard specifies requirements for type, quality, dimensions and other physical characteristics, of burnt clay, shale or brick earth building blocks for use in buildings for structural and non-structural purposes. It also specifies sampling and testing methods.
48	RS 361:2009 EAS 166:2000	Wood poles for power and telecommunications lines ▬ Specification : Eucalyptus	This Standard specifies requirements for pre-cast concrete paving blocks intended for the construction of low speed roads, industrial and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic.
49	RS 362:2009 EAS 418:2005	Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced	This Standard specifies performance requirements and describes test methods for precast concrete units for inspection chambers designed to be used for inverts not exceeding 2 metres deep and manholes, of circular, rectangular (with or without chamfered or rounded corners) or elliptical internal shape, unreinforced, steel fibre and reinforced, with nominal sizes and normal length not exceeding DN 1 250 (circular) or LN 1 250 (rectangular or elliptical).
50	RS 363:2009 EAS 424:2005	Hydraulic road binders ▬ Composition, specifications and conformity criteria	This Standard applies to hydraulic road binders produced in a factory and supplied ready for use in road bases, sub-bases, capping layers, and soil stabilization or soil improvement
51	RS 358:2009 EAS 71:2000	Burnt clay roofing tiles ▬Specification	This Standard specifies requirements for Mangalore and Roman roofing tiles.
52	RS414:2009 EAS 73:2000	Building lime	This Standard specification applies to quick and hydrated lime intended for use in buildings
53	RS415:2009 EAS 179:2003	Precast concrete paving blocks ▬ Specification	This Standard specifies requirements for pre-cast concrete paving blocks intended for the construction of low speed roads, industrial and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic.

C. MECHANICAL ENGINEERING AND METALLURGY STANDARDS

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SN.	Standard Ref.	Title	Scope of Coverage
54	RS 226 -2:2007 ISO 4000-2:2007	Passenger car tyres and Rims — Part 2 : Rims	Specifies the designation, contour and dimensions of 5^0 tapered (drop-centre)rims primarily intended for passenger cars
55	RS 227:2007 EAS 359:2004	Pneumatic tyres for light trucks — Specification	Specifies tyre dimensions, designation, marking requirements and load ratings. It also gives laboratory tests requirements for bead unseating, strength and endurance performance for light truck tyres. It also specifies sampling methods and disposition of non-conforming tyres.
56	RS 228:2007 EAS 357:2004	Pneumatic tyres for light trucks and buses — Specification	Specifies tyre dimensions, designation and marking requirements and load ratings. It also gives laboratory test requirements for strength endurance for tyres primarily intended for trucks and buses.
57	RS ISO 3779:2006	Road Vehicles: Vehicle Identification number (VIN)	Specifies content and structure of an identifier in order to establish, on a worldwide basis the identification of road vehicle manufacturing
58	RS ISO 3780:2006	Road Vehicles: World manufacturers identification code (WMI)	Specifies content and structure of a vehicle identification number (VIN) in order to establish, on a worldwide basis a uniform identification numbering system of road vehicles.
59	RS ISO 4100:2006	Specification for Road Vehicles— World parts manufacturers identifier code (WPMI)	Specifies content and structure of an identifier in order to establish ,on a worldwide basis the identification of the manufacturers or parts for road vehicles
60	RS 207:2009 EAS 159:2000	Engine oils —Specification	This standard covers crankcase-lubricating oils, for automotive type internal combustion engines, meeting or exceeding, API service classification. "SF" for gasoline engine "CD" for diesel engines.
61	RS 210:2009 EAS 158	Gasoline (Petrol) unleaded —Specification	This Standard specifies the requirements and methods of test for unleaded motor gasoline with a research octane number (RON) of 95 also known as petrol or motor spirit for use in Spark ignition internal combustion engines. This standard does not cover aviation gasoline and leaded gasoline
62	RS 211:2009 EAS 177	Automotive diesel — Specification	This standard specifies one grade of automotive diesel fuel suitable for use in compression ignition engines including high-speed engines.
63	RS 258 :2009 ISO 86811986	Petroleum products and Lubricants — Method of classification — Definition of classes	This standard establishes the general classification system which applies to petroleum products, lubricants and related products; defines the classification of petroleum products, lubricants and related products together with their designation.
64	RS 259-1:2009 IS0 8216-3 : 1987	Petroleum products — Fuels (Class F) — Classification — Part 3: Family L (Liquefied petroleum gases)	This part establishes the detailed classification of liquefied petroleum gases within class F (Petroleum fuels). It Should be read in conjunction with ISO 8216/O. Liquefied petroleum gases may be derived from crude oil processing or recovered from natural gas and/or crude

