

**ENVIRONMENTAL AND HEALTH IMPACT OF SMALL-SCALE GOLD
MINING ACTIVITIES IN IBANDA DISTRICT OF UGANDA**

ZAKARIA OMAR MOALIM

2018-08-02451

**A THESIS SUBMITTED TO THE DEPARTMENT OF BIOLOGICAL AND
ENVIRONMENTAL SCIENCES
SCHOOL OF NATURAL AND APPLIED SCIENCES IN PARTIAL FULFILMENT OF
THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN
ENVIRONMENTAL MANAGEMENT OF KAMPALA
INTERNATIONAL UNIVERSITY**

OCTOBER, 2021

DECLARLATION

I, Zakaria Omar Moalim, declare that information given in this research proposal is based to my knowledge, my own piece of work and has never existed in other individual's personification and shall be held to any cases of plagiarism.

Signature:

A handwritten signature in blue ink, appearing to read 'Zakaria', with a stylized flourish extending from the end.

Date:01/10/2021.

APPROVAL

I have read and hereby recommend this thesis report titled “Environmental and Health Impact of Small-Scale Gold Mining Activities in Ibanda District of Uganda” for the acceptance by the School of Natural and Applied Sciences in partial fulfillment of the requirements for the award of Master of Science in Environmental Management of Kampala International University, Uganda.

NAME OF THE SUPERVISOR: ASSOCIATE PROFESSOR PETER, BENJAMIN AINA

Signature: 05/10/2021

Signature.....

COMPLIANCE SUPERVISOR’S NAME: Dr. Suzan LUYIGA

Signature:  08/10/2021

ACKNOWLEDGMENT

I would like to thank the Lord Almighty for his gift of life for seeing me through the time of admission to completion of my course. I would like to abundantly thank and appreciate the valuable contributions of all those who helped me realize the dream of producing this research work.

I would also like to express my indebtedness to my Lead supervisor, Associate Professor PETER B. Aina, who provided limitless guidance to me prior to and during the entire duration of this research work.

I am grateful to my sister, brother and family for their financial support and contributions towards the success of this program, without which I would not be able to complete it. Special thanks to my HOD, Madam Anne Tumushabe. Also, I appreciate the Doctoral Committee, all the Lecturer in the department and the Directorate of Higher Degrees for their assistance towards the completion of this research work.

TABLE OF CONTENTS

DECLARATION	i
APPROVAL	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF ACRONYMS	vi
LIST OF FIGURES	vii
ABSTRACT	viii
CHAPTER ONE: Introduction	1
1.1 Background to the study	1
1.2 Problem Statement	4
1.3 Aim and Objectives	5
1.4 Research Hypothesis	6
1.5 Justification and Significance of the Study	6
1.6 Conceptual Framework	7
CHAPTER TWO: Literature Review	8
2.1 Review of Related Works	8
2.2 Health risk assessment	11
2.3 Susceptible populations	12
2.4 Mining and Health	12
CHAPTER THREE: Research Methodology	13

3.1	Study Area	13
3.2	Research Design	14
3.3	Sample Size	14
3.4	Research Methodology	15
CHAPTER FOUR: Results and Discussion		16
4.1	Analysis of Result	16
4.2	Discussion of Result	18
CHAPTER FIVE: Conclusion and Recommendations		21
5.0	Conclusion	21
5.1	Recommendations	22
	Contribution to Knowledge	23
References		24
Appendices		28
Appendix 1: Resources Required		33

LIST OF ACRONYMS

GDP:	Gross Domestic Revenue
ERB:	Environmentally Responsible Behavior
FDI:	Foreign Direct Investment
ASM:	Artisanal Small Scale
SGM:	Simba Gold Mining
UNEP:	United Nations Environment Programme
WHO:	World Health Organization
EARF:	East Africa Research Fund
NGO:	Non-Governmental Organization
URTI:	Upper Respiratory Tract Infection
CO:	Carbon Monoxide
ASGM:	Artisanal Small–Scale Gold Mining
SPSS:	Statistical Package for the Social Sciences

LIST OF FIGURES

Figure 1	The Conceptual Framework	9
Figure 2	A Map showing the location of Ibanda District	

ABSTRACT

In the recent times, Artisanal Small-Scale Gold mining activities have significant impact on environment and health of people in Ibanda District of Uganda. The study aimed at investigating the environmental and health impacts of small-scale mining activities on the surrounding communities of Ibanda District. The study was conducted from a total of 156 respondents using questionnaires. The study employed open cast and under surface techniques. The Small-Scale Gold mining is done by Simba Gold mining. The result revealed that perception and environment is significantly correlated with p-value ($p < 0.0005$). The result also depicts that environment and health is significantly correlated with p-value ($p < 0.0005$). The result showed that the prevalent diseases in the community are diarrhoea, skin disease and injuries. It is seen from the result that 75% of health workers admit that the health sector in this Municipality is not facilitated enough to handle health issues arising from mining activities.

The result also showed that removal of the top soils, trees and vegetation with heavy machines leads to wearing away of the soil nutrients and makes the land unfit for farming. It is observed from the findings that the heaviest impact of mining activities has been land and vegetation degradation (66.4%) followed by water pollution (25.4%). air pollution and noise pollution are 5.5% and 2.8 respectively. It is concluded that mining artisanal small scale gold mining activities have negative effects on the environment such as pollution, cutting of the vegetation without replacement. Hence, increased gold mining activities will further destroy the vegetation in Kicuzi Sub-county.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Miniature artisanal and gold mining (MSGM) activities are usually found where there is availability of minerals resources and it is frugally workable. The significant effect of Artisanal Small-Scale Gold Mining (ASGM) is due to employment creation, external interchange earnings, and advancement in the economy of the country. ASGM serves as a means of support in the areas in which the natural resources are deposited where uncomplicated tools and appliances are utilized. In order to achieve fast economic development, many countries have resorted to diverse activities to employ resources derived from nature. One of the lucrative activities is mining. As a consequence of this, mining is a significant economic venture which has the prospects of contributing to the advancement of locality furnished with the resource (Allen, 2019; Arah, 2015; Arifin *et al.*, 2015; Aboka *et al.*, 2014 and Ayanbo *et al.*, 2014).

