

Effectiveness of Environmental Impact Assessment in Mining Activities in Rwanda

Dusengimana Theophile^{1*} And Dr Nahayo Lamek

University of Lay Adventist of Kigali, P. O. Box: 6392, Kigali, Rwanda

Date of Submission: 20-04-2024

Date of Acceptance: 30-04-2024

ABSTRACT: This study assessed the effectiveness of Environmental Impact Assessment (EIA) in mining activities in Kamonyi District of Rwanda. A sample of 121 respondents is selected by using the stratified, simple randomly and census surveys. Questionnaires, interviews, field observation and desk review of selected documentation were the main data sources which were analyzed by using the Statistical Package for Social Sciences (SPSS). The results indicate key actions on implementing EIA recommendations at mining sites are, as stated by 65.9 %, provision of appropriate personal protective equipment (PPE) long with keeping the EIA report on site and on-site staff supervising the implementation of EIA recommendations as mentioned by 86.8% and 76.0%, respectively. Regarding how EIA compliance contributes to environmental protection at mining sites, some measures like minimize water pollution stated by 28.4%, minimize water pollution and avoiding piling up excavated soil confirmed by 24.8%. For the effectiveness of EIA appliance for the environmental management within mining activities in Kamonyi District, 93.4% of respondents confirmed that EIA process is sufficiently integrated in relevant legislations. Therefore, it is concluded that EIA compliance is contributing to minimizing the effects of mining practices on environmental sustainability and that its adoption has to be monitoring countrywide.

Key Words: Environmental Impact Assessment, Effectiveness, Environmental Protection, Kamonyi district, Mitigation, Mining, Rwanda

I. INTRODUCTION

Rapid industrialization and urbanization have been the main cause of rapid loss of natural resources, environmental pollution, quality of life and environmental stress. The Environmental Impact Assessment (EIA) is considered as the official tool to address those issues and protect environment, and was globally formalized by the United Nations conference on the Environment in

Stockholm in 1972 and subsequent conventions (Achieng Ogola, 2007).

The widespread global interest in the area of mining and its sustainability that focused on the need to shift mining industry to a more sustainable framework (Kittipongvises, 2017). In Rwanda, the observed environmental impacts of mining activities are associated with the lack of appropriate management of top soil/excavated soil from mining operations, lack of erosion control actions in mining sites, degradation of forest reserves, pollution of water due to mining activities in rivers or their proximity, lack of proper washing facilities causing water pollution, lack of proper protection of workers and the surrounding against dust, and lack of rehabilitation plans for mining sites (OAG, 2015).

Despite the growing importance of mineral extraction and mining production, there has been an increasing concern over environmental impacts associated with the exploration, extraction and use of mineral product, and this makes environmental sustainability in the mining industry crucial (i.e., social, economic and environmental dimensions) (Kittipongvises, 2017).

Mining operations still have adverse effects on the local population in affecting their traditional means of livelihood, influx of newcomers to the area, which put pressure on existing but inadequate social amenities, rising cases of social vices (e.g., teenage pregnancy), and causing environmental problems ranging from waste rock and tailing disposal, land disturbance, air, water and noise pollution and ground vibration as a result of blasting (Owusu, 2012). The public therefore argues that problems that are associated with mining activities may far outweigh the benefits (Owusu, 2012).

The widespread adoption of EIA on international scale indicates that the benefits of undergoing EIA process outweigh potential loss, or even direct costs related to conducting EIA itself. EIA is also part of integrated approach to environmental assessment and development

planning (UNEP, 2004). However, one may ask whether Rwandan mining sector experiences benefits of EIA at project level including attaining expectations on environmental sustainability. Therefore, this study aims to analyze the effectiveness of environmental impact assessment in mining activities in Kamonyi District of Rwanda.

II. METHODS AND MATERIALS

2.1 Description of the Study Area

This study considered Kamonyi District is one of the eight districts of the Southern Province composed by 12 Sectors, 59 Cells and 317

Villages on a total surface area of 655.5 km². It shares its borders with Ruhango District in the South, Muhanga District in the West, Bugesera and Nyarugenge Districts in the East, Gakenke and Rulindo Districts in the North. Kamonyi District enjoys a moderate climate with sufficient rainfall and a humidity varying between 1,200 and 1,400 mm at an average temperature of 20°C. Among other economic activities, the district records mining and quarrying activities. There are coltan and cassiterite along with many sand and clay quarry sites used in construction but their irrational exploitation affects the environment.

