REPUBLIC OF RWANDA

RWANDA ENVIRONMENT MANAGEMENT AUTHORITY (REMA)

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

Draft Report

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June 2012

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.

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ACRONYMS AND DEFINITIONS

CESTRAR	Central Trade Union
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
GoR	Government of Rwanda
HEMM	Heavy Earth Moving Machines
IL	Impact Level
LCA	(Project) Life Cycle Assessment
MINIRENA	Ministry of Natural Resources
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.
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.
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 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;
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, stope design etc. Focus on initial years of mining to reduce uncertainty.

3.1.2 Construction phase (Preparation)

Construction refers 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.

[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.

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 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, usually about 5 years before the operational period ends (for a large mine). 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.

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:

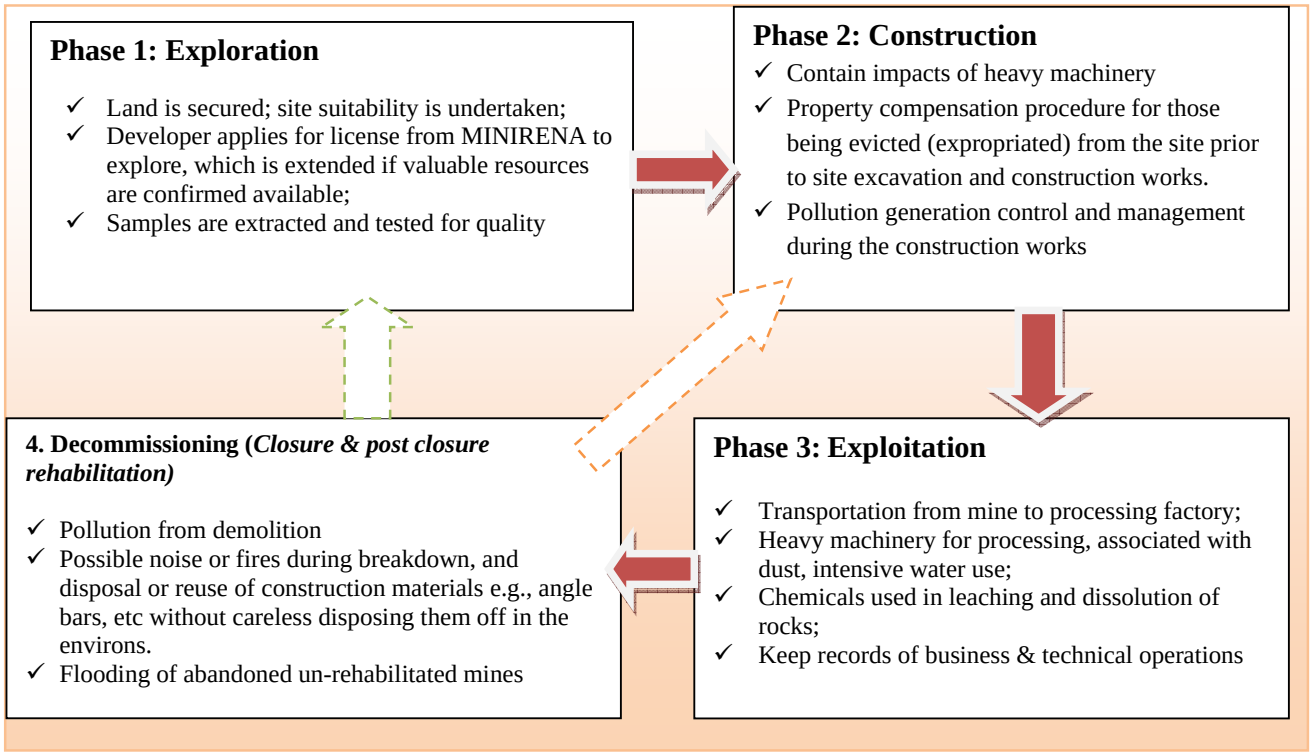

Figure 1: Phases of a Mining Project and associated environmental impacts.

3.2 Types of Mining Activities and Implications for EIA

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

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

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 outlined in 3.3.1 and are outlined in section 3.3.2.

3.3.1 Criteria for classification of Mining Projects

The following criteria are used to classify mining projects according to the potential impact levels:

- *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. 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.
- *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?

3.3.2 Categories of Mining Projects according to Environmental Impact levels

Mining projects are classified into 3 categories as follows:

1. **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 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.

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.

4. THE EIA PROCESS FOR MINING PROJECTS

4.1 Environmental and Social Impacts of Mining Activities

As it involves extraction of earth resources which are usually underground, mining activities – whatever the scale – are associated with significant environmental impacts.