Mining activities have a large number of environmental and health effects. This has emerged from the methods of functioning by the mining companies, its impacts on the natural surrounding as well as the human being in the neighbouring communities. The health value of mining functioning sometimes exceeds the profits gained. Most gold production has been by small producers who include authorized miners and artisans. Production statistics from artisanal miners is only typical given the fact that most contractors are not authorized and even the authorized ones learn to under-proclaim. Hence, most gold mining is carried out through suspicious medium (Awomeso *et al.* 2017; Dooyema *et al.*, 2012 and Basu *et al.*, 2015).

Among East African countries, Uganda is one of the less developed country with a medially firm economic development and hoping to reach a middle-income status by the end of the year 2020. The

country is at a stage in its history of economic modification foregoing a decade of an apogee of gross domestic product (GDP) development that disastrously diminished from 7% in 2009 to 3.9% in the monetary year 2016/2017. Consequently, the budgetary policy is poorly recommending for capital expenditure to strengthen this GDP. The minerals sector which is operating illegally, is purported to contribute an essential part in the country economic move, as confirmed by its position of citation in the 2015 to 2020 National Development Plan (NPA, World Bank, PwC, Omara, Karungi, Kalukusu, Nakabuye, Kagoya, Musau, 2019a; Omara, Karungi, Ssebulime, Kiplagat, Bongomin, Ogwang, and Akaganyira, 2019b). Uganda Investment Authority, Hinton, Kabongo, Kabiswa, Okedi, Mbabazi, 2011; Nyakecho & Hagemann, 2014, and Omara *et al.*, 2019b highlighted the activities of small-scale gold mining and artisanal in the following districts where gold is deposited namely: Kabale, Kisoro, Busia, Bugiri, Bushenyi, Mbarara, Ibanda, Moroto, among others.

Recently, the government of Ugandan has given the small-scale mining activities awareness in the drafted national mining and minerals policy. This policy shall serve as the basis for mining laws and regulations together with the government master plan. In view of this planned policy the significant impact of small-scale mining activities will be greatly needed (Omara *et al.*, 2019b). Kitaka Gold mine that has been lying value for more than 50 years since inception has been reopened by Simba Mining Company in Kasyoha-Kitomi forest reserve in Ibanda District (Omara *et al.*, 2019b).

The mining industry in Uganda got to peak levels in the 1950's and 1960's when the sector reckoned for up to 30% of Uganda's export earnings. Nonetheless, political and economic uncertainty experienced in the country in the 1970's and recently global economic decline led the sector to show off considerably. Presently, the energy sector's quota in total GDP (Financial Year) FY2009/2010 is 0.3 percent. It should be famed that the showoff is not a result of resource exhaustion rather due to poor world prices of cobalt and copper, among others (Omara *et al.*, 2019b).

In Uganda the year 1986 has been an appreciative business climate in which many mining companies have been authorized to operate legally. There was a significant development in the sector in the last decade as recorded in 2006/2007 and 2009/2010 Fiscal Year from 9.4% to 12.8 %. In 1999, in terms of Charter Company there were 66 charters issued which accrue to a total of 517 in 2010. The discovery of gold in Ibanda District, although mined on a small-scale basis, furnishes thousands of local peoples with job opportunity. The turn down impacts on the community since the formation of the small-scale mining activities were speedy loss of farm lands, water and soil pollution, and complications of managing the mine wastes (Omara *et al.*, 2019b).

Normally, ASGM are affected by numbers of challenges including occupational, environmental and social impacts. The major environmental and health concerns of artisanal and small-scale gold (ASG) mining are elemental mercury emissions and cyanide toxicity with consequent effects on humans, animals, plants and aquatic organisms (Nakazawa *et al.*, 2016 and Ministry of Health, 2019). Gold mining causes significant degradation of forest functions and unfavourably affecting biodiversity, protection, and economic values of the forest at local (mining sites) as well as larger scales (forest surrounding the mining sites and construction of roads). The indigenous community benefits in a limited way of current mining activities in terms of better livelihoods alongside with the incidence of illnesses associated with mercury poisoning. ASG miners are frequently opened to inauspicious health, safety and living conditions, frequently practice exceedingly ineffectual and unsafe techniques of “prospecting and extraction” (Ministry of Health, 2019). The use of mercury in gold processing has led to increased occupational health and several environmental risks in this sector.

Miniature gold mining has increase due to increasing poverty levels and perennial prolonged lack of rain. Resettled farmers have fall back to ASM as an alternative source of income, and are working in collaboration with miners to allow mining activities on their farms. ASM has been embraced as part of a coping master plan to reduce the negative impacts of economic penury and lack of rain. Artisanal mining is probably more profitable than agriculture, gaining momentum in the past two

decades. Miniature gold mining leads employment generation, it is associated with ecological and health hazards. Artisanal small-scale gold mining has been acknowledged as one of the major pilots which are accountable for the demolition of the environment (Awomesol, Taiwo, Dada and Ayantobo, 2017).

Natural resources taken out and ASM activities lead to disputes when the profits are not shared equally in a community. Associate decides without the participation of the indigenous community and the environmental impacts are not tactfully addressed. Direct rivalry over resources needed to sustain source of income such as water, cropland and forest can activate disputes among users. The environmental impact of small-scale gold mining in developing countries has been reported by some researchers. In the recent times environmental and health impacts of small-scale mining activities have been attracting the attention of researchers. Despite the fact that, the mining company is believed to have made steps to ameliorate health conditions of residents within the indigenous communities. Nevertheless, the degree to which these efforts are lessen the negative environmental and health impacts is yet to be confirmed (Darimari *et al.*, 2013 and Meech *et al.*, 1998).