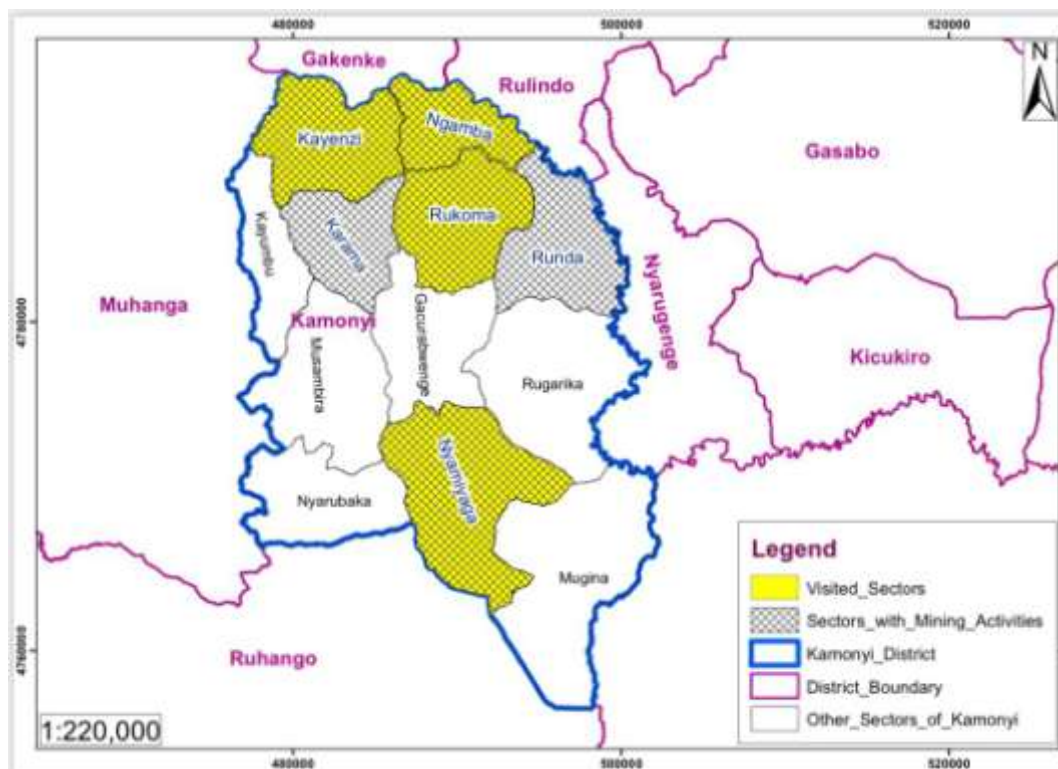


Figure 1: Administrative map of Kamonyi District and mining exploitation areas

This study focused on Kayenzi, Kayumbu, Ngamba, Mugina, Rukoma and Nyamiyaga sectors of Kamonyi District as areas of mining taken as the main case study.

2.2 Data collection and analysis

For the study population, the authors interacted with people thought as main source of first-hand information related to the effectiveness of EIA practice as well as associated factors.

The authors contacted some officials who work is related to mining and/or environmental protection namely the (1) Rwanda Environment Management Authority (REMA), (2) Rwanda Mining, Petroleum and Gas Board (RMB), (3) Rwanda Development Board (RDB), (4) Rwanda Association of Professional Environmental Practitioners (RAPEP). The authors also contacted Ten companies in Mining activities at Kamonyi District and some people around the sites as detailed in Table 1 below.

Table 1: Sample size

Name	Total Population	Sample Size	Sampling techniques
Mining companies	20	20	Stratified, simple randomly and census survey
Local leaders around mining sites	90	90	
REMA	3	3	
RDB	3	3	
RAPEP	4	4	
Kamonyi District	1	1	
Total	121	121	

Source: Authors' observation(2023)

After selecting the above sample, for primary data collection, the authors utilized open ended and close ended questionnaires, structured and semi-structured interviews, and field observation of the surrounding of mining sites. For the secondary data collection, different secondary data sources such as reports, publications, legal instruments, sample EIA reports and documents available on different profiles online were utilized. Furthermore, the authors observed and collected the necessary visual information using different tools such as a camera and an observation checklist in order to conduct field survey systematically.

