



*Research and Postgraduate  
Studies (RPGS) Unit*

**Environmental Compliance in Rwanda:  
“A Case of Cassiterite-Coltan Exploitation in  
Karengwe Sector”**

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**Master’s of Science in Geo-Information for Environmental and Sustainable  
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# **Environmental Compliance in Rwanda: “A Case of Cassiterite-Coltan Exploitation in Karengwe Sector”**

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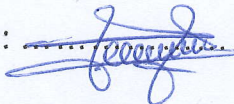
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I declare that this Dissertation contains my own work except where specifically acknowledged.

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## **DEDICATION**

To my lovely Wife INGABIRE Deodat

To my wonderful sons, Kayigire Nisi and Irema Kayigire Nevan.

## ACKNOWLEDGEMENTS

God is good all the time!

A special thanks to my supervisor Professor Emmanuel Twarabamenye for his guidance and advice that enabled me to complete this Thesis.

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Kayigire Dominique.



## **ABSTRACT**

Environmental compliance is one of the key components of the life of any mining project, especially in Rwanda rich Artisanal and Small-Scale Mines (ASM) which maintains the livelihood of thousands of miners mostly living in rural areas with less income generating activities. This ASM has a low level of investment, dominated by unconventional mining operations and lack of environment protection knowledge despite the facts that it contributes the biggest share of the Rwandan mineral (tin, coltan and tungsten) exports.

In this Study, the level of Environmental Compliance in ASM mining cassiterite and coltan in Karengwe Sector, Rwamagana District is investigated with focus on the implementation of the Environmental Impact Assessment as a legal obligation. In a particular way, it examines the barriers impeding the ASM to implement the Environmental Impact Assessment in a satisfactory manner as well as exploring strategies that could enhance the Artisanal and Small-Scale Mining compliance to regulatory mining framework.

The study firsts analyzed national policy, laws, rules and regulations that govern the mining sector in Rwanda to provide the general understanding of mining activity in the country. Thereafter a systematic field observation in Karengwe Mining site was conducted to see in-situ how mining operations were undertaken to three active ASM mines namely H&B Mining Ltd, HABATU Mining Ltd and Ets HAJOS. Finally, a survey with the site managers and relevant government officials in charge of environmental inspections were conducted.

The study reveals that the level of compliance is 50% at H&B, 55.8% at HABATU and 39.5% at Ets HAJOS mines. The primary reasons being of this situation are lack of environmental skills by ASM miners and managers, ignorance of mineral reserves to enable a sustainable mining operations, and insufficient human resources from in-charge government institutions to conduct regular inspections.

To overcome the highlighted challenges, the following main actions should be undertaken by different stakeholders involved in mining activities: it is advised to extend deep explorations works to determine mineral reserves of ASM sector, and invest in a massive capacity building of ASM operators on various environmental aspects.

## **KEY WORDS**

Environmental compliance

Environmental management plan

Environmental commitment

Environmental impact assessment

Minerals

Mining

Exploitation

Artisanal and small scale mine site

Cassiterite

Coltan

Mitigation measures and actions



## LIST OF SYMBOLS AND ACRONYMS

ASM	: Artisanal and Small-Scale Mining
BGR	: Germany Federal Institute for Geosciences and Natural Resources
COPIMAR	: Coopérative de Promotion de l'Industrie Minière Artisanale au Rwanda
EIA	: Environmental Impact Assessment
EMP	: Environmental Management Plan
EMS	: Environmental Management System
EO	: Environmental Officer
FONERWA	: Fond National d'Environnement au Rwanda/Rwanda's Green Fund
GoR	: Government of Rwanda
GSN	: Geological Survey of Namibia
ICGLR	: International Conference on the Great Lakes Region
IGF	: Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
INTOSAI	: International Organization of Supreme Audit Institutions
MINETAIR	: Société des Mines d'Etain du Rwanda-Urundi
MINIRENA	: Ministry of Natural Resources
OECD	: Organization of Economic Cooperation Development
RDB	: Rwanda Development Board
REDEMI	: Régie d'Exploitation et de Développement des Mines
REMA	: Rwanda Environmental Management Authority
RNRA/GMD	: Rwanda Natural Resources Authority, Geology and Mining Department
SOMIRWA	: Société Minière du Rwanda
SOMUKI	: Société Minière de Muhinga-Kigali
UR	: University of Rwanda
WB	: World Bank

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## **Chapter 1. GENERAL INTRODUCTION**

### **1.1. Background Information**

The World Bank (WB, 2008) estimates the Artisanal and Small-Scale Mining (ASM) is one of the components of the extractive industries and is practiced in about 50 countries by people who live in the poorest and most remote rural areas, with few employment alternatives. ASM refers to mining activities carried out using low technology or with minimal machinery. It is estimated that more than 100 million people rely on this sector for income, mainly in developing countries. This number is growing in relation with higher prices and demand for minerals both in the Organization for Economic Cooperation and Development (OECD) countries and emerging economies such as China and India. The range of commodities exploited by artisan miners is diverse, including gemstones, gold, copper, cobalt, coltan, coal, and other industrial minerals. Gold is believed to be the most important mineral extracted by artisanal and small-scale miners. According to the same World Bank source, the most common characteristic and trend in ASM activities is the complex issues of environment degradation in the mining areas and in the surrounding communities.

In their effort to mitigate environmental degradation in the ASM sector, the African Union (AU) with help of international community has launched in 2013 the Africa Mining Vision (AMV) which aims at creating "a transparent and inclusive mining sector that is environmentally and socially responsible in its member States" (Africa Progress Panel, 2013). It is in this context that most governments, donor institutions and companies have adopted internationally recognized environmental impact assessment (EIA) and social impact assessment (SIA) tools that identify potential negative impacts in advance.

Extraction of minerals dates to immemorial time. In African countries, some regions started mining in the Antiquity. Before the European colonization of Africa, the inhabitants of Africa have pursued mining of ores and the extraction of metals in a primitive way Habashi (2007). For example, gold was mined by the ancient Egyptians and made into magnificent artefacts. They quarried granite and other semi-precious stones and made huge statues and vessels. Mining activities mainly consisted of covering rock breaking, ore grinding, ore transport, and ore



smelting. According to the same author, ore grinding is a technology commonly used by many Africans before the introduction of machines. A large granite boulder was tilted back and forth by two men sitting on a wooden beam fixed on top of the boulder (see figure 1-1).

*Figure 1-1: Ancient method of ore grinding and pan washing for mineral including diamonds*



Source: Habashi, 2007

Modern mining methods were later introduced by Europeans in 19<sup>th</sup> century. The figure (see figure 1-2) below illustrates miners in Tanzania using drilling machine and wearing protective equipment in mining.

*Figure 1-2: Modern mining*



Source: Habashi, 2007

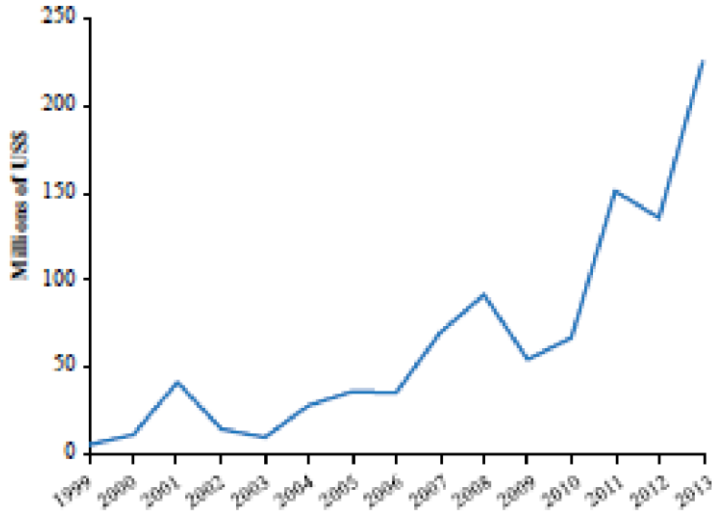
In Rwanda, Belgium colonial administration initiated the first systematic geological study to determine the mineral potential in both Rwanda and Burundi between 1920 and 1930. The

extraction of minerals started in Rwanda with two main companies: *Société des Mines d'Etain du Rwanda-Urundi* (MINETAÏN) in 1930 and *Société Minière de Muhinga et de Kigali* (SOMUKI) in 1934 ( [http://rnra.rw/fileadmin/user\\_upload/Mining\\_in\\_Rwanda\\_pdf](http://rnra.rw/fileadmin/user_upload/Mining_in_Rwanda_pdf)).

As per the same the same source, after independence, the Government of Rwanda (GoR) decided to create a public mining company by grouping together all existing mining companies (SOMUKI, GEORWANDA, MINETAÏN, etc) and tried to strengthen the mining industry. On 9<sup>th</sup> February 1973, the *Société Minière du Rwanda* (SOMIRWA) was established. It was owned by the State of Rwanda represented by the Minister of Finances with 49% of the shares of the company, and the remaining share were owned by SOMUKI and MINETAÏN. SOMIRWA faced many management problems inherited from the old mining companies from which it had taken over most of the concessions and facilities. This led to its bankruptcy on 23<sup>rd</sup> July 1985. The mining industry was re-launched by the GoR with the creation the *Coopérative de Promotion de l'Industrie Minière Artisanale au Rwanda* (COPIMAR) in 1988 and the *Régie d'Exploitation et de Développement des Mines* (REDEMI) in 1989. The later was a state company that took over all SOMIRWA concessions until the start of the 1997 privatization process.

After the start of the privatization of the government owned concessions, the extraction of tin, tantalum and tungsten has become predominantly artisanal. Mining activities and trading were left to semi-mechanized and small private companies and cooperatives as well. However, it constitutes one of the key pillars for the country's economic growth as per the current medium and long-term economic planning tools. Since 2008, the mineral exports from Rwanda have been steadily increasing with high performance of 66% in 2013 according to the World Bank (2014). To date, minerals are the second biggest foreign currency earner for the country after tourism industry. This evolution is explained by the fact that from 2006 and onward, the GoR has liberalized the mining sector.

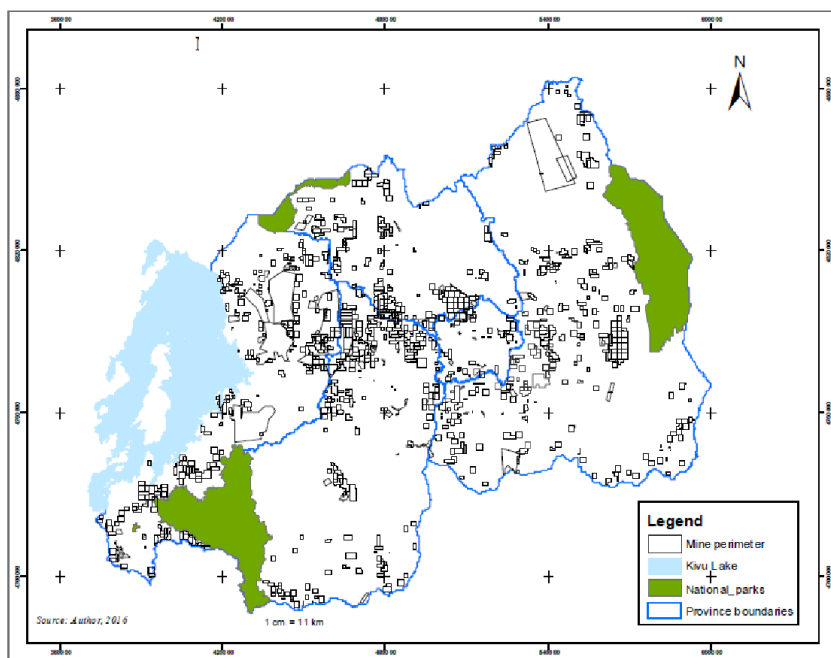
Figure 1-3: Export earnings from 1999 to 2013



Sources: NISR; and World Bank staff calculations.