1.2: Problem statement

Most researchers in the recent times have concentrated greatly on the contribution of harmful ASM activities such as pollution of water and degradation of land (Awomesol, Taiwo, Dada and Ayantobo, 2017). Among the most significant environmental aspects related to artisanal and small scale mining are deforestation, changes in landscape structure, influence over geomorphological processes and hydrological river regime, chemical pollution of soil and watercourses, influencing soil production capacity. The exterior mining technique involves pulling out the top soil up to the foundation, which props up the gold. Heavy devices are used for this purpose. Compromises are therefore made undressed and void of vegetation. The use of heavy devices and chemicals below the surface do not

lead to uncertainty within the earth crust but also water below ground which serves as source of water to different bodies of water in the area are pretentious by permeate of dangerous materials.

Land cover changes resulting from mining activities, have serious consequences to vegetation cover and local environment. According to NEMC (2008), the land which is currently used for mining activities in Ibanda District was previously potential for natural forest, agriculture, grazing, fetching fuel woods, ritual and natural herbs for the local livelihoods. However, the current uncontrolled mining activities have resulted into removal of most vegetation cover, through the process of forest clearing pits creation, settlement establishment and road construction. Undoubtedly, mining activities necessitate for the removal of vegetation cover where community depends for their livelihood. Generally, the process of surface extraction of granite and limestone minerals accelerate clearing vegetation which result into change of land cover, forest stocking and pre-existing land scape.

However, environmental and health impacts of small-scale mining activities have not been carried out in Kicuzi Sub-county, Ibanda District. This necessitates the study to investigate the environmental and health effects of artisanal small-scale mining activities in Kicuzi Sub-county.

1.3: Aim and Objectives of the study

This research study aims to ascertain the environmental and health impacts of small-scale mining activities on the surrounding communities of Ibanda District. Also, to explore the socio-economic, health and environment management status among the artisanal small-scale gold miners in order to make recommendations to project planning and policy makers. The specific objectives are to:

- i examine the effects of gold mining activities on environmental media (air, water and land) interaction in Ibanda District.
- ii determine the effects of gold mining activities on the health of miners in Ibanda communities.
- iii determine the impacts of gold mining activities on vegetation loss in Ibanda Municipality.

iv assess the social, environmental and economic impacts of mining activity in Kicuzi Sub-county.

v assess the socio-economic, health & safety status and environment management of artisanal small-scale gold miners in Kicuzi Sub-county.

1.4. Research Hypothesis

The research hypothesis are as follows:

H01: There is a significant relationship between artisanal small-scale gold mining and environment in Ibanda District.

H02: There is a significant relationship between artisanal small-scale gold mining and health in Ibanda District.

1.5: Justification and Significance of the study

ASM occupations are a principal profitable activity in Ibanda District that contributes to means of living and resuscitation of the economy. Owing to the poor macroeconomic environment, it is believed that ASM is likely keep on to increase in size and place pressure on the little land and resources derived from nature. ASM intimidate to be a factor causing basic environmental disputes through land degradation and water impure. This can place a limit on clean water and land suitable for locals within the area. Through the depicting of land use or land protection changes and participatory resource and how different associates are steering the problems. This study is pivotal to surrounding communities and policy makers as it is directed towards the impact of small-scale activities on the environmental and health hazard of the sector. Mining undertaking are essential in the economic growth of any country furnished with natural resources. This is due to the profit-making satisfactions that are made accessible to countries that are involved in the drawing out of mineral resources, both internal and external. Internally, there is the creation

of revenue and employment generation. Externally, an essential foreign exchange is available to such countries. Admitting the economic contributions of mining activities, nevertheless, a number of economies lost sight of environmental and health impacts associated with mining activities. Researches that have been undertaken lately to look into the environmental and health effects of mining have found mining activities to be more hazardous to economic development than a blessing. Accordingly, several mining companies in the country claim to have responded to this by instituting and implementing several measures to reduce the negative environmental and health effects of their activities on the people. Whether some of these measures have or are capable of reducing the negative health impacts of mining on the environment and surrounding communities in Ibanda District is a matter of great concern. The significance of this research work lies in the fact that it seeks to undertake a thorough and broader outlook into the environmental and health effects of mining on Ibanda surrounding communities, both negative and positive, and recommend policy directives to improve the health policies, as well as reducing the rate of hazardous health effects of the mining activities that may be identified in Ibanda District and other surrounding towns.

1.6 Conceptual Framework

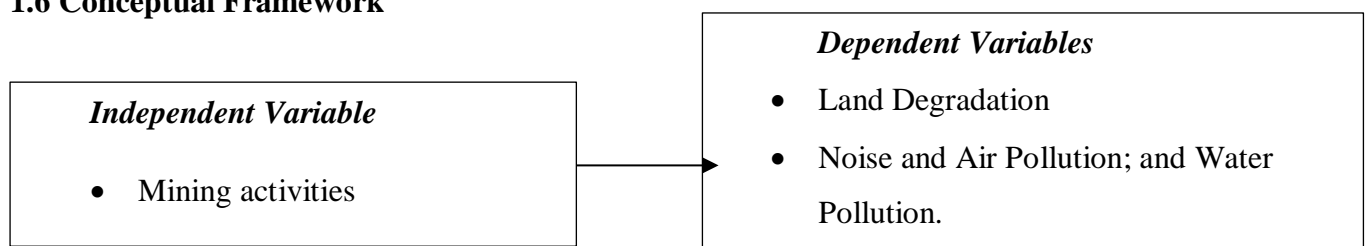


Figure 1: The conceptual frame work

- (An excerpt retrieved from Wikipedia.org on Mining activities accessed 24th of December, 2019).