			oil production
65	RS 260:2009 ISO 6743-99:2002	Lubricants, Industrial oils and related products (class L) — classification — Part 99: General	This part establishes a general system of classification, which applies to lubricants, industrial oils and related products, designated by the prefix "L". Within class L, 18 families of products are defined, according to the application areas of research, so as to cover, as much as possible, all the applications where lubricants, industrial oils and related products are used.
66	RS 400 :2009 IS0 7-1:1994	Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation	This part specifies the requirements for thread form, dimensions, tolerances and designation for jointing pipe threads, sizes 1 /I6 to 6 inclusive, for joints made pressure-tight by the mating of the threads.
67	RS 401:2009 ISO 4706:2008	Refillable welded steel gas cylinders	This Standard gives minimum requirements for certain aspects concerning material, design, construction and workmanship, procedure and test at manufacture of refillable welded steel gas cylinders of a test pressure not greater than 75 bar, and of water capacities from 1L up to and including 150 L for compressed, liquefied or dissolved gases, exposed to ambient temperatures.
68	RS 402:2009 ISO 4427-1:2007	Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 1: General specifications	This part specifies the general aspects of polyethylene (PE) piping systems (mains and service pipes) intended for the conveyance of water for human consumption, including raw water prior to treatment and water for general purposes. It also specifies the test parameters for the test methods to which it refers.
69	RS 403:2009 ISO 1461:1999	Hot dip galvanized coatings on fabricated iron and steel articles— Specification and test methods	This standard specifies the general properties of coatings and test methods for coatings applied by dipping fabricated iron and steel articles (including certain castings) in a zinc melt (containing not more than 2 % of other metals).
70	RS 404:2009 ISO 559:1991	Steel tubes for water and sewage	This Standard specifies the technical conditions for delivery of seamless and welded steel tubes for the conveyance of water and sewage at temperatures between - '10 °C and 120 °C.
71	RS 405:2009 ISO 2531:1998	Ductile iron pipes, fittings, accessories and their joints for gas application	This Standard specifies the requirements and test methods applicable to ductile iron pipes, fittings, accessories and their joints for the construction of pipelines: to convey water (e.g. potable water) or gas; operated with or without pressure; installed below or above ground.
72	RS 406:2009 ISO 65:1981	Carbon steel tubes suitable for screwing in accordance with ISO 7/1	This Standard establishes the dimensions and characteristics of seamless and welded steel tubes for four separate series, namely : a) Heavy series, for seamless and welded steel tubes; b) Medium series, for seamless and welded steel tubes; c) Light series 1, for seamless and welded steel tubes; d) Light series 2, for welded steel tubes.
73	RS 407:2009 ISO 404:1992	Steel and Steel Products — General Technical delivery requirements	This Standard specifies the general technical delivery requirements for all steel products covered by ISO 6929 *(Steel products - Definitions and Classification)*, with the exception of steel castings and powder metallurgical products.
74	RS 455-1:2009 ISO 4948-1:1982	Steel Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition	This part lays down a classification of steels into unalloyed and alloy steels based on Chemical composition.

75	RS 455-2:2009 ISO 4948-2:1981	Steel-Classification ▬ Part 2: Classification of steels into unalloyed and alloy steels according to main quality classes and main property or application characteristics	This part lays down a classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics.
76	RS 456-1:2009 ISO 7989-1:2006	Steel wire and wire products ▬ Non – ferrous metallic coatings on steel ▬ Part 1: General principles	This part specifies the requirements for the coating mass per unit area, for other properties and also for testing of non-ferrous metallic coatings on steel wire products, of circular or other cross-section.
77	RS 456-2:2009 ISO 7989-2:2006	Steel wire and wire products ▬ Non – ferrous metallic coatings on steel ▬ Part 2: Zinc or zinc alloy coating	This part specifies the requirements for the coating mass per unit area, for other properties and also for testing of zinc or zinc-alloy coatings on steel wire and steel wire products, of circular or other section.
78	RS 458:2009 ISO 7900:2006	Steel wire and wire products for fences ▬ Zinc and zinc ▬ alloy coated steel barbed wire	This Standard specifies the characteristics of zinc- and zinc-alloy-coated steel barbed wire, with conventional and reverse twist consisting of two stranded line wires, around which the barbs are tightly wound, a twist being imparted between the barbs to restrict their movement.
79	RS 460:2009 ISO 10144:1991	Certification scheme for steel bars and wires for reinforcement of concrete structures	This Standard specifies rules for a certification scheme for continuous production of steel bars and wires for ordinary reinforcement of concrete structures in order to verify the conformity with requirements specified in product standards such as IS0 6935-1 and IS0 6935-2.
80	RS 277 :2009 EAS 534:2008	Motor vehicle safety ▬ Lights and light-signalling devices installed on motor vehicles and trailers	This Standard specifies the essential characteristics for the installation of lighting and light signalling devices on motor vehicles with or without bodywork and with at least four wheels, intended for on-road use and having a maximum design speed of more than 25 km/h, and their trailers. It is not applicable to vehicles that run on rails, to agricultural or forestry tractors and machinery, or to public works vehicles.
81	RS 278:2009 EAS 537-1:2008	Measurement of noise emitted by accelerating road vehicles ▬ Engineering method ▬ Part 1: M and N categories	This part specifies an engineering method for measuring the noise emitted by road vehicles of categories M and N under typical urban traffic conditions. It excludes vehicles of category L1 and L2, which are covered by ISO 9645, and vehicles of category L3, L4 and L5 covered by ISO 362-2.
82	RS 280:2009 EAS 539:2008	Road vehicles ▬ Symbols for controls, indicators and tell-tales	This Standard establishes symbols (i.e. conventional signs) for use on controls, indicators and telltales applying to passenger cars, light and heavy commercial vehicles and buses, to ensure identification and facilitate use.
83	RS 287:2009 EAS 547:2008	Road vehicles ▬ Location of hand controls, indicators and tell-tales in motor vehicles	This standard specifies the location of the controls in motor vehicles by subdividing the space within reach of drivers into specific zones to which certain controls essential to the safe operation of vehicles are assigned. It also specifies certain combinations of functions for multifunction controls and the degree to which certain indicators tell- tales are to be visible.
84	RS 288:2009 EAS 548:2008	Road vehicles ▬ Dimensional codes for passenger cars	This Standard establishes dimensional Codes for passenger cars and for commercial vehicles which are derived from passenger cars, to be used for the exchange of vehicle data and their electronic processing.
85	RS 445:2009	Road vehicles ▬Special warning lamps ▬	This Standard specifies the dimensions of special warning lamps for road vehicles, in order to