The above data were processed and analyzed by using the Statistical Package for Social Science (SPSS) Software and Microsoft excel program prior to analysis.

III. RESULTS

3.1 Description of Respondents

The results in Table 2 indicated that 81.8% of respondents were male and that those aged between 31 - 35 years, occupy the majority of respondents at 30.6%. The same Table 2 shows that 2.2% hold Masters and above while 28.1% hold Bachelor's Degree. For the experiences in mining career, 32.2% record 2-3 years and 33.9% recording 4-5 years (Table 2).

Table 2: Social Demographic Characteristics of Respondents

	Data	Frequencies	Percentages
Gender	Male	99	81.8
	Female	22	18.2
	Total	121	100.0
Ages	18 -25 years	7	5.8
	26 - 30 years	34	28.1
	31 - 35 years	37	30.6
	36 -40 years	24	19.8
	41 -45 years	7	5.8
	46 – 50 years	7	5.8
	51 years and above	5	4.1
	Total	121	100.0
Education Level	Masters and above	4	2.2
	Bachelor's Degree	34	28.1
	Secondary school	46	38.0
	Primary level	26	21.5
	Professional's courses	15	12.4
	Total	121	100.0
Experiences in mining career	Less than 2 years	8	6.6
	2-3 years	39	32.2
	4-5 years	41	33.9
	6-7 years	23	19.0
	8 years and above	10	8.3
	Total	121	100

Source: Primary Data from field of the study (2022)

3.2 The actions taken for Environmental Impact Assessment within mining sites;

The findings in Table 3 show several actions taken for Environmental Impact Assessment within mining sites and those largely highlighted by respondents (58.7%) are Provision of adequate powers of enforcement to EIA agencies

along with Use of experienced EIA consultants, provision of technical guidance on the content of the Environmental statement, Possession of analytical required for fieldwork, laboratory testing and research and Possession of analytical required for fieldwork, laboratory testing and research stated by 57.9 percent of respondents.

Table 3: Actions taken for Environmental Impact Assessment within mining sites

The actions taken for EIA within mining sites	SA		A		N		D		SD	
	fi	%	fi	%	fi	%	fi	%	fi	%
Having Public participation in EIA decision-making;	68	56.2	29	24.0	8	6.6	8	6.6	8	6.6
Having a post decision and implementation monitoring and audit provision;	69	57.0	28	23.1	8	6.6	9	7.4	7	5.8
Provision of adequate powers of enforcement to EIA agencies;	71	58.7	29	24.0	8	6.6	7	5.8	6	5.0
Examination of alternatives to the project in the EIA process and report;	69	57.0	27	22.3	7	5.8	10	8.3	8	6.6
The use of qualified multi-disciplinary staff;	68	56.2	27	22.3	8	6.6	8	6.6	10	8.3
Use of experienced EIA consultants;	70	57.9	27	22.3	10	8.3	8	6.6	6	5.0
The provision of technical guidance on the content of the Environmental statement;	70	57.9	27	22.3	9	7.4	9	7.4	6	5.0
Possession of analytical required for fieldwork, laboratory testing and research;	70	57.9	27	22.3	7	5.8	11	9.1	6	5.0
Facilitation in getting EIA procedural guidelines;	69	57.0	27	22.3	7	5.8	10	8.3	8	6.6
Time for EIA report to be approved/ corrected or rejected.	70	57.9	33	27.3	9	7.4	6	5.0	3	2.5

Source: Data from field observation and surveyed respondents (2023)

3.3 EIA application within mining practices

The results in Figure 2 show that 96.0% of respondents confirmed to be conducting an EIA before commencing mining activities in Rwanda.