Rwanda accounts for several ASM mine perimeters. The main export commodities are tin, tantalum and tungsten. Rutongo Mines is the biggest and ancient semi mechanized tin mine. There are other big mines concessions under mechanization process including WMP, ETI Nyakabingo, etc. Most of the mine perimeters are operated by ASM miners (individual-owned or cooperatives) producing more than 50% of the total mineral production in Rwanda.

Figure 1-4: Mine perimeters in Rwanda



Source: Author 2016

It is already known that mining is inherently a destructive activity involving the taking of a non-renewable resource. Some environmental damages are inevitable in any mine (INTOSAI, 2010) as the artisanal techniques involve rudimentary methods of ore extraction and processing that sometimes leads to severe impact on the social, physical and ecological environments.

*Photo 1-1: Artisanal mining sites in Rwanda*



An artisanal mine site in Murundi and Rukara sectors, of Kayonza District in Murundi and Rwimishinya cells.

Source: RNRA, 2014



An artisanal ore washing at Rutongo Mines in Rulindo District, Northern Province of Rwanda

Source: RNRA, 2014

Many regulatory instruments have been put in place in Rwanda to cope with the growing artisanal mining activities as the country believes that an overall positive contribution of small-scale mining to sustainable development can be achieved if the positive economic and social aspects are enhanced while negative environmental and social impacts are avoided or minimized (MINIRENA, 2011). The main legal instruments put in place include the 2014 Mining law, the 2004 Environmental Organic Law, the Mining code and other related regulations.

As per the said mining law, general guidelines and procedures for EIA in Rwanda stipulate that any mining license is only granted if the project developer provides an EIA report (REMA, 2006) which shows how adverse environmental impacts will be mitigated. Most of the time mining companies turn to private consultants for the development of the EIA reports. Once ready, EIAs are submitted to relevant authorities for approval. When the EIAs are approved, relevant authorities therefore grant mining licenses thereafter mining companies start mining extraction. However, it is not certain that the mitigation measures proposed in the EIA documents are all well understood and implemented by miners, as some ASM project developers who perceive this as mere formality to acquire mining licenses. According to the environmental law in Rwanda, the project developer is responsible for the full implementation of the said mitigation measures and the proposed Environmental Management Plan (EMP) as part of the EIA study. The Ministry of natural resources through its various affiliated institutions has the responsibility of supervising, monitoring and auditing the environmental compliance of the project along its various implementation phases.

## **1.2. Problem Statement**

Worldwide, artisanal mining deserves special note because the level of environmental degradation is likely to be high since miners have little knowledge on how to translate what is in EIA report into practices, given also their low financial capacity, understanding and poor organizational management (INTOSAI, 2010). As results, more often, the approved mitigation measures in EIA reports are not well translated into actions at mine site level.

In Rwanda, studies have shown that some mining companies scored very low in terms of their environmental performance against set environmental standards because of their small scale, as

they tend to view their operations as low impact with regards to the environment, as they are only subject to limited requirements for EIA and EMP (MINIRENA et al, 2011). Therefore, it is now common to find severe environmental degradation where artisanal mining activities are taking place in many corners of Rwanda.

As example, in many mining areas in Rwanda, farming takes place in close proximity to the mines, if not directly on the mine waste itself. At most of the mine sites, mining and/or processing activities release waste materials into rivers, surrounding agricultural land and settlements, thus potentially affecting human health and the quality of farm products and livestock (MINIRENA, REMA, Germany Federal Institute for Geosciences and Natural Resources (BGR), 2011). For instance, according to BGR (2011), at Rwinkwavu mining (Eastern Province, Rwanda), arsenic contamination in the huge reservoirs downstream of the mining area slightly exceeds East African standards for drinking water. This contamination must be closely monitored. Wide use of that water for irrigation and human consumption may cause bio-accumulation of arsenic. Such negative impacts may be observed in other mining sites in Rwanda, reason why this study was conducted in mining sites of Karenge to investigate the mining compliance.

Karenge Mining site is located in Karenge Sector, Rwamagana District. Karenge Sector deserves attention since mining is a recent income generating activity in the area (in addition to banana and coffee farming). Mining activities are conducted out at a dozen of meters from Mugesera lake and its marshland. The three mining sites to be investigated are operated by three companies namely HABATU Mining Company, H&B Mining Company Ltd, and Enterprise HAJOS. Mining activity is artisanal. The three companies have mining licenses. As per the mining law, they hold approved EMP/EIA report guiding them to manage on daily basis the environment in their respective mines. However, any informed person crossing the area would easily observe that mining activities do not comply with the environment in a satisfactory manner. This is showed by some abandoned open sites/open caste site unfilled in with waste rock and re-vegetate the terrain as recommended by the approved H&B Mining Company Ltd's EIA report (H&B, 2013). In the site operated by HABATU Mining Company, empty plastic bags are piled with waste rocks (See photo1-2) while usage of plastic bags is prohibited in Rwanda (REMA, 2006).



These bags were used to pack and later transport mineralized sands from inside tunnels up to washing places.

Erosion is also crucial on this site. However, the 2013 approved EMP/EIA of HABATU Mining Ltd recommends that non-hazardous wastes be collected and disposed at an approved sanitary landfill and soil erosion must be reduced (HABATU, 2013).

HAJOS Mining Ltd operates in the immediate vicinity of Karenge rural centre. The centre is commercial but also residential. The mine is not well fenced to prevent non-mine employees to enter the site and avoid accidents. However fencing mining pits is recommended in its approved EIA.

*Photo 1-2: Inappropriate disposal of used plastic bags at HABATU Mining sites*



Source: Author 2016

The above non-compliance facts are observed while in every EIA, a section on the environmental Management Plan (EMP) serves as a guideline for both the Government and project developer in monitoring the implementation of all mitigation measures and recommendations proposed in the EIA report. This is in accordance with REMA recommendations to mitigate negative impacts of mining activities (REMA, 2006).

Therefore, it is important to investigate the drivers of non-compliance of mining companies in Karenge Sector while the mining policy, mining laws and other rules and regulations governing mining activities are clear. This study would help deeply assess the level of environmental compliance in artisanal mining activities in Rwanda and explore some best practices that would improve the implementation of EMP hence, the whole EIA.



### **1.3. Objectives of the Study**

The general objective of this study is to assess the environmental compliance of ASM miners in Karengé Sector, Rwamagana District.

The specific objectives of the study and their related research question are as follow:

1. To investigate the environmental compliance of *ASM mines* regarding their EIA/EMP.
2. To examine the barriers impeding artisanal miners to implement in a satisfactory manner the proposed EIA/EMP.
3. To suggest some strategies for ASM operations to be environmentally compliant.

### **1.4. Research questions**

The study will attempt to respond to the following research questions in relation with specific objectives as contained in table 2.

**Table 1-1. Specific Objective and Research Questions**

#	Specific objectives	Research questions
1	To investigate the environmental compliance of ASM mines regarding their EIA/EMP	<ol style="list-style-type: none"> <li>1. What are the proposed EMP activities in each mine EIA Report?</li> <li>2. What are the activities being conducted as part of EMP requirements?</li> <li>3. What evidence can best describe the current status of ASM mines at Karengese Sector?</li> </ol>
2	To examine the barriers impeding artisanal miners to implement in a satisfactory manner the proposed mitigation measures and recommendations in EIA documents	<ol style="list-style-type: none"> <li>1. What are mechanisms put in place by relevant institutions to check what ASM agreed to do in EIA reports?</li> <li>2. What are the barriers impeding ASM miners to fully implement the proposed EMP?</li> <li>3. How familiar are the ASM operators in regard to the proposed EMP?</li> <li>4. What is the implication of the environmental bond paid by miners vis a vis the costs of destroyed environment that will be restored by miners?</li> <li>5. How much have been spent on the implementation of EMP?</li> </ol>
3	To suggest some strategies for ASM operations to be environmental compliant	<ol style="list-style-type: none"> <li>1. How should an artisanal mining company/cooperative be structured to ensure environment is given a high importance?</li> <li>2. What internal tools (e.g.: pre-designed templates for information collection and follow up) and methods can be developed for self-environmental auditing?</li> <li>3. Can an issuance of a local certificate for environmental compliance to motivate more ASM companies to implement their EMP/EIA report?</li> <li>4. Would reputational damage and competition dimensions increase ASM commitment to EMP/EIA implementation?</li> </ol>

### **1.5. Research Hypothesis**

The environmental compliance in ASM mining activities is not satisfactory in regard to the implementation of EMP/EIA requirements in mining operations in Karengye Sector/Rwamagana.

### **1.6. Significance and limitation of the Study**

The study area will be limited to artisanal mining exploitation in Karengye Sector, Rwamagana District, Eastern Province of Rwanda. The choice of this topic is based on the fact that, to our knowledge, few research has been conducted on this theme. This might be due to the fact that EIA is a recent concept in the Rwanda mining sector, especially for ASM. Karengye sector was selected for investigation because it is a new mining site, located in a populated area and near Lake Mugesera whose banks must be protected. Moreover, the sector provides considerable quantities of tin, tantalum and tungsten by artisanal miners though managed by private companies, however the area is experiencing environmental degradation.

The study also explores how some best practices could enhance the environmental compliance in ASM operations and provide to lead agencies with a regular follow up and communication tool in enforcing EIA standards.

It was not easy to get documents from ASM that are subject to this study to support mining sites managers' statements from the conducted interviews because of poor management and administration of the mining companies. Due to limited logistics and financial resources, this study mainly focused on the physical components while assessing the status of environment at the mentioned mines. The study was unable to clearly assess the status of the environment that requires measurements from laboratories. It was difficult to secure a rendezvous with ASM managers due to their extremely busy and regular schedules.

### **1.7. Outline of the Study**

The study is divided into five chapters. The first chapter introduces the study. It comprises the background information on mining in Rwanda, the problem statement, the research objectives and research questions, the hypothesis. It also includes the significance of the study and its limitations.

The second chapter presents an overview on EIA in ASM operations. It therefore includes general information on the environmental compliance and artisanal and small-scale mining, the role of the EMP, and EIA as a response to environmental problems in ASM. EIA in Rwanda and information on requirements for issuing mining license ASM in Rwanda is presented in this chapter.

The third chapter is dedicated to the research methods applied to conduct this study. It mostly focusses on the presentation of the study area, the techniques applied in collection of primary and secondary data needed for the completion of this study.