	EAS 549:2008	Dimensions	ensure interchangeability and accurate positioning, bearing in mind the rapid change of light intensity from such devices in a vertical cross-section of the projected beam.
86	RS 292:2009 EAS 553:2008	Road vehicles — Coupling balls for caravans and light trailers — Dimensions	This Standard lays down the dimensions necessary for the compatibility of mechanical coupling devices between light trailers or caravans and towing vehicles, when the latter are fitted with a coupling ball.
87	RS446:2009 EAS 554:2008	Road vehicles — Specification of non-petroleum-based brake fluids for hydraulic systems	This Standard gives the specifications -requirements and test methods-for non-petroleum-based fluids used in road-vehicle hydraulic brake and clutch systems that are designed for use with such fluids and equipped with seals, cups or double-lipped type gland seals made of styrene-butadiene rubber (SBR) and ethylene-propylene elastomer (EPDM).
88	RS 293:2009 EAS 555:2008	Road vehicles — Hydraulic braking systems — Non-petroleum-based reference fluids	This Standard specifies the composition and characteristics of a reference fluid used for the compatibility testing of hydraulic braking systems and components mounted on road vehicles.
89	RS 299:2009 EAS/PAS 560:2008	Road vehicles — Brake linings frictions materials — Visual inspection	This Standard defines visual aspect for the identification and assessment of brake friction lining characteristics in quality assurance, as well as a basis for commercial and technical agreements.
90	RS 300:2009 EAS 561:2008	Road vehicles — Collection of accident data for evaluation of occupant restraint performance	This Standard specifies information for the field collection of traffic accident data that is necessary or may assist in the evaluation of occupant restraint systems in passenger cars and trucks.
91	RS 303:2009 EAS 564:2008	Road vehicles — Hydraulic jacks — Specifications	This Standard specifies design and safety requirements, and test methods for hydraulic jacks for road vehicles, used for changing wheels and putting on chains.
92	RS 305:2009 EAS 566:2008	Road vehicles — Spark-plugs —Terminals	This Standard specifies the dimensions of the solid post terminals and threaded terminals for spark-plugs for use with spark ignition engines.
93	RS 308:2009 EAS 569:2008	Agricultural tractors — Operator's workplace, access and exit — Dimensions	This Standard specifies the design dimensions of agricultural tractors having a minimum track width exceeding in respect of: a) the minimum dimensions of their access doorways, b) the number, location and minimum dimensions of their emergency exits, and c) Their minimum internal clearance dimensions.
94	RS 314-1:2009 EAS 575-1:2008	Road vehicles — Mechanical coupling between tractors and semi-trailers — Interchangeability	This Standard specifies dimensions to ensure interchangeability between a tractor vehicle and a coupled semi-trailer, the two together constituting an articulated vehicle. It specifies certain interchangeability dimensions, including those of the gooseneck contour, as well as operating dimensions related to angle values.
95	RS 314-2:2009 EAS 575-2:2008	Road vehicles — Mechanical couplings between tractors and semi-trailers — Part 2: Interchangeability between low-coupling tractors and high-volume semi-trailers	This part specifies dimensions to ensure interchangeability between a low coupling height tractor vehicle and a coupled high-volume semi-trailer, the two together constituting a high-volume articulated vehicle. It specifies certain interchangeability dimensions, including those of the optimized gooseneck contour, as well as operating dimensions related to angle values.
96	RS 315:2009 EAS 576:2008	Road vehicles — H-point machine (HPM II) — Specifications and procedure for H-point	This Standard provides the specifications and procedures for using the H-point machine [HPM1)] to audit vehicle seating positions.

		determination	
97	RS 318:2009 EAS 581:2008	Road vehicles — Retro-reflective registration plates for motor vehicles and trailers — Specification	This Standard specifies the provisions applicable to retro-reflective registration plates for motor vehicles and their trailers.
98	RS 319:2009 EAS 582:2008	Commercial road vehicles — Dimensional codes	This Standard establishes dimensional codes for commercial road vehicles to be used for the exchange of vehicle data and electronic processing. It applies to commercial road vehicles as defined in ISO 3833.
99	RS 323:2009 EAS 586:2008	Road vehicles — Graphical symbols to designate brake fluid types	This Standard specifies the graphical symbols and colours used to identify, on road vehicles, the correct type of fluid to be used for: a) petroleum-based brake fluid systems; b) non-petroleum-based brake fluid systems
100	RS 324:2009 EAS 587:2008	Road vehicles — Fuel pump electric connections	This Standard specifies the requirements for electric connections for electric fuel Pumps used in road vehicles. lt does not apply to electric fuel Pumps with free couplers, i.e. cable to cable terminations.