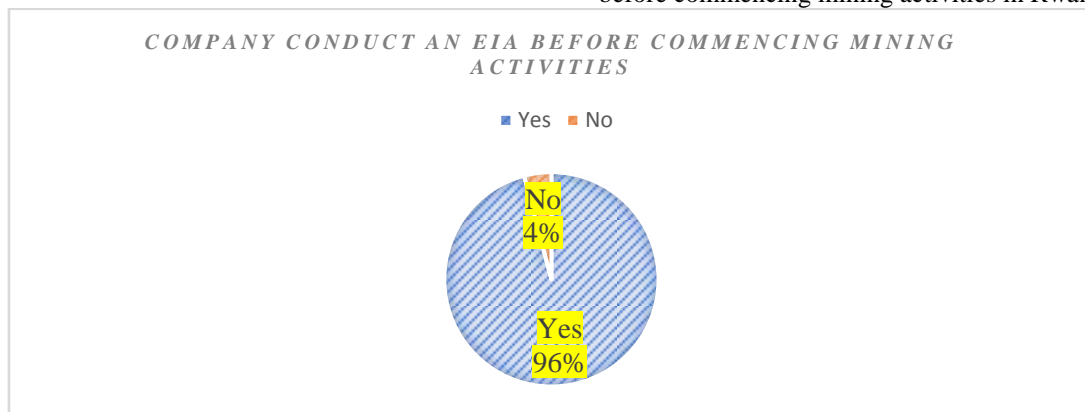


Figure 2: Company conducts an EIA before commencing mining activities

Source: Data from field observation and surveyed respondents (2023)

Regarding the reason behind conducting EIA, the finding in Figure 3 show that, as mentioned by 20.7%, mining companies carry out EIA before mining activities to seek authorization

for our project clearances; 37.2% stated that EIA is conducted in order to minimize negative impacts on the environment.

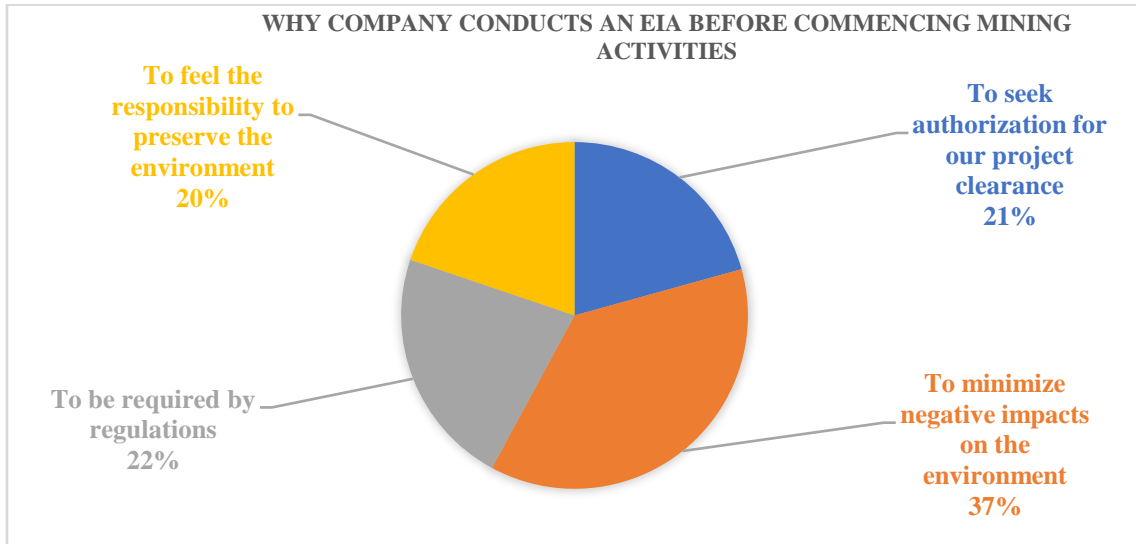


Figure 3: Why Company conducts an EIA before commencing mining activities;

Source: Data from field observation and surveyed respondents (2023)

3.4 Awareness on mining impact on environment

The findings in Figure 4 show Soil erosion is the land degradation voted by 25.6%; release of

fumes and dust was on rate of 21.5%; noise was on 14.9% while water and soil erosion are stated by 11.6 and 7.4 percent, respectively.