The chapter presents the main findings. It includes environmental management plan for targeted mines in Karengé Sector, the general status of the environment at HABATU, H&B and HAJOS mines and their respective status EMP implementation. It furthermore interprets and discusses the results in order to know if ASM in Karengé sector is a particular case or if problems observed there are similar to the ones that are experienced in other mining sites.

The fifth chapter concludes the study and provides some recommendations for best practices to enhance EIA/EMP implementation and enforcement for a better compliance of ASM in Karengé sector.

## **Chapter 2. LITERATURE REVIEW**

Development and international agencies have developed different instruments including Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) just to name a few, to mitigate the problems caused by mining operations, especially in developing countries where the ASM mostly prevails. In this chapter, more focus will be provided on the EIA in ASM in Rwanda.

### **2.1. EIA as a response to environmental problems in ASM**

Environmental impact assessment (EIA) is a process which attempts to identify, predict and mitigate the ecological and social impacts of development proposals and activities. It also helps to assist decision-making and to attain sustainable development (Abebe et al, 2007). The effectiveness of EIA depends on several factors, among which the quality of EIA guidelines, EIA reports and implementation and follow-up of EIA recommendations are of particular importance (Abebe et al., 2007 in Arebo (2005).

The EIA helps the stakeholders with the identification of the environmental, social and economic impacts of a proposed development before a decision is taking on whether to proceed or not. Particular attention is given to EIA practice to preventing, mitigating and offsetting the significant adverse effects of proposed undertakings according to INTOSAI (2010).

The challenges posed to environmental assessments of mining projects are twofold. First, to ensure that environmental, social and health costs of the proposed mining project are given adequate consideration in determining the economic viability and acceptability of alternative project scenarios. Secondly, to ensure that adequate control, mitigation or protection measures are incorporated in proposed mining project design, implementation and mining decommissioning plans.

## **2.2. Environmental compliance and Artisanal and Small-Scale Mining (ASM)**

ASM rarely fulfills environmental compliance. This is due to the fact that ASM has limited capacities and competencies. Indeed, according to INTOSAI (2010), ASM is characterized by:

- lack, or much-reduced degree, of mechanization and a great amount of physically demanding work,
- low level of occupational safety and health care,
- inadequate qualifications among the personnel working at all levels of the mining operation,
- inefficiency in the exploitation and processing of the minerals (low recovery of values),
- exploitation of marginal and/or very small deposits, which cannot be economically exploited by mechanized mining,
- low level of productivity, salaries and income,
- periodical operation by some local inhabitants or according to the market price, and
- lack of social security, working and investment capital.

There are multiple causes for the severe environmental impacts caused by ASM as mentioned by INTOSAI (2010). The most important factors are the following:

- little of knowledge, education and training (in mining techniques and environmental management),
- inefficient technology and limited techniques,
- inefficient administrative management,
- economic limitations,
- very limited access to better techniques,
- lack of information about good practice,
- lack of regulation and enforcement, and
- inadequate environmental legislation.

### **2.3. Role of Environmental Management Plan (EMP)**

Environmental management plan (EMP) seeks to integrate environmental responsibilities into everyday management practices through changes to organizational structures, responsibilities, procedures, processes, and resources. An EMS provides a structured method for company management and the regulating authority to be aware of and control the performance of a project. EMS can be applied at all stages of the life cycle – from identification of a deposit to mine closure. The stages of mine life cycle are:

- organizational commitment,
- environmental policy,
- socio-economic impact assessment,
- environmental impact assessment,
- community consultation,
- setting objectives and targets,
- environmental management plan,
- documentation and environmental manual,
- operational control and emergency procedures,
- training, emissions and performance monitoring, and
- environmental and compliance audits and reviews.
- Mine closure

The responsibility for setting up and running an EMS lies with the company. Ideally, ASM companies/cooperatives should be equipped with an internal EMS that enables them to effectively fulfill their environmental responsibilities. Looking at the characteristics, nature and limited capacity of ASM operations, the introduction and implementation of the individual stages of EMS including EIA is becoming a trend in some countries' environmental legislations.

### **2.4. EIA in Rwanda**

The EIA in Rwanda takes reference from the 2005 Organic Law determining the modalities of protection, conservation and promotion of environment and the latter is mainly enforced through the REMA 2006 guidelines and procedures for EIA to ensure environmental



compliance. The 2014 law on mining and quarry operations leads the regulatory framework of mining activities in Rwanda.

#### **2.4.1. Environmental compliance**

As per REMA 2006 EIA guidelines, the relevant environmental authority shall ensure that all development projects comply with environmental regulations. Compliance is attained when a project fulfills all necessary mitigation, remediation, monitoring and conditions (or any of their amendments) specified by REMA before project implementation.

A project is said to be non-compliant if:

- higher than regulatory levels of impact in at least one parameter have occurred,
- appropriate mitigation measures as agreed in the implementation terms and conditions are not implemented,
- monitoring records are not kept and reported to REMA,
- environment impacts are overlooked,
- no copy of EIA Certificate from REMA was obtained,
- designated environmental inspectors are denied access to project premises.

#### **2.4.2. EIA and ASM mining license**

The Rwandan mining industry is currently in a state of transition. It has recently transformed from a publicly-run to a private industry and at the same time is moving from a regional trading industry to a local extraction and exporting industry (MINIRENA, 2010). Thus, the majority of the permits belong to ASM miners, categorized (in industrial or artisanal) after assessment of their application including environment protection, operations and business plans.

One of the five strategic pillars of the Rwandan mining policy include the reduction of environmental impacts of mining activities (MINIRENA, 2010). The Government has so far been able to put in place the necessary legal framework to ensure that environmental protection is taken care of during mining activities.

The Ministry of Natural Resources has established the list of works, activities and projects for which EIA studies should be conducted prior to their implementations. Those projects including the infrastructure development, mining, agriculture and animal husbandry, works in parks and in its buffer zone, works of extraction of mines (MINIRENA, 2008).

Among the particular requirements before the acquisition of a mining license including a copy of the EIA study and a certificate of approval issued by a competent authority that is currently RDB as well as a receipt of the deposit of the financial guarantee of environmental protection in case the application is approved (MINIRENA, 2015). The guarantee shall be 5% of the total planned investment budget of the project.

REMA defines the environmental monitoring to regular collection of environmental data at the project site while environmental auditing is a systematic documentation, periodic and objective evaluation of protection and management of the environment.

#### **2.4.3. Responsibilities of parties in EIA implementation**

The developer, in this case the ASM company/cooperative has the direct responsibility to undertake self-monitoring, self-record-keeping and self-reporting jointly with REMA and the lead agency (REMA, 2007). Information gathered through monitoring shall be recorded and forwarded to REMA annually. The developer shall set a monitoring plan which delineates responsibilities, specifying who collects data, what specific actions and costs involved. REMA and relevant Lead Agencies (see table 2-2) shall review the monitoring reports and advise on measures necessary to abate any ongoing impacts.

**Table 2-2: Responsibilities of different actors in EIA implementation**

<b>Functions/ EIA stages</b>	<b>REMA</b>	<b>Lead Agencies</b>	<b>Local Government</b>	<b>Community</b>
Project implementation, monitoring & auditing	<ul style="list-style-type: none"> <li>● Inspect to ensure compliance during the implementation.</li> <li>● Receive and review annual monitoring reports prepared by developers.</li> <li>● Crosscheck monitoring results</li> <li>● Undertake routine inspection and auditing to enforce compliance</li> <li>● Takes action when project not in compliance</li> </ul>	Assist in inspection and monitoring environmental compliance during project implementation	Environmental officers at local level assist in inspecting and monitoring environmental compliance during project implementation.	

Source: REMA, 2006

Lead agencies are government ministries or departments which have the responsibility for management and protection of environmental resources and oversee EIA implementation.

#### **2.4.4. Specific role of the Project developer in the EIA implementation in Rwanda**

Following the EIA process in Chapter 2 above, developers shall undertake the following roles:

- prepare and submit EIA applications (in form of Project Briefs) to REMA,
- hire experts to undertake EIA studies on their behalf,
- prepare and append an addendum (*Environmental Impact Report Addendum*) to the EIA report (if necessary),
- submit the EIA report, Environmental Management Plan and the EIA Report Addendum (if applicable) to the Authority,
- participate in public hearings,
- implement terms and conditions (if any) REMA attached to approval of their projects,
- report to REMA and relevant Lead Agencies on compliance with terms and conditions of approval,

- undertake monitoring of projects during implementation and report annually to REMA,
- undertake annual (or at any other time as demanded by REMA) environmental auditing of their projects, according to Audit Guidelines and Regulations of Rwanda,
- undertake environmental auditing, according to Audit Guidelines and Regulations of Rwanda, when seeking closure or relocation.

The specialized government agencies have so far formulated clear policies, laws and rules and regulation to govern the mining sector and ASM must be compliant with these tools.

## **Chapter 3. RESEARCH METHODS**

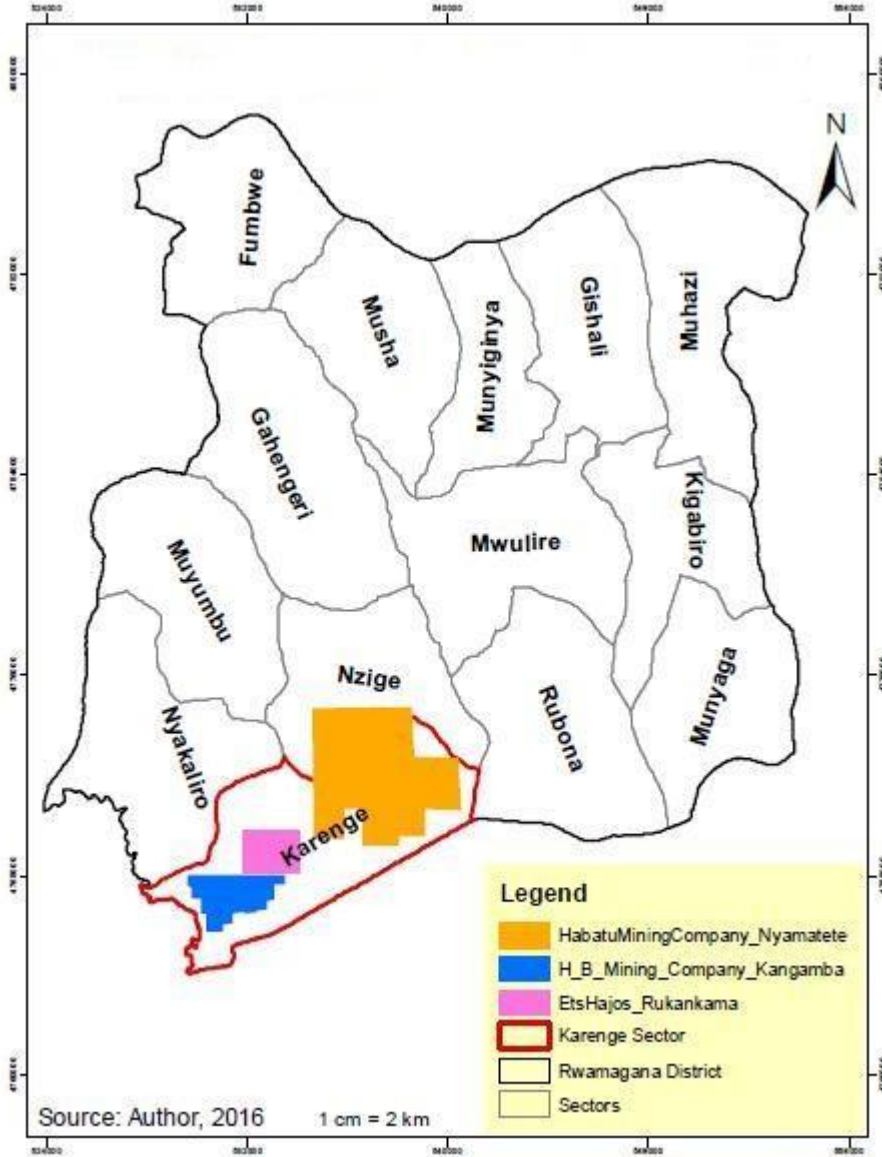
This chapter presents the research methods, procedures and tools that guided the collected data and information which enabled the researcher to verify the hypothesis and reach conclusions.