CHAPTER TWO

LITERATURE REVIEW

Several researches have been conducted on mining and its effects as well as contributions to economic development of countries endowed with mineral resources. Whereas some researches highlight the benefits of mining to economic development, others focus on the negative impacts of mining on the overall development of such economies.

2.1 Theoretical framework / Review of related works

Allen (2019) investigated on large-scale mines and local-level politics between New Caledonia and Papua New Guinea. His findings revealed that there are significant differences in the nature of the relationship that can be attributed to political-economic and historical differences between PNG and NC, albeit with a swathe of additional caveats including the careful avoidance of teleological tropes and pitfalls. Omara, T. Adupa, E. Laker, F. Kalukusu, R. Owori, T. (2019a). Their study revealed that *Sorghum bicolor* L. (Moench) (Epuripur 1995) grew normally and survived in the petroleum oil contaminated soils.

Omara *et al.*, (2019b) investigated on artisanal and small-scale gold mining in Syanyonja, Busia Gold District, and South Eastern Uganda. Their result showed that the most common health problems among miners are malaria and abdominal pain. It is also seen from their findings that the standard of living of the miners are evidently low, and most mines are characterized by school dropouts, prostitutes and thieves. Brown and Kimani (2019) examined the artisanal and small-scale mining. Their observation showed that regions where ASM activities are carried out on arable agricultural land, such as in tropical West Africa, can use crop farming as a means for these communities to pivot sustainably out of artisanal mining. Also, where the soil profile and climate favour farming activities, conscious efforts should be made to help miners shift into farming and this would entail changing some fundamental aspects of agriculture in order to make it as appealing as mining. However, shifting to agriculture is not a panacea as many areas of ASM activity are not agriculturally viable, but farming can be a crucial alternative in areas that are viable. Whereas agriculture provides a clean and sustainable way

out and with a growing African population and accelerating rural-urban migration, food production promises to remain a critical and resilient sector.

Machacek (2019) studied typology of environmental impacts of artisanal and small-scale mining in African Great Lakes Region. His study covers a broad understanding of environmental impacts of artisanal and small-scale mining with a focus on anthropogenic influencing. Barreto, Schein, Hinton, and Hruschka (2018) investigated on the impact of small-scale mining operations on economies and livelihoods in low- to middle-income countries. Their report showed that the three East African countries assessed present differences and similarities. Also, their observation give room for generalising the national findings from the study countries in a regional context 181 that likely can be extrapolated to many countries with more than insignificant ASM activity.

Aboka, Cobbina, and Doke (2018) investigated on the review of environmental and health impacts of mining in Ghana. Their study reviewed data on environmental and health impacts of mining such as pollution of water bodies, degradation of forest resources, depletion of soil nutrients, destruction of wildlife habitat, and reduction in quality and threats to human health. Friday, Sakimp, Kamese, Mukasa, Douglas, John and Ssempebwa (2018) investigated on the assessment of occupational, environment and other impacts from use of mercury in artisanal small – scale gold mining (ASGM) in Uganda was reported by Uganda government.

Awomeso, Taiwo, Dada and Ayantobo (2017) investigated on human health and environmental assessments of small-scale and artisanal mining activities in the Gold City of Ijeshaland, Southwestern Nigeria. Their result showed that higher concentrations of most major and trace elements were found in groundwater than surface water, while rare earth elements (REEs) were more concentrated in groundwater than surface water. Also, impacts of artisanal gold mining activities on soil properties in a part of southwestern Nigeria was examined by Eludoyin, Ojo, Ojo & Awotoye, (2017). Their study revealed that artisanal gold mining activities caused severe soil degradation and

loss of important soil nutrients in the area. It implies that the impact of the mining activities is a major threat to qualitative food security and sustainable livelihoods in the area.

Romero and Saavedra (2016) investigated on the effects of gold mining on newborns' health. Their result revealed that contaminated fish consumption in the first weeks of gestation lead to an increase in exogenous hormone. Assessing the environmental and socio-economic impacts of Local Mining in Northern Ghana. Banda Nkwanta in the Bole District as a Case Study was studied by Bigson (2016). His result showed that mining activities have significant effects on the soil characteristics, like affecting the potential of regeneration of the ecosystem.

Arah (2015) proposed the impact of small-scale gold mining on mining communities in Ghana. His findings revealed that adequately resourcing regulatory bodies, streamlining the process of license acquisition and applying stricter sanctions for offenders. Additionally, regularizing and proper monitoring of the informal sector and the provision of environmentally friendly equipment is critical. Kessey and Arko (2013) examined small scale gold mining and environmental degradation, in Ghana (Issues of mining policy implementation and challenges). Their findings revealed that since the public agencies charged with the responsibility of regulating small scale gold mining are ineffective, the need to search for alternative approaches is crucial.

Yeboah (2008) investigated on environmental and health impact of mining on surrounding communities: A case study of AngloGold Ashanti in Obuasi. His findings revealed that mining activities have resulted in land degradation leading to limited land available for local food production within the municipality. Also, there is incidence of pollution of varied kinds (that is, air, noise and water) to the environment.

Arets, Van der Meer, Van der, Tjon, Atmopawiro and Ouboter (2006) examined the assessment of the impacts of gold mining on soil and vegetation in Brownsberg NaturePark, Suriname. Environmental impact of small-scale and artisanal gold mining in Southern Ecuador was considered by Tarras-Wahlberg, Flachier, Fredriksson, Lane, Lundberg and Sangfors (2000). Their result suggested that

there is a need to consider the suspended and sediment phases when evaluating water-quality impacts, and in setting appropriate environmental water-quality standards.