D. ELECTRICAL ENGINEERING STANDARDS

SN.	IStandard Ref.	Title	Scope of Coverage
101	RS IEC 60227 - 1:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 1: General requirements.	Applies to rigid and flexible cables with insulation and sheath if any, based on polyvinyl chloride, of rated voltages U0/U up to and including 450/750 V used in power installations of nominal voltage not exceeding 450/750 V a.c.
102	RS IEC 60227 - 3:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 3: Non – sheathed cables for fixed wiring.	Details the particular specifications for polyvinyl chloride insulated single-core non-sheathed cables for fixed wiring of rated voltages up to and including 450/750 V.
103	RS IEC 60227 - 4:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 4: Sheathed cables for fixed wiring.	Details the particular Specification for light polyvinyl chloride sheathed cables of rated voltage of 300/500 V.
104	RS IEC 60227 - 5:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords).	Details the particular specifications for polyvinyl chloride insulated flexible cables (cords), of rated voltages up to and including 300/500 V
105	RS IEC 60227 - 6:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 6: Lift cables and cables for flexible connections fixed wiring.	Details the particular specifications for both circular and flat lift cables and cables for flexible connections of rated voltages up to and including 450/750 V
106	RS IEC 60227 - 7:2006	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 7: Flexible cables screened and unscreened with two or more	Details the particular specifications for polyvinyl chloride insulated screened and unscreened control cables of rated voltages up to and including 300/500 V.

		conductors.	
107	RS IEC 60228:2006	Conductors of insulated cables	Specifies the normal cross section area in the range of 0.5 sq mm to 2500 sq mm. Numbers and size of wires and resistance values are also included.
108	RS IEC 60884 - 1:2006	Plugs, Socket –outlets for house hold and similar purposes ▬ Part1: General requirements	Applies to plugs and fixed or portable socket-outlets for a.c. only, with or without earthing contact, with rated voltage greater than 50 V but not exceeding 440 V and a rated current not exceeding 32 A, intended for household and similar purposes, either indoors or outdoors.
109	RS IEC 60884-2 - 1:2006	Plugs, Socket –outlets for house hold and similar purposes ▬ Part 2 -1: Particular requirements for fused plugs	Applies where fuses are primarily intended to protect the flexible cable or cord (e.g. with ring circuits).The fuses are not intended to protect appliances or parts of them against overload.
110	RS IEC 60884 -2 - 2:2006	Plugs, Socket –outlets for house hold and similar purposes ▬ Part 2 - 2: Particular requirements socket outlets for appliances	Applies to socket –outlets integrated or intended to to be incorporated in or fixed to appliances(hereinafter referred to as ‘’socket-outlets for appliances’’)
111	RS IEC 60884 - 2 - 5:2006	Plugs, Socket –outlets for house hold and similar purposes ▬ Part 2 - 5: Particular requirements for adapters	Applies to shuttered and non-shuttered, fused and non-fused adaptors for a.c. only. Fused of fused adaptors are not intended to protect appliances or parts of them against overload.
112	RS IEC 60998 - 1:2006	Connecting devices for low voltage circuits for household and similar purposes▬ Part 1: General requirements	Applies to connecting devices as separate entities of two or more electrical copper conductors.
113	RS IEC 60086 - 1:2005	Primary batteries ▬ Part 1: General	Specifies electrochemical system, nomenclature, terminal configurations, markings, test methods, typical performance, safety and environmental aspects for primary batteries
114	RS IEC 60086 - 2:2005	Primary batteries ▬ Part 2: Physical and electrical specification	Specifies the physical dimensions, discharge test conditions and discharge performance requirements
115	RS IEC 60086 - 3:2005	Primary batteries ▬ Part 3: Watch batteries - Specification	Specifies dimensions, designation, methods of tests and requirements for primary batteries for watches
116	RS IEC 60086 - 4:2005	Primary batteries ▬ Part 4: Safety of lithium batteries	Specifies tests and requirements for primary lithium batteries to ensure their Safe operation under intended use and reasonably foreseeable misuse
117	RS IEC 60086 - 5:2005	Primary batteries ▬ Part 5: Safety of batteries with aqueous electrolyte	Specifies tests and requirements for primary batteries with aqueous electrolyte to ensure their safe operation
118	RS IEC 60095-1:2005	Lead acid starter batteries ▬ Part 1: General requirements and methods of test	Applicable to lead-acid batteries with nominal voltage of 12 V, used primary as a power source for the staring and igniting of internal combustion engines, lighting and for auxiliary equipment of internal combustion engine vehicles
119	RS IEC 60095 - 2:2005	Lead acid starter batteries ▬ Part 2: Dimensions of batteries and dimensions and marking of terminals	Applicable to lead-acid batteries used for staring, lighting and ignition of passenger automobiles and light commercial vehicles with a nominal voltage of 12 V fastened to the vehicles by means of ledges on the long sides of the batteries case(standard fastening)
120	RS IEC 61427:2005	Secondary cells and batteries for photovoltaic energy systems (PVES) ▬ General requirements	Gives general information relating to the requirements of the secondary batteries used in photovoltaic (PV) solar energy systems and to the typical methods of test used for the