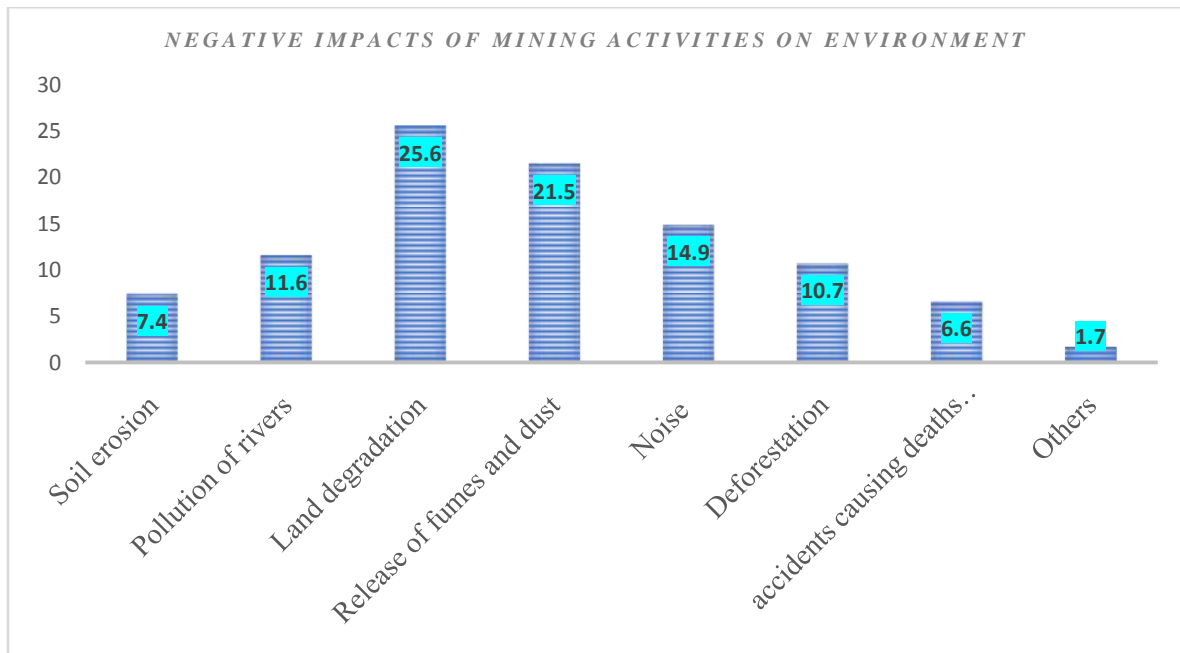


Figure 4: Major and frequent negative mining impacts on environment in Kamonyi District

Source: Data from field observation and surveyed respondents (2023)

For the social and economic mining impacts, the results in Figure 5 show that school dropout for young is highlighted by 33.9%;

pregnancies of local children is confirmed on rate of 37.2% while Child labor was voted by 17.4%