The negative environmental and health impacts of artisanal gold mining activities in many countries of the world had been reported in published studies among them are Dooyema *et al.*, (2012), Hruschka (2011), Barreto (2011), UNEP (2012), Plumlee *et al.*, (2013), Nyakecho and Hagemann (2014), Ayantobo *et al.*, (2014a, b), Arifin *et al.*, (2015), Basu *et al.*, (2015), Ministry of Health, 2019, Rajaei *et al.*, (2015), Nakazawa *et al.*, (2016) and Obiri *et al.*, (2016). Most of these studies lacked explicit information on the impacts of gold mining activities on multiple environmental indices such as surface water, groundwater, floating plants, the bottom sediments and fish. These negative social, ecological and economic impacts often lead to conflicts within the areas whereby ASM activities occur and the occurrence of conflicts is a reflection of the state of environmental governance within a region. Environmental governance describes the manner in which authority is exercised over natural resources by decision-makers who range from governmental ministers, property owners to farmers (WRI, 2004).

2.2: Health risk assessment

Human being's health likelihood assessment for chemicals is generally a study to estimate the risk of adverse health impacts occurring in an individual, subpopulation or population due to subjection to some chemical (such as mercury). There are four main steps involved in risk evaluation such as: hazard identification, hazard characterization, exposure evaluation and risk characterization. Human beings' exposure can also be approximated through biomonitoring of levels of mercury in different foods acquired from chosen environmental ecosystems, and the consumption designs by the target communities. Human beings are exposed to methyl mercury mainly through their diet, the depletion of freshwater and consumption of other animals that consume. The principal targets

for toxicity of mercury and mercury compounds are the nervous system, the kidneys, and the cardiovascular system (Awomeso *et al.*, 2017).

2.3 Susceptible populations

Generally, there are two susceptible subpopulations, namely, those who are more sensitive to the effects of mercury and those who are exposed to higher levels of mercury, for example workers with high occupational exposure such as ASG Miners. Individuals with diseases of the liver, kidney, nervous system, and lung are also at higher risk of suffering from the toxic effects of mercury.

2.4 Mining and Health

WHO (2005) and Stephen & Ahern (2001) state that; “Health can be described as a condition of total mental, physical, and good health of an individual, and not the absence of disease and weakness”. A modification in the living cells of the body which endangers survival in the surrounding results in diseases. Health complications become apparent from a variation of man’s activities including farming, industrialization, migration, mining and among others. Mining remains one of the most hazardous professions in the world, both in terms of short-term bruises and mortalities but also due to long term effects such as cancers and respiratory conditions such as silicosis, asbestosis and pneumoconiosis. Studies of surface mining focus on coal, granite and rock mining and health risks related to dust breathing. Health risks occur with dust exposure in all levels of mining activities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area

Ibanda is a town in the Western Region of Uganda. It is the main political, administrative, and commercial centre of Ibanda District and the site of the district headquarters. Ibanda District achieved district status in 2005. It is one of the four districts created out of Mbarara District. It started way back in 1990s and was elevated from a trading centre to a town board, town council and in 2016 it was granted a Municipality status. Ibanda District is located in western Uganda. The district office at Ibanda is about 70 kilometers (43 miles), on the road northwest of Mbarara, the largest city in the Ankole sub-area. Ibanda District is bordered by Kamwenge District in the West and North, Kiruhura District in the East, Mbarara District and Buhweju District in the South, and Rubirizi District in the South. Latitude and Longitude of Ibanda District are 0.1167° S and 30.4991° E. The main occupation of people in Ibanda District is farming.



Figure 2: A Map showing the location of Ibanda District

(Excerpt from [www. Map data](http://www.mapdata.com), retrieved on 4th of December, 2019)

3.2 Research Design

The study is quantitative in nature. The quantitative data collection methods employed closed ended questionnaire, which were filled in by the residents of the Division. The answers to questions were displayed on a one (1) to two (2) point Likert Scale.

3.3 Sample Size

According to the population census of estimates of 2012 it's believed that Ibanda District has now a total population 255,500 with a density of 264.8/km² and lies 1800m above sea level. According to Uganda Bureau of Statistics (UBOS,2014) the average household population is 257 persons per square kilometer from a total population of 249,625. Due to limited time and resources, a pre-coded semi-structured household from a representative sample size of 156 households were selected from the study total households of 54,604 below

$$n = \frac{N}{1 + Ne^2} = \frac{257}{1.6425} = 156$$

where n is the sample size, N is the total population, e is the error level or error tolerance or the significance level which is appropriate at 5 percent. The parishes of villages were randomly selected area in the mining site of Kicuzi Sub-county.

3.4 Research Method

In order to achieve the research objectives a survey questionnaire was administered to 156 residents in the Division. Pearson's Rank correlation was utilized as a qualitative approach and the analysis was done using Statistical Package for the Social Sciences (SPSS). Officials and workers of health centers within the locality were also contacted for relevant information. Moreover, there were field observations to the mine sites and other areas to determine the effects of mining operations on the environment. The data collected included background data of respondents, awareness, perception and effects of mining within the surrounding communities, health status of residents in the surrounding communities, food security and the status of health facilities available to the residents in the surrounding communities of the mines. This research work makes use of primary and secondary data that were generated via questionnaires administration in addition to literature, internet, journals, among others.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

4.1 Analysis of Result

Table 4.1 Extraction Methods and its Effect

Count						
Extraction Methods		Some Effects				Total
		Degradation of Land and Vegetation	Water Pollution	Air Pollution	Noise Pollution	
	Surface Mining	57	16	6	0	79
	Underground Mining	40	28	4	5	77
Total		97	44	10	5	156

Table 4.2 Mining Associated Diseases

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Diarrhoea	4	33.3	33.3	33.3
Skin Diseases	3	25.0	25.0	58.3
Injuries	5	41.7	41.7	100.0
Total	12	100.0	100.0	

Table 4.3 Effects of Mining on the Environment

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Degradation of Land and Vegetation	94	60.3	60.3	60.3
Water Pollution	43	27.6	27.6	87.9
Air Pollution	12	7.7	7.7	95.6
Noise Pollution	7	4.4	4.4	100.0
Total	156	100.0	100.0	