		and methods of test	verification of battery performances
121	RS IEC 60335 - 1:2005	Household and similar electrical appliances — Safety — Part 1: General requirements	It deals with the common hazards presented by appliances that are encountered by all persons in and around the home
122	RS IEC 60335 - 2-15:2005	Household and similar electrical appliances — Safety — Part 2-15: Particular requirements for appliances for heating liquids	Applicable to the safety of electrical appliances for heating liquids for household and similar purposes, their rated voltage being not more than 250 V.
123	RS IEC 60335 - 2-35:2005	Household and similar electrical appliances — Safety— Part 2-35: Particular requirements for instantaneous water heaters	Deals with the safety of electric instantaneous water heaters for household and similar purposes and intended for heating water below boiling temperature.
124	RS IEC 60335 -2 - 13:2005	Household and similar electrical appliances —Safety — Part 2-13: Particular requirements for deep fat fryers, frying pans and similar appliances	Deals with the safety of electric deep fat fryers, frying pans and other appliances in which oil is used for cooking, and intended for household use only, their rated voltage being not more than 250 V.
125	RS IEC 60335 - 2 - 14:2005	Household and similar electrical appliances — Safety — Part 2-14: Particular requirements for Kitchen machines	Deals with the safety of electric kitchen machines, their rated voltage being not more than 250 V, for household and similar purposes.
126	RS IEC 60335 - 2 - 3:2005	Household and similar electrical appliances — Safety— Part 2-3: Particular requirements for electric irons	Deals with the safety of electric dry irons and steam irons. It includes those with a separate water reservoir or boiler with a capacity less than 5 l.
127	RS IEC 60335 - 2 - 24:2005	Household and similar electrical appliances —Safety— Part 2- 24: Particular requirements for refrigerating appliances and ice – cream appliances and ice - makers	Deals with the safety of refrigerating appliances for household and similar use; ice-makers incorporating a motor-compressor and ice-makers intended to be incorporated in frozen food storage compartments; refrigerating appliances and ice-makers for use in camping, touring caravans and boats for leisure purposes.
128	RS IEC 60335 - 2 - 25:2005	Household and similar electrical appliances — Safety— Part 2-25: Particular requirements for microwave ovens, including combination microwave ovens	Deals with the safety of microwave ovens for household use. The rated voltage is less than 250 V. It also deals with combination microwave ovens.
129	RS IEC 60502-1:2006	Power cables with extruded insulation and their accessories for rated voltages from 1 kV(Um = 1,2 kV) up to 30 kV(Um= 36 kV) Part 1: Cables for rated voltages of 1 kV(Um=1,2 kV) and 3 kV(Um=3,6 kV)	Specifies the construction, dimensions and test requirements of power cables with extruded solid insulation for rated voltages of 1 KV up to 3kV

130	RS IEC 60598 - 1:2006	Luminaires ▬ Part 1: General requirements and tests	Specifies general requirements for luminaries, incorporating electric light sources for from supply voltages up to 1000 V
131	RS IEC 60598 - 2 - 17:2006	Luminaires ▬ Part 2-17: Particular requirements. Section Seventeen ▬ Luminaries for stage lighting, television and film studios (outdoor and indoor)	Specifies requirements for stage, television and film studio luminaries (including spot and floodlighting projectors)
132	RSIEC 60598 - 2 - 1:2006	Luminaires ▬ Part 2- 1: Particular requirements ▬Section one :Fixed general purpose luminaires	Specifies requirements for fixed general purpose luminaries for use with tungsten filament , tubular fluorescent and other discharge lamps on supply voltages not exceeding 1000 V
133	RS IEC 60598 - 2 - 3:2006	Luminaires ▬ Part 2 - 3: Particular requirements▬ Luminaires for road and street lighting	Specifies requirement for luminaries for road lightning and other public outdoor lighting applications
134	RS IEC 60598 -2 - 4:2006	Luminaires ▬ Part 2-4 : Particular requirements ▬ Section 4: Portable general purpose luminaires	Specifies requirements for portable general purpose luminaries other that hand lamps, for use with tungsten filament, tubular fluorescent and other discharge lamps on supply voltage not exceeding 250V
135	RS IEC 60598 -2 - 8:2006	Luminaires ▬ Part 2 -8: Particular requirements ▬ Section 8: Hand lamps	Specifies requirements for hand lamps and similar portable luminaries which are held in the hand when used, for use with tungsten filament and tubular fluorescent lamps on supply voltage not exceeding 250V
136	RS IEC 60598 - 2 - 9:2006	Luminaires ▬ Part 2-9: Particular requirements. Section Nine : Photo and Film luminaires (non – professional)	Specifies requirements for photo and film luminaries (non-professional) for use with low-pressure tungsten halogen lamps
137	RS IEC 61960:2005	Secondary cells and batteries containing alkaline or other non-acid electrolytes ▬ Secondary lithium cells and batteries for portable applications	Specifies performance tests designations, markings, dimensions and other requirements for secondary lithium single cells and batteries for portable applications
138	RS IEC 62133:2005	Secondary cells and batteries containing alkaline or other non- acid electrolytes ▬Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications	This standards specifies requirements and tests for the safe operation of portable sealed secondary cells and batteries(other than button)containing alkaline or other non-acid electrolyte, under intended use and reasonably foreseeable misuse
139	RSIEC 60601 - 1-1:2009	Medical electrical equipment ▬ Part 1-1: General requirements for safety Collateral standard: Safety requirements for medical electrical systems	This standard applies to the safety of medical electrical systems. It describes the safety requirements necessary to provide protection for the patient, the operator and surroundings.
140	RSIEC 62115 :2009	Electric toys ▬ Safety	This standard deals with the safety of toys that have at least one function dependent on electricity.
141	RSIEC 61010 - 1:2009	Safety requirement for electrical equipment for measurement, control, and laboratory use ▬ Part 1: General requirements	This standard specifies general safety requirements for electrical equipment intended for professional, industrial process, and educational use, any of which may incorporate computing devices.
142	RSIEC 62040 - 2:2009	Uninterruptible power supplies(UPS) ▬ Part 2: Electromagnetic	This standard applies to single UPS units or UPS systems comprising a number of interconnected UPS and associated control/switchgear forming a single power system,