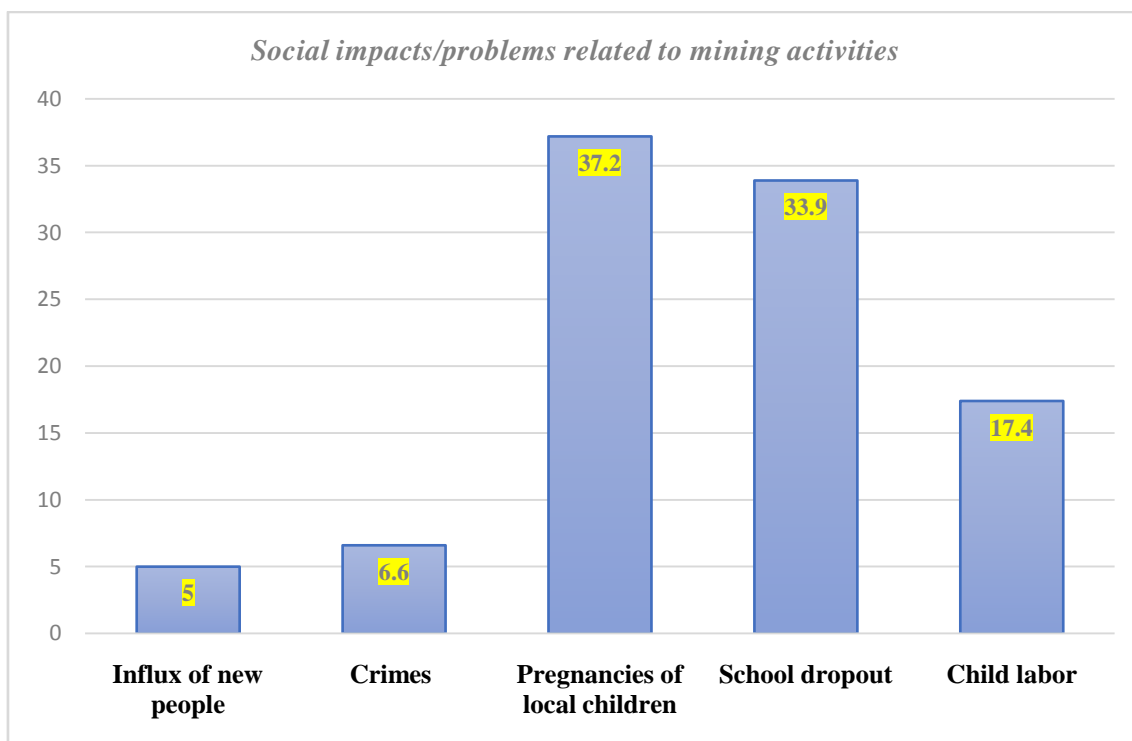


Figure 5: Social problems related to mining activities especially in Kamonyi District

Source: Data from field observation and surveyed respondents (2023)

3.5 Effectiveness of EIA system on environmental protection within mining sites

The results presented in Table 4, as mentioned by 95.9% of respondents, there is an appropriate personal protective equipment (PPE) provided. There is also, an external inspection and/or monitoring missions conducted as one among the actions taken of the implementation of

environmental impact assessment recommendations at mining sites. This is confirmed by 99.2% of respondents while 86.8% confirmed using “Yes” that one of the actions taken in implementation of environmental impact assessment recommendations at mining sites, is the EIA report kept on site.

Table 4: EIA actions/recommendations at mining sites

	Data	Frequencies	Percentages
There is appropriate personal protective equipment (PPE) provided;	Yes	116	95.9
	No	5	4.1
	Total	121	100.0
There is EIA report kept on site;	Yes	105	86.8
	No	16	13.2
	Total	121	100.0
There was a staff to follow up on	Yes	92	76.0
	No	29	24.0

implementation of EIA recommendations appointed;	Total	121	100.0
	Yes	101	83.5
There was an appropriate budget for implementing mitigation measures allocated/availed;	No	20	16.5
	Total	121	100.0
There is EMP monitored regularly by the company;	Yes	102	84.3
	No	19	15.7
	Total	121	100.0
There is external inspection and/or monitoring missions conducted;	Yes	120	99.2
	No	1	.8
	Total	121	100.0
They attend training on mining process;	Yes	105	86.8
	No	16	13.2
	Total	121	100.0
There was a site rehabilitation plan developed.	Yes	108	89.3
	No	13	10.7
	Total	121	100.0

Source: Data from field observation and surveyed respondents (2023)

The results in Table 5 present the opinions of respondents on the measures in place to avoid or minimize soil erosion; where avoiding piling up excavated soil was confirmed on 24.8%; water canalization confirmed by 27.3%. With regards to measure applied to avoid or minimize water pollution, Table 5 show Dam to collect waste water

constructed, confirmed by 26.4% while other measures are confirmed on 23.1%. The same Table 5 shows that Re-vegetation of exposed soils is the major policy as confirmed by 25.6% along with avoiding dust release by watering the site and putting dust barriers in the site (trees) stated by 24.0%, respectively.