### **3.1. Study area description**

The study was conducted in Karenge Sector, Rwamagana District, Eastern Province of Rwanda. It is an area with many new ASM companies and only few of them have exploitation license which are subject to EIA requirements. Many of the ASM sites started to be mined in the year 2010. This means the majority of them are still under exploration activities. Since 2013, Karenge Sector has some of the most productive ASM mines compared to other sectors of Rwamagana District (see appendix 2, the figures on ASM production in Karenge Sector). The main ASM companies being H&B Mining Company Ltd, HABATU Mining Company Ltd, La Misericorde Trading Company Ltd and Ets HAJOS.

This is something that could raise any researcher's curiosity on how friendly those ASM operations are to the surrounding environment provide that the area is home to Mugesera Lake (a fragile ecosystem). Karenge Sector is also known for its coffee and banana farming activities as its agricultural specialization and main source of income for the majority of population. Another important aspect of the Karenge Sector is its relatively high population density estimated at 361 inhabitants per square kilometer (Nyiransabimana, 2014).

**Figure 3-5: Mining Perimeters in Karengu Sector**



Source: Author, 2016

### 3.2. Data collection methods

Given the descriptive nature of this thesis and in order to attain the research objectives and drawn research questions, the suited research methods comprised of both documentation research for collection of secondary data and field work for collection of primary data.

### **3.2.1. Documentation**

As part of the collection process of secondary data, the literature review mainly focused on the review of EIA reports, mineral and environmental regulations in general and specifically those of artisanal mining in Rwanda. In addition to the EIA and their proposed environmental management plans (EMP), ASM business plans documents were also reviewed.

### **3.2.2. Selection of ASM mines**

As mentioned in section 3.2. (description of the study area), the selection of ASM mines in Karenghe Sector that are subject to this research were based on the possession of mining licenses by those mines and the quantity of minerals (3Ts at least) being produced. It is obvious that a mine with a big production is likely to be environmentally affected than one with low production. Thus, only 3 mines including H&B Mining Company Ltd, HABATU Mining Company Ltd and Ets Hajos were singled out.

### **3.2.3. Primary data collection**

The fieldwork was composed of field structured observation and the qualitative analysis to appraise the level of implementation of the EIA.

#### ***3.2.3.1. Field observation***

The field structured observation was undertaken to collect the primary data/qualitative at the said three mines. Bentley et al. (1994) mentions that observations are structured when an observation list is used with a fixed number of points to notice, and when this list is applied in a pre-determined number of situations, or with a pre-determined number of people. The rationale behind the field observation was to witness in-situ and to collect ground facts on how EMP is being translated into reality at the mine site level. By field observation, it was possible to capture firsthand information while touring the mining sites.

The field observation looked at and covered the approved EMP activities of the three respective ASM mines in the study area, and that are supposed to be implemented. However, because of limited logistics and financial means, the field observation did not look at EMP activities that require laboratory analysis to determine the status of the environment, but it focused on the



physical elements of the environment (as they are described in each mine's respective EMP document). The physical features are those whose implementations are verified with the human sight and basic measurements using folding meter for example. The evidence of the observation was recorded via note taking, geographic coordinates and photographs capturing with Garmin GPS map and camera for navigation/positioning and documentation respectively.

### ***3.2.3.2. Semi-structured interviews***

Other primary data were collected through semi-structured interviews with managers and some employees of the three mines and key field staff of the lead agencies as well. The interviews were conducted in the period of March to July 2016.

#### ***A. Focus on the interview***

The interview questions were addressed to two categories of ASM operators and technical staff of the government lead agencies in charge of overseeing the implementation of the EIA. Thus, two types of questionnaires were designed to target the two mentioned categories.

Questions towards operators were focusing on the current level of EIA implementation, the internal organization and readiness of the ASM companies to implement EIA and challenges they are facing in that process (See appendix 3).

For lead agencies, questions were structured to have information on the capacity of each targeted lead agency to be on top of the situation in regard to the supervision of the EIA implementation in the ASM sector (See appendix 4).

#### ***B. Selection of interviewees***

The purposive sampling technique was applied to select respondents who provided information at different stages of this research. This technique was used since it allows the researcher to determine the respondent who can provide the best information to achieve the objectives of the envisaged study (Kumar, 2005).

Interviewees were technical and managing directors of the selected ASM mines. We also interviewed one senior environmentalist from REMA, one mine inspector from RNRA/GMD and one Officer in charge of environment at Rwamagana District Office. The choice of the interviewees was motivated by the fact that these are senior field specialists who have the mandate of conducting mines and environmental inspections, and in return they advise their

respective institutions on individual cases identified on ground. They are well positioned to understand field context and confront it with the existing legal framework; thus, they provided crucial information.

The collected information enabled to link the efforts lead agencies in the enforcement of the environmental instruments with the actual efforts of ASM operators in Karengye Sector to meeting expected environmental compliance.

### **3.3. Data processing and analysis**

For the purpose of analyzing and processing environmental data collected from the study area, the computer interface (Microsoft Office 2010) was used to conduct the content analysis (for both conceptual and relational) and thesis writing.

The used research methods helped in the successful collection of primary and secondary data and guided their compilation and analysis as described by the next chapter which provides the study results and discusses them as well.

## **Chapter 4. RESULTS AND DISCUSSIONS**

The current chapter presents research results, interprets and discusses them. It mainly emphasizes on the assessment of the EMP implementation by the three selected mines, the main environmental challenges miners faced and explores some best practices to enhance their effort towards compulsory environmental compliance.

### **4.1. Environmental Management Plan for targeted mines in Karenghe Sector**

As mentioned in the methodology section, this study looked at all elements of the EMP of each mine: H&B Mining Ltd, HABATU Mining Ltd and Hajos Enterprise and the check whether all EMP activities which have been implemented, the ones in progress and the yet to be implemented.

When a clearance/approval certificate for EIA/EMP is issued to any mine project by RDB, the latter also adds another list of environmental conditions to comply with (see table 4-3 and RDB, 2013). It is important to note that these are conditions that may also cover mechanized mining activities; therefore, due to the low level of investment and ASM operations, some of the conditions may not be applicable to some of these mines.

**Table 4-3: Implementation of RDB general environmental conditions for the three targeted mines.**

#	EMP activity to be implemented	Status		
		HAJOS	HABATU	H&B
1	Provide all staff on sites with protective equipments	v	v	v
2	The extraction area should be fenced to avoid non-staff to enter on the site	v	v	-
3	No mining and construction works shall be carried out during night hours	v	v	v
4	Blasting activity if any shall be authorized by the Minister of Internal Security and the surrounding people shall be informed in advance on those activities	-	v	v
5	Provide a warning systems to the community before the extraction	-	v	v
6	Avoid the emission of dust emanating from the earth works on sites or due to road use from or to mining sites, driving speed be reduced to minimum, within the mining area	v	v	v
7	Potable water should be available on project site	v	v	v
8	Ecosan toilets should be available on project site	-	-	-
9	Put emphasis on tree planting program within and around the project site as a mitigation measure to noise and dust emitted in the atmosphere	v	v	-
10	Dust extraction and collection would be provided	-	-	-
11	Security measures shall be taken to avoids accident following embankments failure, falling rocks and any other form of fatal accident during mining operations	v	v	v
12	A first aid kit should be made available on site, transport means ready for any injured to the nearest health centre, and some of the workers trained in injury handling techniques	v	v	v
13	Stockpile topsoil for future use in the rehabilitation of used sites on top of the site to ease the rapid growth of vegetation	-	-	-
14	Undertaking systematic rehabilitation of the exploited sites	-	-	-

	in such a way that the new site opening goes simultaneously with full restoration of the previous ones			
15	Make sure that reservoirs and settling basins are fenced to limit and control their access	-	-	-
16	Installation of traps for stored loose construction such as sand	-	-	-
17	Establish an onsite storm water conveying system	-	-	-
18	Provision of an ecological onsite sanitation facility using dry method	-	-	-
19	All machinery and equipment shall be in good condition	v	v	v
20	Provide sign posts to indicate where mining extraction activities are carried out	v	v	v
21	Abandoned mining area should be rehabilitated, backfilled and re-vegetated to avoid vectors and therefore source of diseases	-	-	-
22	Water spraying system would be installed on sites before during mining activities to avoid dust	-	-	-
23	When appropriate, all works should start when all expropriation and compensation activities have been completed with involvement of the District	-	-	-
24	Oil waste is captured and disposed of in appropriate area	-	v	v
25	Organize sensitization sessions on the prevention measures to avoid accidents and HIV/AIDS pandemic, malaria and water born diseases, contaminations.	-	v	v
26	Sensitization of workers on adhering to Mutuelle de Sante and SACCOs schemes,	v	v	v
27	Subscribe workers to Rwanda Social Security Board,	-	v	v
28	Strict respect of the EMP established in the Environmental Impact	-	-	-
	<b>Marks</b>	<b>39.2%</b>	<b>57.1%</b>	<b>50%</b>

Source: RDB, 2013

v: Means an EMP activity that has been completed or an ongoing one.

-: Symbolizes an EMP activity that is yet to be implemented.

The table above illustrates 28 additional environmental requirements from RDB (2013) to which each of the three ASM companies committed to implement. As of May 2016, H&B, HABATU and HAJOS mines had only complied at a level of 50% (14 activities implemented out of 28), 57.1% (16 activities implemented out of 28) and 39.2% (11 activities implemented out of 28) respectively.

The displayed figures show that even those ASM indicated as organized and promising still have a long way to go as the most advanced one is at 57.1% in the implementation of GoR environmental requirements.

## **4.2. H&B Mining Ltd**

### **4.2.1. General status of the environment at H&B Mining Ltd**

During the field visit, the first impression may confirm that the mine is among ASM role models in Rwanda in terms of improved mining operations and level of organization, RNRA/GMD (2013). However, after the assessment of the mine, many issues of environmental protection were identified. These include the current problems related to soil erosion on massive tailings stockpiled on the major sites where mining operations are taking place. Also, the mine sits on accident prone sites due to a large abandoned and unfilled site. See below sections.