Table 4. 4: Socio-Demographic characteristic in Ibanda District

Count									
		Occupation							
		Resident	Business Person	Student	Farmer	Manager	Teacher	Employer	Principal
Sex	Male	0	16	17	35	18	9	11	1
	Female	8	12	8	16	0	5	0	0
	Total	8	28	25	51	18	14	11	1

Table 4. 5: Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secondary	34	21.8	21.8	21.8
	Vocational	58	37.2	37.2	59.0
	Tertiary	64	41.0	41.0	100.0
	Total	156	100.0	100.0	

Table 4. 6: Education Level

Valid	Married	79	50.6	50.6	50.6
	Unmarried	43	27.6	27.6	78.2
	Divorced	34	21.8	21.8	100.0
	Total	156	100.0	100.0	

Table 4.7 Heathy Cases

Signifi cantly fatal	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	9	75.0	75.0	75.0
No	3	25.0	25.0	100.0
Total	12	100.0	100.0	

Table 4.8 Medical readiness to handle health cases

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	3	25.0	25.0	25.0
No	9	75.0	75.0	100.0
Total	12	100.0	100.0	

Table 4. 9: Residential's Correlation on Environment, Health and Perceptions

		HEALTH	PERCEPTIONS	ENVIRONMENT
HEALTH	Pearson Correlation	1	.225*	.447**
	Sig. (2-tailed)		.025	.000
	N	156	156	156
PERCEPTIONS	Pearson Correlation	.225*	1	.612**
	Sig. (2-tailed)	.025		.000
	N	156	156	156
ENVIRONMENT	Pearson Correlation	.447**	.612**	1
	Sig. (2-tailed)	.000	.000	
	N	156	156	156

Correlation is significant at the 0.05 level (2-tailed). Correlation is significant at the 0.01 level (2-tailed).

4.2 Discussion of Results

In Ibanda communities both surface mining and underground mining were the method of extraction in this District. The respondents assert that both surface mining and underground mining leads to environmental effect. Table 4.1 shows that mining has been a major contributor to degradation of land

and vegetation this area. Also, it is seen from the table that it leads to pollution such as water pollution, air pollution and noise pollution which satisfies Objective I. One of the major impacts of surface mining as shown in Table 4.1 is land degradation. The result is in agreement with Kessey and Arko (2013).

Table 4.2 showed that the prevalent diseases in the community are diarrhoea, skin disease and injuries which satisfies Objective II. 75% of health workers have observed that mining activities have led to fatalities. The level of awareness of occupational health and safety practices was high at 75%. 75% of health workers admit that the health sector in this Municipality is not facilitated enough to handle health issues arising from mining activities. 75% of health workers have observed that mining activities have led to fatalities. The result is in agreement with Omara *et al.*, 2019b.

Removal of the top soils, trees and vegetation with heavy machines leads to wearing away of the soil nutrients and makes the land unfit for farming which satisfies Objective III. Table 4.4 shows the highest number of female miners was recorded in the Ibanda District (64.2%). Respondents who had attended school were high in Ibanda District.

Most miners in this locality had attended vocational and tertiary level of education which satisfies Objective IV.

From Table 4.4 mining activities have been a major source of living in this Municipality and lead to employment opportunities to the educated. These farmers (81) have been the biggest beneficiaries of mining activities followed by business people (73). The levels of child labour were higher in ASGM sites that are more informal and where participation is poverty rather than enterprise driven. The study also, revealed that Some of the children in these localities are orphans, unable to pay school fees and scholastic materials, corroborating preceding studies in other parts of Uganda. This study is in agreement with previous reports in that women realize little or no benefits from artisanal and small-scale mining than men but both bear the brunt of negative impacts which satisfies Objective V.

Mining activities have been blamed for land and vegetation degradation (66.4%). Since farming is directly negatively impacted by land and vegetation degradation with such a high percentage has undermined farming in this locality which satisfies Objective III. Noise pollution is also predominant in communities that are close to mining areas, and surrounding communities. The heaviest impact of mining activities has been land and vegetation degradation (66.4%) followed by water pollution (25.4%). air pollution and noise pollution are 5.5% and 2.8 respectively. The results from table 4.9 revealed that perception and environment is significantly correlated with p-value ($p < 0.0005$). The result also depicts that environment and health is significantly correlated with p-value ($p < 0.0005$). It is in agreement with Ministry of Health, Uganda.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

From the findings of this research work, the ecological and livelihood challenges associated with ASGM in Ibanda District goes beyond the accrued benefits. Artisanal small-gold miners are typically poor, hardworking, illiterates with no formal education, health challenges and lack basic needs. Miners in this locality are better acquainted with the health impacts of the mercury based ASGM than the accompanying environmental impacts. ASGM in Ibanda District have led to deforestation and pollution of land, air and water.

Environmental and health impacts of artisanal small-scale gold mining (ASGM) activities in Ibanda District cannot be over emphasized. The mining activities have led to fatalities in Kicuzi sub-country and consequently diarrhoea, skin disease and injuries. Also, it is seen from the findings of this study showed that artisanal small-scale gold mining (ASGM) activities lead to water pollution, air pollution, and noise pollution and land degradation. In general, the level of child labour was low, which was attributed to the on-going government efforts to enforce compliance to laws prohibiting child labour. Low level of education is considered an occupational risk factor.

Air pollution has emanated from emission of dust and other particles into the air, emission of chemicals such as carbon, sulphur, arsenic from processing plants and waste disposed into tailings dams. Noise and vibrations are essentially the effects of blasting of rocks with explosives from both surface and underground mines. As a result, water resources within the communities are not in a very good state as most of them have been polluted with waste from mining activities.