Table 3: Sample Checklist: Sources of Potential Environmental Impacts by phase

	Project Phase	Activity likely to result in environmental impacts	Notes
1	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	
2	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	
		✓ 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	
3	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 RDB in form of a Project Brief. RDB registers the Project Brief as 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. A template or sa

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). Based on information in the Project Brief and established project screening criteria above, RDB determines whether or not a detailed EIA is required and the developer is accordingly notified.

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. When the ToRs have been approved by the Authority, they 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;	Displacement and rehabilitation; resettlement of affected people disrupt culture & social relations; crime and illicit activities

	Environmental attribute	Environmental Impact	
		Positive	**Negative/Adverse**
		educational; commercial, recreational; medical facilities	
6	Air and dust		High intensity of dust nuisance problems such as visuals, soiling and degradation of materials; Gaseous missions; HEMM & other transport vehicles
7	Risks/hazards		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

3.3.4 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.

3.3.6 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.

3.3.7 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), 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.

4.4 Key Areas of Focus in the EIA for Mining Projects

4.4.1 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.

4.4.2 Environmental Impact on Water Resources /Hydrology

One of the most important areas where mining has significant impacts are water resources – both surface and ground water.

1) 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)

2) 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.

4.4.3 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 5.

Table 5: 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	
Skilled	Technician's Certificate	• Mining technicians • Lab. Assistants	
	College Degree/ Diploma	• Managers • Mining Engineers • Geologists • Scientists • Accountants	

*** 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 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.

4.4.4 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.

4.4.5 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: ttechnology; mine locations; methods for obtaining the mineral; mining methods; site configuration; land use for site after mining operations have ceased; and even mitigation measures.

[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.

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.

4.5 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:

4.5.1 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.

4.5.2 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.

4.5.3 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.

4.5.4 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);

4.5.5 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;

2) Illumination systems should be adequate and safe for the planned working conditions in travel paths, mine working areas, and within and around surface facilities and dumpsites of mines (see the illumination guideline values presented in Section 2.0). Additional illumination guidance includes 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, emergency exits, 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;

To the extent that alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure, all mining projects must have the following measures:

- ✓ Adequate personal protective equipment (PPE) for workers and visitors such as uniforms, safety boots, helmets, gas/dust masks, goggles, gloves and overalls when at work;

- ✓ 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.
- ✓ 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 sight so that in case of injury, they are quickly responded to;
- ✓ 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.
- ✓ 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.

4.5.6 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, stope 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.

4.5.7 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.

4.5.8 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
- exploration activities;
- Drilling
- Excavation
- Extraction
- Grinding
- Crushing
- 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.

4.5.9 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, people harvesting or community work/*Umuganda* periods);

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.

4.5.10 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.

4.5.11 Wet tailings impoundments

Dewatering of tailings and using them as backfill is the environmentally-preferable disposal option (e-law, 2010), in which case management of a wet tailings impoundment would not be an issue in the EMP. The following management strategies to protect water quality 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.

4.5.12 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.

4.6 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.

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, Trade Union (CESTRAR), local communities and NGOs.

4.6.3 Mechanisms for Public participation

While methods of public participation will depend on circumstances of each EIA, the following are considered appropriate:

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

Every EIA Certificate is accompanied by conditions to be fulfilled, including an approved EMP. 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 6: Summary of Key Environmental Monitoring issues in Mining projects

These standards may be used as checklists 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

	Environmental aspect to monitor	Checklist of key issues to guide monitoring
		benefits? ✓ Land acquisition processes – have people been consulted ✓ Communication- Is there rapport among representatives of community, mining company and local authorities and NGOs?
9	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?

ANNEXTURES

ANNEX 1: 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 2: Outline of Terms of Reference for Mining Project EIA

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

- A description of the project
- A list of the agencies or ministries responsible for overseeing the EIA process and making decisions
- The geographic area to be studied (also called the 'impact zone')
- EIA requirements in applicable laws or regulations
- Impacts and issues to be studied
- Mitigation and/or monitoring systems to be designed
- Provisions for public involvement
- Key stakeholders
- Timeframe for completing the EIA process
- Expected work product and deliverables
- Budget for the EIA

Annex 3: ENVIRONMENTAL 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.

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 include:

1. Does the EIA fulfill requirements for the proposed activity, as set out in the relevant EIA guidelines or Terms of Reference?

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?

4. Has the EIA defined the area of direct and indirect influence of the project?

5. Is the impact analysis clear about the extent and significance of the impacts? Is the analysis rigorous enough?

6. What sources support the conclusions?

7. Can they be verified?
    a. Is there enough information about alternatives to the project?
    b. Is the EIA clear and easy to understand? Does it acknowledge limitations and difficulties?
    c. Does the EIA describe how the project would implement proposed mitigation and management measures (including pollution control measures and closure)?

References

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