In general, the mine has basic infrastructures including offices, stores, bathrooms, toilets to serve miners and employees working in offices and in different corners of the concession. Many of their tunnels are electrified; they have a well organized and improved mineral washing system which minimizes the use of water and a bulldozer machine to clear when the site is burdened by waste soil, rocks and mineral tailings, especially to prevent waste water to contaminate the nearby Mugesera Lake and its wetland. This relatively high investment reflects the potential and richness of the mineral reserve at that mine.

*Photo 4-3 Mineral washing facility and an excavator used for various sites clearing activities*



Source: Author, 2016

#### **4.2.2. Risks of accident due abandoned sites**

Failure to comply with REMA and RDB requirements which are advising a systematic rehabilitation of the exploited sites in a such way that the new site opening goes systematically with full restoration of the previous ones RDB (2013), made the mine have abandoned/old pits sites which are unfilled/non-restored with soil and vegetation. That unfilled site presents a huge accident risk to mine workers, nearby residents (even babies who can sometimes move within the active sites with adults) and domestic animals (see photo 4-2), as the site was extracted in an opencast, pits and tunnel systems, and is around 15 meters deep with a diameter of many dozens of meters. The site findings concur with Kabatesi (2014), who stated that excavated pits are left unfilled.

*Photo 4-4: Non-fenced, unfilled and abandoned site at H&B*



Source: Author, 2016

#### **4.2.3. Soil erosion**

The lack of vegetation cover on tailings and soil wastes are not properly disposed at this mine. This is among the most common elements of environmental noncompliance that was sighted



during the site visits. As results, soil erosion on those massive mineral wastes is very serious to the level that if nothing is done, the nearby Mugesera Lake wetland will be polluted and silted as well. Then push further the reasoning on the possible consequence of the pollution and silting on water resources, water treatment because the water of the lake is treated and distributed to the population in the area and Kigali. Another risk of drying up of the lake because silting exposes more surface area, this increases the evapotranspiration.

*Photo 4-5: Insufficient protecting vegetation on abandoned waste soil*



Sauce: Author 2016

#### **4.2.4. Lack of monitoring measures of water quality**

One of the critical environmental component that is not followed up, and yet it appears among the mine EIA requirements, whereby the monitoring of water levels (by the mine company) in adjacent land to tailings ponds should be conducted RDB (2013). The field evaluation revealed that, there is no measurement or monitoring data available nor conducted on water levels especially that the mine operates a few hundred meters away from Mugesera Lake wetland (see picture 4-6). This is a fragile ecosystem that needs frequent mentoring to check the toxic chemical elements that might have infiltrated the wetland through water runoff and erosion.

REMA (2015) confirms that the mining and/or processing activities at all of the studied mines release waste into rivers, onto adjacent agricultural lands and close to settlements. It also recognizes that the main threats are from dumps of mine tailings and waste released from processing plants.



*Photo 4-6: Mugesera Lake wetland separates two hills where H&B mines.*



Source: Author, 2016

MINIRENA, and IGF (2017) indicate that the below listed truth constitute is considered as some of the major problems in the management of the environment in the mining sector in Rwanda:

- Water quality guidelines and monitoring – specific to metal contamination of water catchment areas;
- Local government capacity on environmental issues is limited
- Waste management is not formalized;
- Quality of emergency planning, preparedness, and response is low.

#### **4.3. Evaluation of EMP implementation at H&B Mines**

The table summarizes all EMP activities under which H&B Mining Ltd received a Certificate of Approval by RDB as a sign that the submitted EIA Report for the mining project was found to have adequate mitigation measures related to the identified impacts of the envisaged activities of the project on the environment, and was therefore approved, RDB (2013).

**Table 4-4: Evaluation of the implementation of H&B Mining Company Ltd specific EMP**

#	Specific EMP activity to be implemented by H&B Mining Company Ltd	Status
1	Minimize line width during trenches/line cutting	v
2	Infill and re-vegetation and after sampling and mapping during prospection activities	v
3	Minimize where possible the influx of population coming for mining activities	v
4	Consider reuse, recycling and treatment of waste water	-
5	Stabilize with waste rocks shallow and deep underground mining	v
6	Minimizing disturbance to vegetation and soils	v
7	Reforestation on the overburden disposal	-
8	Minimize soil erosion by sowing grasses on overburden, tailings, river banks and lake shore, etc	-
9	Block water from flowing at the nearby lake or river carrying soils	v
10	Landscaping (terracing) for a well disposal of waste rock and overburden	v
11	Re-vegetation of dumps, waste rock and overburden	-
12	Use of waste rock as backfill in mines to stabilize waste rock and overburden	-
13	Construction of tailings ponds	v
14	Monitor water levels in adjacent land to tailings ponds	-
15	Non-hazardous solid waste should be collected and disposed at an approved sanitary landfill	-
16	Workplace program to prevent new HIV/AIDS infections and provide care and support for infected and affected workers	-
17	Construct necessary facilities as workers	v
18	Appoint a Site Environment Officer (SEO) to enforce this EIA	-
	<b>Mark (9 activities out of 17)</b>	<b>50%</b>

Source: H&B Mining Company Ltd, 2013

v: Means an EMP activity that has been completed or an ongoing one.

-: Symbolizes an EMP activity that is yet to be implemented.

The table 4-4 lists the company 18 EMP specific mitigations measures to be implemented before the expiry of the company mine permit by 2018. So far, only 9 of them, representing 50% were implemented as of mid-2016. Note that H&B has a five years renewable mining license, issued in 2013 and will end in mid-2018. From the above table, the mine is on good track even though expectations are always high because EIA or EMP are ASM own commitments. Thus, this progress is not satisfied.

#### 4.4. HABATU Mining Ltd

##### 4.4.1. Status of environment at HABATU Mining Lt

At this mine, the main mining operations take place in Nyamatete and Bicaca cells of Karenge Sector. Minerals are mined in deep underground electrified tunnels even though the EIA does not clarify whether mining operations should be underground or open cast (source). Operators choose themselves the mining methods depending on the geology and mineralized veins and costs involved. The electricity is generated by power generator machines and mining activities are taking place on the land acquired by the company after compensating the previous tenants.

*Photo 4-7: General view of one of HABATU active sites*



Source: Author, 2016

*Photo: 4-8: Old mine site being vegetated at HABATU mine*



However, HABATU has a lot to do to improve on environmental aspects, as it is not respecting well all its responsibilities in that regard. For example, the straight forward environmental

issues observed once at the mine, is the piles of used plastics bags to move mineral sands from tunnels are disposed near the tunnel entrance and sand washing station. Another environmental issue is the presence households living a few meters near the tunnels, lack of water quality monitoring and erosion on soil wastes and tailings.

#### **4.4.2. Plastic bag disposal**

The field observation revealed the presence of scattered utilized plastic bags near the tunnel entrance and mineral washing place. These are bags used by miners to transport minerals sand from inside the tunnel to the washing place. Their presence is in contradiction to the mine’s EMP advising to dispose nonhazardous wastes to approved dumping site, HABATU (2013). It is important to recall the REMA, 2006 use of plastic ban on Rwanda Territory. Some of the most common consequences of scattered plastic bags are that they prevent water infiltration and some of them may contaminate the soil with chemicals (polythene) they are made of.

*Photo 4-9: Inappropriate disposal of used plastic bags*



Source: Author, 2016

#### **4.4.3. Residents living within active mining perimeter**

Despite a lot of effort by the mine to expropriate residents near the site, there are households are still living within 150 meters from the active site. Obviously, this is posing a risk of pollutions caused by various mining activities (noise pollution, air pollution by particles and then respiratory diseases in the population). As per the EIA/EMP, mining operations should start after all necessary land expropriation have been done RDB (2013).

#### **4.4.4. Presence of severe soil erosion**

Unlike H&B, HABATU has so far put less efforts to fight against the soil erosion on the wastes/overburden. This is very crucial provide that the water pond (where waste water is channeled) is located in a valley with agricultural potentials. During the visiting period, banana and sorghum were the main crops that were being grown that valley. If nothing is done to prevent this, this valley is also at risk of being flooded by the non-disposed waste soil and the low land is sedimented with sand mining wastes as well.

It is also in the views of REMA (2015) that mining has local impacts on water quality with the potential for heavy metals (lead, cadmium, zinc, copper) to accumulate in soils and enter the food chain, especially in floodplains used for agriculture and irrigation.

*Photo 4-10: Erosion of waste soil at HABATU mine*



Source: Author, 2016

Erosion and related land degradation problems are also present on other ASM areas in Rwanda like sites located in Rukoma Sector of Kamonyi District as noted by Niyishobora (2013).



#### 4.5. Evaluation of EMP implementation at HABATU Mining Ltd

Table 4-5: Evaluation of the implementation of HABATU Mining Company Ltd specific EMP

#	Specific EMP activity to be implemented by HABATU Mining Company Ltd	Status
1	Restoration of the vegetation cover after the activities of mineral prospection by planting of trees and grasses including pasprarum	v
2	In-fill of trenches and sampling pits immediately after prospection pits prospection	v
3	Equip tunnels with supporting walls	v
4	Creation of buffer zone of 30 meters around the sand settling pond to minimize the deterioration of water quality in rivers, wetlands, and rainwater flow	-
5	Planting of filtering grasses around the sand settling pond and overburden	-
6	Apply anti erosion techniques around the mining area	-
7	Use of ears protection equipments during mining activities	-
8	Supply of drinking water	v
9	Water spraying system would be installed on sites before during mining activities to avoid dust	-
10	Employ women and residents near the mine	v
11	To avail condoms to all miner workers	-
12	To pay miners insurance	v
13	Report any accident at the mine	v
14	To wear protective equipments all time at the site	v
15	Appoint a Site Environment Officer (SEO) to enforce this EIA	-
	<b>Mark (8 activities/15)</b>	<b>53.3</b>

Source: HABATU Mining Company Ltd, 2013

v: Means an EMP activity that has been completed or an ongoing one.

-: Symbolizes an EMP activity that is yet to be implemented.

Like its sister mine, the table above highlights that further improvements are needed because, as of mid-2016, out of 15 EMP mitigation measures, only 8 were implemented, representing 53.3% of the total activities. Note that the company mining permit will also expire in 2018. Even if there is no scale to which progress are considered poor, good or better against a certain time period, in the environment, the implementation should be optimal, provide that these EMP activities are miners' own commitment where the Government didn't influence the process of their elaboration. You would find that many of the activities that are not yet implemented don't

necessary require the mobilization of important funds, but the fact that are not implemented are sometimes perceived as lack of environmental awareness on the company's end.

#### **4.6. HAJOS Enterprise**

##### **4.6.1. Status of environment at HAJOS Enterprise**

The active tunnels being located at less than 100 meters before Karengé trading center on right on the main, in Karengé Cell, this mine is not doing much to put into actions its EMP. As general direct and foreseen environmental issues, are those of residents leaving in less than 50 meters from the tunnels and pits, in some parts, the mine is not well fenced to avoid mine accidents that may happen especially due to unfilled and abandoned sites and degradation of farmland around due to soil overburden. Lucky enough, the mine is free of severe erosion due to the relatively flat terrain where mining operations active in addition to the mine underground operations.

*Photo 4-11: HAJOS Mines within Karengé trading center*



Source: Google Earth, 2016

The white stain on this google image shows the location of HAJOS which is very close to the Karengé trading center and within residential houses.