5.2 Recommendations

Based on the results of this research studies, the study has emphasized issues of policy applicability as follows:

- i There is need for more awareness campaigns and programs for proper management of small-scale gold mining (ASGM) activities in Ibanda District.
- ii There should be a concerted responsibility from both government and non-governmental organizations for an effective collaboration and co-ordination in raising the households' levels of perception and cognition approach towards environmental media interaction in the District.
- iii There is for effective regulations to enable spatial vegetation cutting without depletion.
- iv There is need for re-afforestation scheme near and in the mine as trees cut are replaced with new ones planted to cater for the future environment.
- v There is need for Simba Mining Company needs to provide its workers with safety gears at work as well as putting in place safety precautions in dangerous places to minimize accidents.
- vi There is need for community protection from the harms of mining through establishment of health centers by the company to cater for mining illnesses. The safety and environmental regulating agencies in Ibanda District have not done enough to develop the mining sector.
- vii There is need for more comprehensive mitigation measures for the negative impacts of mining on the environment and health of people living in and around Kitaka gold mines, Ibanda district be designed in collaboration between environmentalist and health workers and put in place.
- viii There is need for national environment, health and mining regulations to generate effective policy in the management of the environment that can sustain the environment.
- ix Future studies can be on the effect of intervention measures adopted and implemented by mining companies and stakeholder organizations in the surrounding communities.

5.3 Contribution to Knowledge

Based on the findings of this study, the contributions to the existing body of knowledge are as follows:

- i. The effects of gold mining activities on environmental media interaction in Ibanda District.is determined.
- ii. Demographic characteristics of gold in the Division are identified.
- iii. The impacts of gold mining activities on vegetation loss in Ibanda Municipality is examined
- iv. The impact of gold mining activities on the health of miners in Ibanda communities is determined

REFERENCES

- [1] Allen, M. (2019). Large-scale mines and local-level politics: Between New Caledonia and Papua New Guinea, *Journals of Australian Geographer*, pp 1-4.
- [2] Aboka, Y.E., Cobbina, S. J., and Doke, A. D. (2018). Review of Environmental and Health Impacts of Mining in Ghana. *Journals of Health and Pollution*, vol.17, pp 43-52.
- [3] Arah, I.K. (2015). The impact of small-scale gold mining on mining communities in Ghana. *African Studies Association of Australasia and the Pacific (AFSAAP) 37th Annual Conference – Dunedin*
- [4] Arets, E. J.M.M., Van der Meer P.J., Van der Brink, K., Atmopawiro, T., and Ouboter, P.E. (2006). Assessment of the impacts of gold mining on soil and vegetation in Brownsberg NaturePark, Suriname. Alterra, Wageningen, Alterra-Rapport 1359,26 blz.
- [5] Arifin Y.I., Sakakibara, M., and Sera, K. (2015). Impacts of Artisanal and small-scale gold mining (ASGM) on environment and human health of Gorontalo Utara Regency, Gorontalo Province, Indonesia. *Journal of Geoscience*, Vol. 5(2), pp160–176
- [6] Awomeso, J.A., Taiwo, A.M., Dada, E.O., and Ayantobo, O.O. (2017). Human health and environmental assessments of small-scale and artisanal mining activities in the Gold City of Ijeshaland, Southwestern Nigeria. *Journals of Environmental System Research*, 6(18), pp 1-11.
- [7] Ayantobo, O.O., Awomeso, J.A., Oluwasanya, G.O., Bada, B.S. and Taiwo, A.M (2014). Gold mining in Igun-Ijesha, Southwest Nigeria: impacts and implications for water quality. *American Journal of Environmental Science*, Vol. 10, pp 289–300.
- [8] Barreto, L. (2011) Analysis for stakeholders on formalization in the artisanal and small-scale gold mining sector based on experiences in Latin America, Africa, and Asia. *United Nations Environment Programme*. pp 1–85

- [9] Barreto, M.L., Schein, P., Hinton, J., and Hruschka, F. (2018). The impact of small-scale mining operations on economies and livelihoods in low- to middle-income countries. East Africa Research Fund (EARF) project ‘Understanding the Economic Contribution of Small-scale Mining in East Africa’ covering Kenya, Rwanda, and Uganda.
- [10] Basu, N., Clarke, E., Green, A., Calys-Tagoe, B., Chan, L., Dzodzomenyo, M., Fobil, J., Long, R. N., Neitzel, R.L., Obiri, S., and Ode, E. (2015). Integrated assessment of artisanal and small-scale gold mining in Ghana—Part 1: Human Health Review. *International Journals of Environmental Research and Public Health*, Vol.12, pp 5143–5176
- [11] Bigson, M.S.A. (2016). Assessing the environmental and Socio-Economic impacts of Local Mining in Northern Ghana. Banda Nkawanta in the Bole District as a Case Study. Unpublished MSc Thesis University of Twente, Netherlands.
- [12] Brown, E.K.A., and Kimani, E. (2019). Artisanal and small-scale mining: the paradox of extraction. *Journals of Africa Center for Economic Transformation*, pp 1-5.
- [13] Dooyema, C.A., Neri, A., Lo, Y.C., Durant, J., Dargan, P.I., Swarthout, T., and Nguku, P.M. (2012). Outbreak of fatal childhood lead poisoning related to artisanal gold mining in northwestern Nigeria, 2010. *Journal of Environmental Health Perspective*, Vol. 120(4), pp 601
- [14] Eludoyin, A.O., Ojo, A.T., Ojo, T. O., and Awotoye, O. O. (2017). Effects of artisanal gold mining activities on soil properties in a part of southwestern Nigeria. *Journals of Environmental Management & Conservation*,3, pp 1-14.
- [15] Friday, A.E., Sakimp, D.K., Kamese, G., Mukasa, V., Douglas, N., and Ssempebwa, J.C. (2018). Assessment of occupational, environment and other impacts from use of mercury in

artisanal small – scale gold mining (ASGM) in Uganda: 2017-2018 Report. Retrieved November, 2019.