		compatibility(EMC)requirements	intended to be installed in any operator accessible area or in separated electrical locations, connected to either industrial or public low voltage supply networks. The standard does not cover d.c. supplied electronic ballast or UPS based on rotating machines.
143	RS 273-1:2009 IEC 60364-5-52:2009	Electrical installations of buildings — Part 5-52: Selection and erection of electrical equipment —Wiring system	The standard applies in general to protective conductors during installation of buildings.
144	RS 273-2 :2009 IEC 60364-5-53:2009	Electrical installations of buildings — Part 5-53: Selection and erection of electrical equipment —Isolation, Switching and Control.	This standard deals with general requirements for isolation, switching and control and with the requirements for selection and erection of the devices provided to fulfil such functions
145	RS 273-3:2009 IEC 60364-5-54:2002	Electrical installations of buildings — Part 5-54: Selection and erection of electrical equipment —Earthing arrangement, protective conductors and protective bonding conductors.	The standard details the earthing arrangements, protective conductors and protective bonding conductors in order to satisfy the safety of the electrical installation.
146	RS 410-1:2009 IEC 60335-2-9::2008	Household and similar electrical appliances —Safety — Part 2 - 9: Particular requirements for grills, toasters and similar portable cooking appliances	The standard deals with the safety of electric portable appliances for household purposes that have a cooking function such as baking, roasting and grilling, their rated voltage being not more than 250 V
147	RS 410-2:2009 IEC 60335-2 - 29:2004	Household and similar electrical appliances — Safety — Part 2 - 29: Particular requirements for battery chargers	The standard deals with the safety of electric battery chargers for household and similar use having an output at safety extra-low voltage, their rated voltage being not more than 250 V
148	RS 410-3:2009 IEC 60335 -2 - 7:2008	Household and similar electrical appliances — Safety — Part 2 -7: Particular requirements for washing machines	The standard deals with the safety of electric washing machines for household and similar use, that are intended for washing clothes and textiles, their rated voltage being not more than 250 V for single – phase appliances and 480 V for other appliances
149	RS 410-4:2009 IEC 60335-2 - 26:2008	Household and similar electrical appliances — Safety — Part 2 -26: Particular requirements for clocks	The standard deals with the safety of electric clocks having a rated voltage not more than
150	RS 410-5:2009 IEC 60335 - 2 - 23:2008	Household and similar electrical appliances — Safety — Part 2 -23: Particular requirements for skin or hair care	The standard deals with the safety of electric appliances for the care of skin or hair of person or animals and intended for household and similar purposes, their rated voltage being not more than 250 V
151	RS 365-2:2009 EAS 498-2:2008	Low-frequency cables and wires with PVC insulation and PVC sheath —Part 2: Cables in pairs, triples, quads and quintuples for inside installations	This standard is applicable to cables for inside installations, intended for the interconnection of the following: – transmission equipment; – telecommunications equipment; – equipment for data processing
152	RS 365-3:2009	Low-frequency cables and wires with PVC	This standard is applicable to equipment wires with solid or stranded conductor, polyvinyl