#### 4.6.2. Evaluation of EMP implementation at HAJOS Enterprise

Table 4-6. Evaluation of the implementation of HAJOS Enterprise specific EMP

#	EMP activity to be implemented by HAJOS Enterprise	Status
1	Restoration of the vegetation cover after the activities of mineral prospecting by planting of trees and grasses including <i>pasprarum</i>	-
2	In-fill of trenches and sampling pits immediately after prospecting pits prospecting	-
3	Creating stairs and other subsoil support during exploitation of minerals depending on soil layers reached	v
4	Stop the use tyres to warm the rock/quartzite vein to avoid air pollution	v
5	Apply anti erosion techniques area the mining works at reforestation after mining activities	-
6	Storage of top soil layer in a secure place and use the site restoration after the mining works	-
7	Use explosives with less than 360 Kg by shoot	v
8	Water spraying not during mining activities	-
9	Supply of drinking water for mining activities and workers	v
10	Construction of public toilets at the mine	v
11	Employ women and residents near the mine, as they have lost the agricultural land to mining activities	-
12	Expropriation of land near mine sites	-
13	Avail condoms at the site to all mine workers	-
14	Wearing personal protective equipments all time at mine	-
15	Report any accident occurred at the mine site	-
16	Buy all workers life insurance	v
17	Appoint a Site Environment Officer (SEO) to enforce this EIA	-
	<b>Marks (6 activities out 17)</b>	<b>35.2%</b>

Source: HAJOS Enterprise, 2013

v: Means an EMP activity that has been completed or an ongoing one.

-: Symbolizes an EMP activity that is yet to be implemented.

The above information in the table simply clarifies how serious environmental damage at HAJOS mine is. It also reflects the information provided by the EO of Rwamagana District. The mine was found to have implemented 35.2% of EMP environmental measures, representing 6 activities out of a total of 17.

This study reveals that the 3 ASM companies don't hold any proper or structured way of recording environmental activities undertaken or ongoing.



## **4.7. EIA implementation challenges in ASM**

### **4.7.1. Views of HABATU and H&B mines staff**

It turns out that Habatu and H&B mining companies belong to one mine operator.

In the interview, the Technical Director of the two companies reported six challenges with regard to the implementation of EIA.

Firstly, the terrain on which the mine operates is relatively steep, thus making it difficult to manage. It does not make it easy for the control of erosion and other measures mentioned in the EMP (see tables 4-4 and 4-5).

Secondly, they mentioned the high cost which is not reflected and not anticipated in the EIA study report conducted by the private consultants due to their lack of mining engineering skills and experience that are needed to be related to the environment.

According to MINIRENA, IGF (2017), EIA consultants who carry out the EIAs themselves require capacity building. According to the same sources, insufficient collaboration in assessment and approval of EIA between agencies responsible for mining, environmental management, and the agency in charge of land, lack of consultation of the local communities in mining area before the EIA is approved

Operator's staff said that they have spent over RWF 45 million in protecting the environment in 2015 for the two mines, especially on building tunnels and other safety engineering activities. *"This is why the mine operators only do what the inspection teams from government institutions instruct to do or implement actions that we think the said organizations will appreciate or those which directly contribute to the safety at our mines"*, they added.

Thirdly, less importance is paid by the mine owner on the EIA report that was produced with the purpose of complying with the application formalities for mining license while it should be a reference document to guide miners on most of aspects of environmental protection. As matter of proof, none of the three operators had a copy of the EIA report in their mine offices.

Fourthly, the two Technical directors declared that the fall of mineral price at the international market does affect the way EIAs are implemented as they do not get the necessary fun to invest in the environment due to low business return.

Fifthly, the lack of necessary skills to report what they have achieved in EIA implementation to relevant government institutions.

Finally, the smallness of the surface where mining operations take place as land compensation is very expensive reported as a challenge, since the mine has to deal with a big number of land owners (on a very small land perimeter due to high population density) with different and unrealistic expectations in terms of land pricing as they think the land if filled with high value minerals wanted by people with massive money.

#### **4.7.2. HAJOS Enterprise**

The manager of this mine concurred with the views of his fellow miners of H&B and HABATU that the EIA implementation is very expensive, especially when mineral prices fall. But he could not prove his statement using his business figures and his company doesn't document expenses incurred to implement the EMP at his mine. He added that the inspection teams from the relevant Government institutions need to appreciate even the little they are doing to comply with environmental standards. He recognized the importance of EIA in the mining operations. His thoughts are that the paid environmental bond to the Government is not significant to become the main problem of noncompliance to the EIA.

### **4.8. EIA enforcement challenges in ASM Sector**

#### **4.8.1. Views of RNRA/GMD**

The Mine Inspector based at (based at RNRA/GMD headquarters in Kigali) in charge of the Eastern Province; declared that inspections of mines are organized in a way that each mine in Rwanda would be inspected at least twice a year by the RNRA/GMD inspectors (with offices in Kigali). He confirmed that twice a year is far not enough to ensure that all mines (around 300 with exploration and mining licenses, RNRA, 2016) are guided to comply with approved environmental standards. The RNRA/GMD has a total of 6 inspectors at national level, while in full capacity, the agency should have 7 ([http://rnra.rw/fileadmin/user\\_upload/documents/land\\_doc/NEW\\_ORGANISATION\\_STRUCTURE.pdf](http://rnra.rw/fileadmin/user_upload/documents/land_doc/NEW_ORGANISATION_STRUCTURE.pdf) ). This implies that at least every inspector should inspect a total of 50 mines in addition to 19 active mineral trading/processing facilities operating in Kigali.

MINIRENA, IGF (2017) concurs with the above views that Rwanda does not have enough mining inspectors in the country; inspectors do not have specialized skill sets in the various topics covered in the monitoring of the Environmental Management Plan.

The Mine Inspector disagrees that financial constraints as being among the main reason for environmental non-compliance by ASM. His statement could be supported by the fact that a company including HABATU Mining Company Ltd, producing 40 tons (MINIRENA, 2015) of mixed coltan and tin/year, with a value of RWF 600 million, when a Kg is sold at the lowest of RWF 15,000 RWF. Yet, the total implementation cost of EMP/EIA for five years (expiry period of a mining license) is estimated at RWF 8,150,000 (HABATU, 2013). For H&B and HAJOS their total cost for EMP/EIA implementation is RWF 12.7 million and RWF 43 million respectively. It is also important to assess whether the EIA reports give the good estimations of implementation costs.

He further specified the below as part of the main challenges to the full implementation of EIA in the majority of ASM operators as he considers the implementation to below.

- small number of mine inspectors, this was already mentioned above
- no specialized skills in environment by min inspectors,
- low level on environmental awareness among ASM,
- gap in the enforcement of mining and environmental regulations,
- lack of enough knowledge on EIA/EMP by RNRA/GMD inspectors,
- lack of EMP/EIA only oriented inspections, as the usual ones combine all aspects of mines including mineral production and their tracking, mines corporate responsibilities, taxes, etc
- history of mining in Rwanda: where whereby some miners engage in mining business only by speculation without a real commitment and understanding of the sector: thus, with no care on the environment.

#### **4.8.2. Views of REMA Director in charge of environmental regulation and pollution**

The REMA Director in charge of environmental regulation and pollution said that, despite their team of 8 staff, being in charge of monitoring the environmental across all sectors of the, they always try their best to follow up issues of compliance in the mining (see

<http://rema.gov.rw/index.php?id=19>). According to him, REMA does not have enough human resources to ensure their employees conduct at least two visits per year to all mines. He emphasized that presently REMA is doing joint inspections with RNRA/GMD and the Environmental Protection Unit of the Rwanda National Police, to guarantee that a mine found to not be compliant is held responsible immediately.

When asked on the level of EMP/EIA implementation in ASM, he advised that it is not strategic to make it mandatory for all mines to employ environmental officer who will be answerable to all environmental issues. He instead advocates to see 3 or 4 ASM operating in the same geographic area to hire 1 mining technician who would also advise on environmental and mining operations issues; in no order to minimize mines' overheads.

Director from REMA mentioned the following facts as the main barriers for ASM Companies to be fully compliant:

- lack of a sense of responsibility and unclear structure of mining operations: in many cases, the concession owners leave all mining operations in the hands of local community living near it. With almost no basic mining techniques and no environment consideration, these people will only chase mineral veins. The owner will only go to site to collect and pay for what have been mined.
- lack of knowledge on environmental protection.
- transfer of the profit from mining to other sector: Some ASM operators do not have any long vision of their mining businesses, since they are not able to determine the mineral reserve and deposit within their concession, and investment in the environment to enable a proper mining of the discovered reserve
- lack of commitment to implement EIA.

#### **4.8.3. Views of Rwamangana District Environmental Officer**

Enthusiastic to answer interview questions, the Environmental Officer (EO), declared that they conduct environmental inspections every semester as stipulated in the district regulations and intervene when there are reported complaints based on disturbances of residents living near mine sites. HAJO Enterprise mine is among those regularly visited mostly due to land

compensation/expropriation issues between the mine and residents living near and within the mine perimeter. HAJOS is also visited due to its proximity to Karengé trading centre.

He said that the district officer in charge of mining cannot monitor all mines within a semester since inspections are conducted by a team composed the EO, Forest Officer, and Agriculture Officer of each Rwamagana sector. It is not easy to have them available at the same time because they have different responsibilities. Also, because they regulate environment in other sectors of the district economy other than mining.

His thoughts are that the level of EMP/EIA implementation by ASM in Karengé Sector is not good; they still have a long way to go, however, there is progress given his reminder that the EIA concept in mining and other sectors in general is new and it is early to fully achieve all EMP targets. He gave an example of where the EIA implementation helped to minimize the use water in HABATU and H&B mines.

The EO also stated that there was no link between the drop of mineral prices at the international market and the EMP/EIA compliance at ASM mines, but the opposite is true as miners tend to work hard to earn money when prices are good and tend to forget environmental aspect. He concurs with REMA and RNRA/GMD that is not a good idea to make it mandatory for all ASM mines to have EO simply because EMP/EIA activities do not need a permanent presence of the EO. He supports any actions and initiatives that would help and enhance ASM environment compliance and follow up/reporting of the EMP activities as well as awarding the best performers.

The fact ASM companies do not see sustainability in their mining operations is due to lack knowledge about the exact mineral reserves and deposits is the major cause of not investing in environment as it creates uncertainty and less hope about the future of the mine. As results, the profits from mines operations, are invested in other economic sectors. It is now known that many ASM company owners possess hotels, manufacturing industries and other businesses in Rwanda where it is easy to estimate the long-term profitability.

The district EO emphasized that the following factors are also part of major causes preventing mines to fully comply with EMP:

- low level of environmental awareness and less importance of EIA and they don't see it as part of their investment obligation;
- lack of deep exploration studies to determine concessions reserves and deposits;
- small number of staff available at the District Office to enforce the environment standards in a satisfactory manner.

He advised both miners and the GoR to invest in a sustainable mining and increase the budget for enforcement respectively.