Table 5: Measures to avoid or minimize soil erosion, water and soil pollution;

The measures in place to minimize soil erosion	Frequency	Percent
Avoiding piling up excavated soil	30	24.8
Water canalization	33	27.3
Tree planting	18	14.9
Planting grass	24	19.8
Pit backfilling	16	13.2
Total	121	100.0
Measures in place to avoid or minimize water pollution	Frequency	Percent
Dam to collect waste water constructed	32	26.4
Waste water is recycled and reused	22	18.2
Washing facility is far from natural streams	18	14.9
Final water discharge is clean	21	17.4

Others	28	23.1
Total	121	100.0
Measures in place to avoid/minimize air pollution		
Avoiding dust release by watering the site	29	24.0
Dust barriers in the site (trees)	29	24.0
Re-vegetation of exposed soils	31	25.6
Loading, transfer, and discharge of materials at minimum height of fall	19	15.7
Other	13	10.7
Total	121	100.0

Source: Data from field observation and surveyed respondents (2023)

Furthermore, the results in Table 6 show work in night hours, as confirmed by 29.8% and allocating mining site far from residential area (31.4%) are part of measures of reducing noise pollution. For reducing deforestation, the results in Table 6 reveal that reforestation is largely applied as measures in place to avoid/minimize

deforestation as confirmed by 63.6%. Finally, for the accidents control, it is noticed that regular maintenance of equipment and machinery stated by 32.2% and availability of safety signposts stated by 17.4% are the primary precautions in place (see Table 6).

Table 6: Measures to avoid/minimize noise pollution, deforestation and accidents

The measures in place to avoid/minimize noise pollution	Frequency	Percent
No work in night hours	36	29.8
Regular maintenance of machinery	19	15.7
Prior notification of blasting events	17	14.0
The mining site is located far from residential area	38	31.4
Other	11	9.1
Total	121	100.0
The measures in place to avoid/minimize deforestation	Frequency	Percent
Reforestation activities	77	63.6
Bush clearing is minimized	33	27.3
Rehabilitation of already mined pit areas	10	8.3
Other measures	1	.8
Total	121	100.0
The measures in place to avoid/reduce accidents	Frequency	Percent
Appropriate PPEs provided to workers and visitors	16	13.2
The site is demarcated	20	16.5
Safety signposts available	21	17.4
Vehicle movements are controlled	20	16.5

Regular maintenance of equipment and machinery	39	32.2
First aid kits available	5	4.1
Total	121	100.0

Source: Data from field observation and surveyed respondents (2023)

In order to rank the EIA effectiveness in mining sites for the environmental protection, the authors asked respondents to rank the EIA effectiveness and as shown in Table 7, 43 percent highlighted that it helps mining project developers,

20.7% confirmed that the application of EIA contributes to reducing environmental impacts, 19.8 percent mentioned that it helps in environmental protection related decision-making.

Table 7: Ranking the EIA effectiveness

EIA practices are effective for:	Frequency	Percent
Helping in decision-making	24	19.8
Helping mining project developers	52	43.0
Reducing environmental impacts	25	20.7
Contributing to sustainable development	20	16.5
Total	121	100.0

Source: Data from field observation and surveyed respondents (2023)

Based on the results of this study, it can be noticed that undertaking EIA helps to inform and influence the decision-making process with respect to proposed developments in order to promote environmentally-sound decisions. EIA is not a procedure for preventing developments from being implemented; rather, it is intended to provide a comprehensive mechanism to ensure that developments are approved in the full knowledge of their environmental consequences.

IV. CONCLUSION

This study assessed the effectiveness of EIA practice in mining areas in order to protect the environment in Southern Rwanda. The results obtained through the use of questionnaire and interview along with field visit indicated that several actions taken for EIA within mining sites are Provision of adequate powers of enforcement to EIA agencies along with Use of experienced EIA consultants, provision of technical guidance on the content of the Environmental statement, Possession of analytical required for fieldwork. As stated by 96.0%, EIA is conducted before commencing mining activities in Rwanda. EIA is conducted before mining activities to seek authorization for project clearances and to minimize negative impacts on the environment. For environmental negative impacts of mining, soil erosion is voted by 25.6% and 21.5 percent mentioned release of fumes

and dust. Socio-economically, early pregnancies and school dropout are stated by 37.2 and 33.9%, respectively. Regarding the effectiveness of EIA system on environmental protection within mining sites, there is an appropriate personal protective equipment (PPE) provided, external inspection and/or monitoring missions, and implementation of EIA recommendations. For the the EIA effectiveness in mining sites for the environmental protection, 43 percent highlighted that it helps mining project developers, 20.7% confirmed that the application of EIA contributes to reducing environmental impacts, 19.8 percent mentioned that it helps in environmental protection related decision-making.