	EAS 498-3:2008	insulation and PVC sheath — Part 3: Equipment wires with solid or stranded conductor wires, PVC insulated, in singles, pairs and triples	chloride (PVC) insulated, in singles, pairs and triples to be used for internal wiring of telecommunication equipment, industrial and consumer electronic equipment.
153	RS 370-1:2009 EAS 506-2:2008	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV) —Part 2: Cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um = 36 kV)	The standard specifies the construction, dimensions and test requirements of power cables with extruded solid insulation from 6 kV up to 30 kV for fixed installations such as distribution networks or industrial installations. Cables for special installation and service conditions are not included
154	RS 370-2:2009 EAS 506-4:2008	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV) — Part 4: Test requirements on accessories for cables with rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um = 36 kV	The standard specifies the test requirements for type testing of accessories for power cables with rated voltages from 3,6/6 (7,2) kV up to 18/30 (36) kV. Accessories for special applications, such as aerial cables, submarine or ship cables or hazardous situations (explosive environments, fire resistant cables or seismic conditions), are not included.
155	RS 371:2009 EAS 507:2008	Aluminium-magnesium-silicon alloy wire for overhead line conductors	This standard is applicable to aluminium-magnesium-silicon alloy wires of two types having different mechanical and electrical properties for the manufacture of stranded conductors for overhead power transmission purposes. It specifies the mechanical and electrical properties of wires in the diameter range 1.50 mm to 4.50 mm.
156	RS 373:2009 EAS 509:2008	Zinc-coated steel wires for stranded conductors	This standard applies to zinc-coated steel wires used in the construction and/or reinforcement of Conductors for overhead power transmission purposes. It is intended to cover all wires used in constructions where the individual wire diameters, including coating, are in the range of 1.25 mm to 5.50 mm.
157	RS 374:2009 EAS 510:2008	Hard-drawn aluminium wire for overhead line conductors	This standard is applicable to hard-drawn aluminium wires for the manufacture of stranded Conductors for overhead power transmission purposes. It specifies the mechanical and electrical properties of wires in the diameter range 1.25 mm to 5.00 mm.
158	RS 375:2009 EAS 511:2008	Sleeves of insulating material for live working	This standard is applicable to insulating sleeves for the protection of workers from accidental contact with live electrical conductors, apparatus or circuits.
159	RS 376:2009 EAS 512:2008	Thermal-resistant aluminium alloy wire for overhead line conductor	This standard is applicable to thermal-resistant aluminium alloy wires before stranding for manufacture of stranded conductors for overhead lines. It specifies the mechanical, electrical and thermal resistant properties of wires in the diameter range commercially available.
160	RS 377:2009 EAS 513:2008	Overhead electrical conductors — Formed wire, concentric lay, stranded conductor	This standard specifies the electrical and mechanical characteristics of concentric lay, overhead conductors of wires formed or shaped before, during or after stranding.
161	RS 380-1:2009 EAS 516-1:2008	Lead-acid traction batteries — Part 1: General requirements and methods of tests	This standard specifies certain essential characteristics of lead-acid traction batteries or cells used as power sources for electric propulsion, together with the relevant test methods of those characteristics.
162	RS 380-2:2009 EAS 516-2:2008	Lead-acid traction batteries — Part 2: Dimensions of cells and terminals and marking of polarity on	This standard is applicable to lead-acid traction batteries used as power sources for electric propulsion.

		cells	
163	RS 381:2009 EAS 517:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Sealed nickel-cadmium prismatic rechargeable single cells	This standard specifies marking, tests and requirements for sealed nickel cadmium prismatic secondary single cells.
164	RS 382:2009 EAS 518:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Vented nickel-cadmium prismatic rechargeable single cells	This Standard specifies marking, designation, dimensions, tests and requirements or vented nickel-cadmium prismatic secondary single cells.
165	RS 383-1:2009 EAS 519-11:2008	Secondary cells batteries — Part 11: Vented types — General requirements and methods of tests	This part is applicable to lead-acid cells and batteries which are designed for service in fixed locations (i.e. not habitually to be moved from place to place) and which are permanently connected to the load and to the d.c. power supply. This part 11 of the standard is applicable to vented types only.
166	RS 383-3:2009 EAS 519-22:2008	Stationary lead-acid batteries —Part 22: Valve regulated types — Requirements	This part applies to all stationary lead-acid cells and monobloc batteries of the valve regulated type for float charge applications, (i.e. permanently connected to a load and to a d.c. power supply), in a static location (i.e. not generally intended to be moved from place to place) and incorporated into stationary equipment or installed in battery rooms for use in telecom, uninterruptible power supply (UPS), utility switching, emergency power or similar applications.
167	RS 385-2:2009 EAS 521-2:2008	General purpose lead-acid batteries (valve-regulated types) — Part 2: Dimensions, terminals and marking	This part specifies the dimensions, terminals and marking for all general purpose lead-acid cells and batteries of the valve regulated type
168	RS 386:2009 EAS/TR 522:2008	Opportunity-charging of lead-acid traction batteries	Covers the opportunity charging of lead-acid traction batteries, i.e. the use of free time during a working period to top up the charge and thus extend the working day of a battery whilst avoiding excessive discharge.
169	RS 390-1:2009 EAS 526-1:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Portable sealed rechargeable single cells — Part 1: Nickel-cadmium	This part specifies marking, designation, dimensions, tests and requirements for portable sealed nickel-cadmium small prismatic, cylindrical and button rechargeable single cells, suitable for use in any orientation.
170	RS 390-2:2009 EAS 526-2:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Portable sealed rechargeable single cells — Part 2: Nickel-metal hydride	This part specifies marking, designation, dimensions, tests and requirements for portable sealed nickel-metal hydride, small prismatic, cylindrical and button rechargeable single cells, suitable for use in any orientation.
171	RS 393:2009 EAS 529:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Secondary lithium cells and batteries for portable applications	This Standard specifies performance tests, designations, markings, dimensions and other requirements for secondary lithium single cells and batteries for portable applications. This standard defines a minimum required level of performance and a standardized methodology by which testing is performed and the results of this testing reported to the user.
172	RS 395:2009 EAS 531:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements	This Standard specifies requirements and tests for the safe operation of portable sealed secondary cells and batteries (other than button) containing alkaline or other non-acid