#### **4.9. Proposed best practices to enhance EIA/EMP implementation and enforcement**

The purpose of this section is to propose some best practices that would help to continue the started long journey of enhancing the implementation and enforcement of EIA and its components while

- Minimizing the implementations costs by miners;
- Taking into account the skills issues especially from miners;
- Summarizing for miners and inspection teams (from lead agencies) the ordinarily voluminous EIA report and sometimes difficult to interpret;
- Encouraging the self-monitoring by miners as government institutions will never be present every day at all mines to enforce EIA;
- Easing the follow up, data collection and reporting to both mine operators and lead agencies;
- Increasing the environmental awareness of miners and related accountability.

##### **4.9.1. Issuance of appreciation certificate and award for environmental compliance**

During interview with officials from lead agencies, they all concurred with the idea of continuing to organize annual events whereby ASM which performed well in terms of environmental standards should publicly be recognized GoR and be appreciation certificates or award. This will create and spur competitions and innovation in environmental friendly mining operations. The financial resources should be arranged by lead institutions including RNRA/GMD, REMA, and other key environmental partners.

#### 4.9.2. Internal company tools for environmental data collection and reporting

Most of respondents strongly supported the idea of developing an environmental data collection and reporting tool for ASM mines compliance. Appendix 1 proposes a reporting tool/format that will help ASM assess the number of environmental activities that awaiting them, and will serve as a reporting tool showing the progress being made at each stage of implementation.

The proposed information management tool on environmental activities is a real-time data collection and reporting tool which allows the capturing of electronic data right from the mine sites by employees of an ASM mine using an application installed on a smartphone or any other mobile gadget. The tool will be populated with the list of EMP activities for each ASM site, their implementation status (e.g.: done, ongoing or to be done), incurred expenses, challenges encountered during the implementation of each EMP activity at a specific ASM site. Any other data which would inform any relevant institution on the status of the environment at a given period and site.

The collected information will be instantly submitted to the lead agencies in any desired format including pdf, excel, word or simply through the database managed by lead agencies.

This tool will improve the data availability, efficiency, reduce administrative burden and minimize the risk of errors on both in-charge Government and operators ends.

Photo 4-12: Electronic devices for automatic data capture visualization



*Source: Google, March 2017.*

The use of an electronic data capture system in ASM is also complying with the Government policy of digitizing all information from various socioeconomic areas from in Rwanda.

This idea was put forward by the interviewed RNRA/GMD inspector, and confirmed the institution has not yet developed any internal based system guiding the inspectors or mine operators while tracking environmental status and progress from ASM. Again, as per the environmental law, ASM will need to annually submit a report on their implantation progress using the same tool. The principal is to design a system or application which is friendly and easy to use that would be translated into Kinyarwanda (the application/interface) to allow any miner with basics on environment to complete it at their ease.

From experience, in 2014, MINIRENA initiated a reporting format for monthly mineral production and export as per the mining code (<http://www.minirena.gov.rw/index.php?id=132>). This template has been made available on MINIRENA and RNRA websites and the number of operators who timely submit their monthly mining activity reports has increased (RNRA, 2015). Before the said template (in both English and French) was made available, a fine of RWF 100,000 used to be applied because most of ASM and mineral traders were unable to produce a report by themselves. Lead agencies (inspection teams) should use this template to verify what has been reported by ASM with actual ground truth (See appendix 1).

This application/system should be made available (free download) on google play (the application bank for smartphones) and on internet in general.

#### **4.9.3. Specialize RNRA/GMD EIA oriented inspections**

It is more strategic that the above institution organizes only EIA oriented inspections to systematically check the progress being made on the implementation of each EIA/EMP planned activity and investment being incurred as well encountered challenges.

The RNRA/GMD Mine Inspector informed that During an inspection of an ASM, the inspector(s) conduct a wide range of verifications including human rights, labor conditions, land conflicts, presence of women and children, level of investment, census of miners, checking of mineral production records, holding meetings with local government leaders, socio-corporate responsibilities, general health and safety issues, tax payment, environmental status, etc.



In this type of mine inspection, it is obvious that environment compliance is not given enough attention, thus, a pressing need for mine administration to consider conducting only environmental oriented inspections.

#### **4.9.4. Government investment in deep and small-scale exploration activities.**

The views (from most of interviewed officials from lead agencies) that miners do not intentionally invest in EIA implementation and divert the accumulated benefits to other businesses, simply because they do not see any sustainable benefits (as they see the mineral serves and deposits that can mined in certain number of years), would be removed by investing in deep exploration work by the government. The very promising concession could be sold to ASM companies that are ready to fully comply with the environmental standards. It is already known that mining exploration is a very costly activity and demand highly skilled people; thus, it considered to be driven by and under government means. Therefore, I would be part of state effort to modernize and professionalize mining activities.

#### **4.9.5. Compensation of land owners before any grant of mining license**

Currently, it is not mandatory for miners to acquire land before to the grant of the license by the government. To actively reduce land conflicts between concession owners and residents near the site as well as preventing any environmental damage due to mining operations taking place households, the mining authority should make it mandatory to anyone (individual, enterprise or company) intending to acquire an exploitation license to prove the availability of a piece of land that has been secured before the grant of the license to ensure a smooth mining start of mining operations. The acquisition should be done either by compensating local residents, purchase, or leasing. The minimum size should be set by the mining authority to allow enough space to install basic mine infrastructures such store/office, space for digging tunnels/pits/shafts, bathrooms, space for mineral washing, wastes disposal, and other preliminary mine activities. If well enforced this will be an additional element that would help identify and challenging those acquiring mining license by speculations, less sensitive to environmental concerns. Thus, paving way for a continuous improvement and moderation of the artisanal mining sector as per MINIRENA vision.

## 5. CONCLUSION AND RECOMMENDATIONS

### 5.1. CONCLUSION

The objective of this study was to assess the environmental compliance of ASM in Karengé Sector of Rwamagana District in regard to the implementation of their respective EIA documents. The study focused on three ASM mines including H&B, HABATU and HAJOS mines all operating in Karengé Sector of Rwamagana District all mining tin and tantalum.

including an excavator, secured tunnels, improved mineral washing system as well as and mining infrastructure such as running water and electricity, H&B Mining Company Ltd is confronted to environmental problems due to noncompliance of EIA standards. The study findings show that only 50% of EIA/EMP activities have been implemented or are ongoing.

Among the observed environmental problems include the risk of accidents on employees due to a 15 meters deep abandoned site with a diameter of many dozens of meters which is not filled and vegetated. This is in contradiction with this mine EIA/EMP approved by RDB in 2013. The latter advises a systematic rehabilitation of the exploited sites in a such way that the new site opening goes systematically with full restoration of the previous ones.

Soil erosion on waste soils which are not well disposed and lack of monitoring measures of after quality and levels to adjacent lands were also part of the site identified environmental issues given the part of the adjacent land to this mine the Mugesera Lake and its wetland located at less than 200 meters from the mines sites.

Mining operations being organized the same way as at H&B, EIA implementation level is generally around 55.8% (specific EMP activities for HABATU and additional ones from RDB) at HABATU Mining Company. However, environmental challenges were also seen at this mine as elements to conform low environmental performance. The major environmental constraints being the non-expropriation plot to few residents living on the active site in opposition to this mine RDB approved EIA where mining should start after proper land expropriation where possible.

Also, the presence of scattered used plastics bags on the active were also detected. It is contraction with the mine obligation to properly dispose non-hazardous waste. Another serious

issue is the soil erosion on due to less efforts in protecting soil wastes and overburdens which are located near an agricultural valley where sorghum and banana crops are grown. If not contained, this erosion may negatively affect this valley.

HAJOS, one of the 3 ASM mines which were subject to this research, findings show that it the less performing mine in regard to EIA, at a level of 39.5% (both specific HAJOS EMP and those by RDB).

According to EO of Rwamagana District, they regularly receive complaints from local residents on land conflict due to no expropriation of residents living on the active sites of HAJOS. the latter will continue to experience some environmental problems since the mine operates in a residential area of Karengu trading centre (at less than 100 meters).

However, the relatively flat terrain of HAJOS sites, and their methods of underground mining are helping it to avoid some environmental problems.

When interviewed, the technical director of both H&B and HABATU that the relief of their terrain, and the much-underestimated costs of implementation in EIA report by consultants compared to real cost. His unverified statement mentions that over RWF 45 million was spend in 2015 alone for both mines on environment protection, especially on tunnels building and other safety engineering activities.

They added that less importance is paid by the mine managers on EIA report as reference environmental document of the mine. This is coupled with other his other complaints that land expropriation is very expensive (same views of HAJOS manager that EIA is very expensive to implement) to the company while recognizing that the mine staff lack necessary skills to report to government the progress made in EIA implementation.

The main enforcement challenges are due to lack enough human resources to perform regular environmental inspection and supervisions. These are shared thoughts by interviewed officials in charge of environmental from REMA, RDB, and Rwamagana District. The mine sector (without mentioning other environment aspects of all other economic sectors of the country) only has around 548 licenses – as of 2013 – (REMA, 2015) to oversee to a staff of less than 10 employees per each of the 3 mentioned institutions. With this capacity, each institution is able to conduct a maximum of two ordinary inspections annually.

Another common view, is that, despite the lack of environmental skills, is that ASM operators lack a long vision of their business due to ignorance of the concession mineral reserve. This make them not to investment in the achievement of their environmental obligation.

However, they all welcomed the idea to develop reporting forms or templates that would help ASM to systematically report any slight progress made on EIA implementation. This should be coupled by initiating the recognition of best EIA implementers via by awarding them certificates and other prizes to encourage competition.

It was found that it is possible to use practical and relatively easy best practice to enhance the implementation of EIA and improve the enforcing and timely follow up. These best practices include the use of data collection and reporting template that could be used by both operators and lead agencies to timely and regularly track any progress made in the EIA implementation and advice the way forward.

According to various officials interviewed, the current level of implementation of EIA/EMP at the mentioned mines is low and more needs to be done.

## **5.2. Recommendations**

Drawing on the challenges of this study, the below salient recommendations would contribute to enhance the status of environmental compliance of ASM operations:

- It is important for environmental actors to design and test the tool for collecting and reporting electronic real-time data on environmental status of ASM.
- There is need to conduct regular studies on the assessment of water quality and levels as well as pollution of heavy metals in hydrological network in and round ASM areas.
- To ensure sustainability of ASM mining and improvement of their operations/conditions through credible investments, the Government should invest in long term and deep exploration studies to determine mineral reserves in ASM sites.
- It would be more beneficial if the Government looks into the feasibility of making it mandatory for ASM to undergo at least two environmental audits per year by capitalizing on the capacity of accredited and independent local environmental experts to conducts the audits; as part of the solutions on the small of environmental/mine inspectors.
- Priority should be given to continuous provision of specific environmental capacity building to ASM owners and staff as a way of increasing their ownership on environmental issues.