Acknowledgements

The authors thank all respondents for their answers which led to the completion of this study.

REFERENCES

- [1]. African Development Bank (2003). Guidelines for Integrated Environmental and Social Assessment. www.afdb.org
- [2]. Berger, K. and Garyfalakis, E., (2012), Environmental Impact Assessment of road transportation – Analysis to measure environmental impacts of road transportation based on a company case. Master's thesis, Jönköping University.

- [3]. GASANA, S-H. F., et al. (2015), Assessment of Environmental Health Impact of ores mining project in Nyaruguru District, RWANDA: A perspective for Sustainable Development.
- [4]. Gilbert, L., (2006), An Evaluation of Environmental Impact Assessment in Barbados. Master's thesis, Carleton university.
- [5]. Grayson, R (2006). How to conduct Public Consultation Guidance for EIA Consultancies. www.consultationinstitute.org.
- [6]. Guide Book for Evaluating Mining Project EIAs. <http://www.elaw.org/files/miningeia-guidebook>
- [7]. <http://www.slideshare.net/jadonmohit/environmental-impact-assessment-of-miningprojects-170309>.
- [8]. <http://www1.ifc.org/wps/wcm/connect/1f4dc28048855af4879cd76a6515bb18/Final%2B-%2BMining.pdf?MOD=AJPERES&id=1323153264157>
- [9]. Juneviciute, A., (2006), Evaluation of Environmental Impact Assessment procedure for the coastal zone development in Lithuania and Sweden. Master's thesis, Royal Institute of Technology, Stockholm, Sweden.
- [10]. Kittipongvises, S., (2017), Assessment of Environmental Impacts of Limestone Quarrying Operations in Thailand, Environmental Research Institute, Chulalongkorn University (ERIC), Bangkok 10330, Thailand.
- [11]. Law N° 37 /2008 of 11/08/2008 Law on mining and quarry exploitation. Official Gazette of the Republic of Rwanda.
- [12]. Madlome, S. F., (2016), Evaluation of the effectiveness of Environmental Impact Assessment in promoting sustainable development in the energy sector of South Africa, Master's thesis, University of the Witwatersrand, Johannesburg, South Africa.
- [13]. McKillop, J. and Brown, A.L., (1999), Inking project appraisal and development: the performance of EIA in large-scale mining projects, Journal of Environmental Assessment Policy and Management Vol. 01, No. 04, pp. 407-428.
- [14]. MINIRENA (2010). <http://www.minirena.gov.rw/IMG/pdf/Stra> getegic_Plan OGMRApril_2010_1_validated.pdf
- [15]. Ministry of Environment (2019), National Environment and Climate Change Policy, Kigali, Rwanda.
- [16]. Ogola, P.F.A., (2007), Environmental Impact Assessment general procedures. Presented at Short Course II on Surface Exploration for Geothermal Resources, organized by UNU-GTP and KenGen, at Lake Naivasha, Kenya.
- [17]. Owusu, B. D., (2012), The impact of golden star wassa limited (gswl) operations on its catchment communities, Master's thesis, Institute of Distance Learning, Kwame Nkrumah University of Science and Technology.
- [18]. Pienaar, M. (2012), The merit of environmental impact assessment for civil engineers in South Africa. Master's thesis, North West University, South Africa.
- [19]. REMA (2006), General guidelines and procedure for Environmental Impact Assessment, Kigali, Rwanda.
- [20]. REMA (2014), Rwanda Environment Outlook issue 002 July 2014, Managing natural resources for sustainable development, Kigali, Rwanda.
- [21]. Rwanda Bureau of Standards (BRS) (2010). Mining and Quarry – Code of Practice. 1st Edition.
- [22]. Rwanda Environmental Management Authority (REMA) 2007. General Guidelines for Environmental Impact Assessment.
- [23]. Sciberras, R., (2013), Effectiveness of environmental impact assessment process in the Maltese Islands, Master's thesis, James Madison University.
- [24]. UNEP (2004): Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach, Geneva, Switzerland.
- [25]. Wathern, P. (2004), Environmental Impact Assessment: Theory and Practice, Taylor & Francis e-Library, London – New York.
- [26]. World Bank (2010), Guidance Notes on tools for pollution management, New York.