		for portable sealed secondary cells, and for batteries made from them, for use in portable applications	electrolyte, under intended use and reasonably foreseeable misuse.
173	RS 396:2009 EAS 532:2008	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Design and manufacturing recommendations for portable batteries made from sealed secondary cells	Identifies and recommends procedures to ensure that batteries for portable equipment are designed, manufactured and marketed according to good practice.
174	RS 397:2009 EAS 721:2008	Photovoltaic(PV) systems —Characteristics of the utility interface	This Standard applies to utility-interconnected photovoltaic (PV) power systems operating in parallel with the utility and utilizing static (solid-state) non-islanding inverters for the conversion of DC to AC. This document describes specific recommendations for systems rated at 10 kVA or less, such as may be utilized on individual residences single or three phases. This standard applies to interconnection with the low-voltage utility distribution system.
175	RS 416 - 1:2009 EAS 722-1:2008	Photovoltaic(PV) module safety qualification —Part 1: Requirements for construction	This standard describes the fundamental construction requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation during their expected lifetime. The specific requirements for marine and vehicle applications are not covered. This standard is not applicable to modules with integrated AC inverters (AC modules).

Annex 7: List of Stakeholders and Institutions Met/ Consulted

	Names	Position	Organisation
1	Mpuunga Joseph	Director/One-stop- Centre	Rwanda Development Board (RDB)
2	Dusabeyezu Sebastien	UNFCCC Focal Point/ Environmental Analyst	Rwanda Development Board
3	Murenzi U. Godance	Director/ Internal Trade	MINICOM
4	Musoni Jackie	Environmental Analyst	RDB
5	Muhama Annick	Director/ Energy Regulation	Rwanda Utilities Regulatory Authority
6	Musabyimana Innocent	Director of Planning, M&E	Ministry of Natural Resources
7	Ntiyamira Patrice	D.DG/ Technical Operations	Rwanda Bureau of Standards
8	Munyaneza Tite	Geologist	Geology & Mining Dep't/ RNRA
9	Duhuze Remy Nobert	Director/ Environmental Monitoring and Compliance	REMA
10	Dr. Rugege Denis	EIA Technical Advisor	REMA
11	Mulisa Alex	Environmental Consultant	REMA
12	Uwizeye Fidel	Director of Lands & Mining	MINIRENA
13	Munyaneza Tito	In-Charge of Research	Geology & Mining Dep't/ RNRA
14	Markus Ceiss	Director	STRABAG International
15	Turikunkiko S.	Technician/Mines& Quarries	RNRA/Dept of Geology & Mines
16	Kazalika Michel	Supervisor/ Mines& Quarries	RNRA/Dept of Geology & Mines
17	Sabiti Fred	Project Manager/PEI	REMA
18	Harugimana Silvester	Director	SPCT Ltd Mining
19	Sinunvayabo Victor	Foreman	SEAVMC Company Ltd
20	Siborureme Mathias		HAJJUS Company Ltd
21	Ngendahayo Richard	EIAExpert	Independent EIA Practitioner
22	Marara Madeleine	EIA Expert	Independent Consultant
23	Innocent Sheija (Ms)	Admin/ Accountant	ROKA Company Ltd
24	Twagirayezu Chrisostome	Director	H & B Mining Company Ltd
25	Murenzi John Baptist	Kigali Mining Company Ltd	
26	Raphael Ritter	Director	Phoenix Metal S. a r. l.

References

1. African Development Bank (2003). Guidelines for Integrated Environmental and Social Assessment. www.afdb.org
2. MINIRENA (2010). http://www.minirena.gov.rw/IMG/pdf/Stragetegic_Plan-OGMR-April_2010_1_validated.pdf
3. Law N° 37 /2008 of 11/08/2008 Law on mining and quarry exploitation. Official Gazette of the Republic of Rwanda.
4. Rwanda Bureau of Standards (BRS) (2010). Mining and Quarry – Code of Practice. 1st Edition.
5. Rwanda Environmental Management Authority (REMA) 2007. General Guidelines for Environmental Impact Assessment.
6. Grayson, R (2006). How to conduct Public Consultation Guidance for EIA Consultancies. www.consultationinstitute.org.
7. Guide Book for Evaluating Mining Project EIAs. http://www.elaw.org/files/mining-eia-guidebook
8. http://www.slideshare.net/jadonmohit/environmental-impact-assessment-of-mining-projects-170309.
9. http://www1.ifc.org/wps/wcm/connect/1f4dc28048855af4879cd76a6515bb18/Final%2B-%2BMining.pdf?MOD=AJPERES&id=1323153264157