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# APPENDICES

## Appendix 1: Proposed EIA data collection and reporting template

REPUBLIC OF RWANDA



Ministry of Natural Resources (MINIRENA)  
 Rwanda Natural Resources Authority (RNRA)  
 Geology and Mines Department (GMD)  
 Rwanda Environmental Management Authority (REMA)  
[www.minirena.gov.rw](http://www.minirena.gov.rw)  
[www.rnra.rw](http://www.rnra.rw)  
[www.rema.gov.rw](http://www.rema.gov.rw)

### Proposed Semester EIA Data Collection and Reporting Template

**DATE OF REPORT:**

<i>Name of the Licensee</i>					<i>Type of Business</i>	<i>Company</i> <input type="checkbox"/>	<i>Cooperative</i> <input type="checkbox"/>
<i>Contact person</i>					<i>TIN Number</i>		
<i>Contact details</i>	<i>Tel:</i>		<i>Email:</i>				
<i>Address</i>	<i>Cell</i>		<i>Sector:</i>		<i>District</i>		
<i>License details</i>	<i>Prospection</i> <input type="checkbox"/>		<i>Exploration</i> <input type="checkbox"/>		<i>Exploitation</i> <input type="checkbox"/>		
	<i>License Number</i>		<i>Issue date</i>		<i>Expiring Date:</i>		
<i>Reporting Period (Day_Month_Year)</i>	<i>From:</i>		<i>To:</i>		<i>Minerals mined:</i>	<i>Cassiterite</i> <input type="checkbox"/>	<i>Coltan</i> <input type="checkbox"/>
					<i>Wolfram</i> <input type="checkbox"/>	<i>Other</i> <input type="checkbox"/>	



#	EMP activities	Status			Used budget (RWF)	Challenge	Remark
		Y/N	Ongoing	Measurement			
1	Provide all staff on sites with protective equipments						
2	The extraction area should be fenced to avoid non staff to enter on the site			Fence length in meter			
3	No mining and construction works shall be carried out during night hours						
4	Blasting activity if any shall be authorized by the Minister of Internal Security and the surrounding people shall be informed in advance on those activities						
5	Provide a warning systems to the community before the extraction						
6	Avoid the emission of dust emanating from the earth works on sites or due to road use from or to mining sites, driving speed be reduced to minimum, within the mining area						
7	Potable water should be available on project site						

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	EMP activities	Status			Used budget (RWF)	Challenge	Remark
		Y/N	Ongoing	Measurement			
8	Ecosan toilets should be available on project site						
9	Put emphasis on tree planting program within and around the project site as a mitigation measure to noise and dust emitted in the atmosphere			Nbr of planted trees:			
				Nbr of germinated trees:			
10	Dust extraction and collection would be provided			Name of equipment used:			
				Nbr of equipment:			
11	Security measures shall be taken to avoids accident following embankments failure, falling rocks and any other form of fatal accident during mining operations			Nbr of secured tunnel: Length of secured tunnel: Equipment used (wood, metal, sand gilled bags, other):			
12	A first aid kit should be made available on site, transport means ready for any injured to the nearest health centre, and some of the workers trained in injury handling techniques			List equipments:  Nbr of trained workers:  Name of trainer:			

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	EMP activities	Status		Used budget (RWF)	Challenge	Remark
		Y/N	Ongoing			
13	Stockpile top soil for future use in the rehabilitation of used sites on top of the site to ease the rapid growth of vegetation			Qty of stockpile in m <sup>3</sup>		
14	Undertaking systematic rehabilitation of the exploited sites in such a way that the new site opening goes simultaneously with full restoration of the previous ones			Rehabilitation method (infill, revegetation, site clearing, other) Length/depth/surface of rehabilitated sites (meter, m <sup>2</sup> ) Number of rehabilitated sites/pits/tunnel/pits:		
15	Make sure that reservoirs and settling basins are fenced to limit and control their access			Nbr of reservoir: Capacity of reservoir m <sup>3</sup> : Fenced length/meters:		
16	Installation of traps for stored loose construction such as sand			Material used (wood, metal, sand filled bags, rocks, other) Trap length/meter: Trap height/meter:		

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	EMP activities	Status			Used budget (RWF)	Challenge	Remark
		Y/N	Ongoing	Measurement			
17	Establish an onsite storm water conveying system			Length: Depth:			
18	Provision of an ecological onsite sanitation facility using dry method						
19	All machinery and equipment shall be in good condition			Type of machine: List of equipments:			
20	Provide sign posts to indicates where mining extraction activities are carried out			Nbr of sig post:			
21	Abandoned mining area should be rehabilitated, backfilled and re-vegetated to avoid vectors and therefore source of diseases			Rehabilitation method (infill, revegetation, site clearing, other) Length/depth/surface of rehabilitated sites (meter, m <sup>2</sup> ) Number of rehabilitated sites/pits/tunnel/pits:			
22	Water spraying system would be installed on sites before during mining activities to avoid dust			Type of system used:			

	EMP activities	Status			Used budget (RWF)	Challenge	Remark
		Y/N	Ongoing	Measurement			
23	When appropriate, all works should start when all expropriation and compensation activities have been completed with involvement of the District			Size of acquired land/ha:			
24	Oil waste is captured and disposed of in appropriate area			Qty/liter:			
25	Organize sensitization sessions on the prevention measures to avoid accidents and HIV/AIDS pandemic, malaria and water born diseases, contaminations.			Nbr of session/semester on: Accidents: Malaria: HIV/AIDS: Diseases:			
28	Sensitization of workers on adhering to Mutuelle de Sante and SACCOs schemes,			Nbr of workers with Mutuelle: SACCO accounts:			
27	Subscribe workers to Rwanda Social Security Board,			Nbr of workers subscribed to RSSB:			
28	Strict respect of the EMP established in the Environmental Impact						
					<b>Total</b>	<b>RWF</b>	

Note: the above activities are RDB (Rwanda Development Board) general environmental requirements in addition to those usually proposed in ELA/EMP studies. The latter should also be subject to this reporting template report.

EIA: Environmental Impact Assessment  
EMP: Environmental Management Plan  
Nbr: Number  
Qty: Quantity

Source: Author, 2016.

**Appendix 2: Some of the most active ASM mines in Rwamagana District**

#	Mine Site Name	Mine site Operator	Location			Types of Minerals produced	Production details in tons				Mining Licence Information	
	Mine Site (Perimeter)	Mine Site Operator	District	Sector	Cell	Mineral	2011	2012	2013	2014	ICGLR classification	Type of mineral license
1	Kibaza/Dihiro	Mining Quality Supply LTD	Rwamagana	Fumbwe	Nyagasambu	Wolframite	Not active	Not active	Not active	8	Artisanal	Exploration
2	Rubona	DUMAC LTD	Rwamagana	Mwurire	Bicumbi	mixed (cassiterite-coltan)	Not active	Not active	Not active	0	Artisanal	Exploration
3	Rukankama	Ets Hajos	Rwamagana	Karenge	Karenge	Cassiterite	5	81	56	62	Artisanal	Exploitation
4	Kabayezi-Karambo	UNM	Rwamagana	Munyaga	Zinga	mixed (cassiterite-coltan)	1	1	2	1	Artisanal	Exploitation
5	Munini-Bujujuju	Ets Munsad Minerals	Rwamagana	Muyumbu	Bujujuju	Cassiterite	5	13	14	Not active	Artisanal	Exploitation
6	Rwamashyongoshyo and Rweri	La Misercorde Trading Company Ltd	Rwamagana	Gahengeli	Rweri	Wolframite	Not active	Not active	24	68	Artisanal	Exploration
7	Kangamba	H&B Mining Company Ltd	Rwamagana	Karenge	Byimana	Cassiterite & Coltan	Not active	66	34	39	Small scale	Exploitation
8	Kibabara	Purity General Service Ltd	Rwamagana	Gahengeri	Kibare	Wolframite	Not active	Not active	Not active	Not active	Artisanal	Exploration
9	Nyamatete	HABATU Mining Company Ltd	Rwamagana	Karenge	Nyamatete/Bicaca	mixed (cassiterite-coltan)				40	Artisanal	Exploitation

Source: MINIRENA, 2015, <http://www.minirena.gov.rw/index.php?id=215>

The above table mentions the ASM mine sites in Rwamagana District being mined under exploitation licences. As per the scope of this study, only mines located in Karenge Sector were under investigation in the current study.

**Appendix 3:**

**INTERVIEW QUESTIONS**

*Targeted respondents:*

**Managers/representatives or senior technical staff of ASM mines in Karengwe Sector of Rwamagana District**

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These interview questions intend to help Dominique Kayigire, an MSc Student (at the College of Science and Technology of the University of Rwanda) to collect information on how ASM miners implement the Environmental Impact Assessment (EIA). The collected information will only serve to inform his MSc Thesis.

The information by this questionnaire which is considered to be sensitive or confidential will be treated that way.

ASM are encouraged to share any written document (where possible) on each questions.

**Identification**

Date: .....

Name of the respondent: .....

Job Position: .....

Name of the Government respondent institution: .....

Contact/e-mail: .....

**Questions**

1. Does the company structure/organigramme showing the role and responsibilities of each position on the company structure especially the staff in charge of environmental protection?

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.....

2. Did your mine undergo an EIA?

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3. Is your staff familiar with the proved company EIA?

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.....

4. At which level has your company implement the approved EIA?

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5. Is there any document mentioning the mine budget with specific line for EIA implementation?

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6. Do you often submit report to REMA/MINIRENA/RNRA on the progress of EIA implementation at your mine?

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7. Does your company have a daily follow up mechanism to implement the EMP/EIA for example: data dedicated collection staff, internal environmental database, etc?

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.....

8. How would you relate the paid environmental bond with the EMP/EIA?

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.....

9. What are the company challenges being faced while implementing EIA?

.....  
.....

10. How much money has your company spent of so far in the implementation of EMP/EIA?

.....  
.....



11. Is there any relationship between the minerals price decline at the international market and the implementation of the EMP/EIA at your mine?

12. ....  
.....

13. What else (advice) would you give to enable EIA implementation as planned?

.....  
.....

**Thank you!**

**Appendix 4:**

**INTERVIEW QUESTIONS**

*Targeted respondents:*

**Senior Government staff in charge of environmental supervision and inspections of ASM mines**

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These interview questions intend to help Dominique Kayigire, an MSc Student (at the College of Science and Technology of the University of Rwanda) to collect information on how ASM miners implement the Environmental Impact Assessment (EIA). The collected information will only serve to inform his MSc Thesis.

The information by this questionnaire which is considered to be sensitive or confidential will be treated that way.

**Identification**

Date: .....

Name of the respondent: .....

Job Position: .....

Name of the Government respondent institution: .....

Contact/e-mail: .....

**Questions**

1. How often does your institution allow you conduct environmental inspections and supervisions at ASM mines? (as per the internal rules and regulations)  
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.....
2. How many environmental supervisors does the institution you work for have?  
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3. Are all positions in your organization’s structure filled?  
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4. How do you appreciate the level of EIA implementation by ASM operators?  
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5. Is there any relationship between the decline in minerals price at the international market and the compliance of EIA standards at mine sites?  
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6. What is your opinion on the idea for each ASM mine to me mandatory employ a qualified and permanent employee specifically in charge of environment?  
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7. Does your institution avail to ASM tools such as forms/template to report regular progress made in the implementation of EIA?  
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8. What are your views on the idea to periodically issue local certificates or awards to recognize and appreciate efforts made by ASM in EIA implementation?  
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9. What are the major barriers which are preventing ASM miners to fully implement the EIA?  
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10. What advice would you give to enable the implementation of EIA as planned?  
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**Thank you!**