- [16] Hruschka, F. (2011). SDC experiences with formalization and responsible environmental practices in artisanal and small-scale gold mining in Latin America and Asia (Mongolia). United Nations Environment Programme (UNEP).
- [17] Kessey, K.D., and Arko, B (2013). Small scale gold mining and environmental degradation, in Ghana: Issues of Mining Policy Implementation and Challenges. *Journal of Studies in Social Sciences*, Vol. 5(1), pp 12-30.
- [18] Machacek, J. (2019). Typology of Environmental Impacts of Artisanal and Small-Scale Mining in African Great Lakes Region. *Journals of Sustainability*, 11, pp 1-24.
- [19] Ministry of Health, Uganda. (2019). Malaria cases. Retrieved on 13th of August, 2019.
- [20] Nakazawa, K., Nagafuchi, O., Kawakami, T., Inoue, T., Yokota, K., Serikawa, Y., and Elvince, R. (2016) Human health risk assessment of mercury vapor around artisanal small-scale gold mining area, Palu city, Central Sulawesi, Indonesia. *Journal of Ecotoxicology and Environmental Safety*, Vol. 124, pp155–162.
- [21] National Environmental Monitoring Conference (NEMC) Proceedings (2008), Washington DC August 10 – 16, 2008.
- [22] Obiri, S., Yeboah, P.O., Osae, S., Adu-kumi, S., Cobbina, S.J., Armah, F.A., Ason, B., Antwi, E., and Quansah, R. (2016). *International Journal of Environmental Research and Public Health*, Vol.12, pp139
- [23] Omara, T. Adupa, E. Laker, F. Kalukusu, R. Owori, T. (2019a). Potential of *Sorghum bicolor* L. (Moench) and the Effectiveness of Some Organic Amendments in Remediation of Petroleum-Oil Vitiated Soils of an Automobile Repair Workshop in Urbanite Kampala. *Asian Journals of Applied Chemistry Research*, Vol. 3(1), pp1-10.

- [24] Omara, T., Karungi, S., Ssebulime, S., Kiplagat, K.M., Bongomin, O., Ogwang, R and Akaganyira, S . (2019b). Artisanal and Small-Scale Gold Mining in Syanyonja, Busia Gold District, South Eastern Uganda: Impacts on the Mining Population and the Environment. doi:10.20944/preprints201910.0298.v1
- [25] Plumlee, G.S., Morman, S.A., Meeker, G.P., Hoefen, T.M., Hageman, P.L., Wolf, R.E. (2013) The environmental and medical geochemistry of potentially hazardous materials produced by disasters. *Journal of Treat Geochem*, Vol. 11, pp257–304
- [26] Rajae, M., Sánchez, B.N., Renne, E.P., Basu, N. (2015) An investigation of organic and inorganic mercury exposure and blood pressure in a small-scale gold mining community in Ghana, I. *International Journal of Environmental Res Public Health*, Vol. 12, pp10020–10038.
- [27] Romero, M and Saavedra, S. (2016). The Effects of Gold Mining on Newborns' Health. Retrieved November 25, 2019.
- [28] Tarras-Wahlberg, N.H., Flachier, A., Fredriksson, G., Lane, S. Lundberg, B and Sangfors, O. (2000). Environmental impact of small-scale and artisanal gold mining in Southern Ecuador. *Journal of Human Environment*, Vol. 29(8), pp1–8.
- [29] Yeboah, J.Y. (2008). Environmental and health impact of mining on surrounding communities: A case study of Anglogold Ashanti in Obuasi. Unpublished MSc Thesis submitted to the Department of Geography and Rural Development, Kwame Nkrumah University of Science and Technology.

Appendix A: Questionnaire

QUESTIONNAIRE SCHEDULE FOR RESIDENTS IN THE SURROUNDING COMMUNITIES.

A. Personal Information

1. Residence..... 2. Sex.... Male [] Female [] 3. Age.....
4. Occupation.....
5. Marital status: a. Married [] b. Unmarried [] c. Divorced []
6. Highest level of educational attainment a. Illiterate [] b. Basic [] c. Secondary (S.S.S, Training College, Vocational) [] d. Tertiary (Polytechnic, University [] e. Others, specify []
7. For how long have you been staying in this town/village?

B. MINING ACTIVITIES AND IMPACTS ON THE ENVIRONMENT

8. Do you have any idea about mining activities in this town/village? Yes [] No []
9. If yes, what method(s) of extraction is/are used by the company? (Tick all that apply) A. Surface Mining B. Underground Mining C. Dredging D. Gallamsey Method E. Other, specify.....
10. Do you think the methods of operation by the mining company have some effects the natural environment? Yes [] No []
11. If yes, what are some of the effects? (Tick all that apply) A. Degradation of land and vegetation B. Water pollution C. Air pollution D. Noise pollution E. Other, specify
.....
12. What actually cause(s) land degradation? (Tick all that apply) A. Presence of tailing dams B. Use of toxic materials C. Use of heavy machines D. Clearing of Vegetation E. Long period of extraction Other, Specify.....
13. What cause(s) pollution (of any sort as chosen in Q11) on the environment? (Tick all that apply) A. Presence of tailing dams B. Use of toxic materials C. Use of heavy machines D. Clearing of Vegetation E. Long period of extraction Other, Specify.....
14. Simba Gold Mining (SGM) made attempts to reduce or curtail the adverse environmental effects of mining activities? Yes [] No []
15. If yes, what are some of the measures being undertaken? A. Re-afforestation B. Resettlement of affected communities C. Providing alternative sources of drinking water D. Compensation to

affected communities E. Reviewing or varying methods of operation F. Others, specify
.....

16. Are the efforts at reducing the environmental impacts satisfactory and effective? Yes [] No []

C. MINING AND HEALTH

17. Which of the following diseases do you usually suffer from or contract? A. Malaria B. Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)
.....

18. What diseases do people in your family frequently contract? A. Malaria B. Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)

19. Would you say the disease(s) chosen above are related to the mining activities? Yes [] No []

20. What are the sources of medicine to address your health needs? A. Clinics B. Hospitals C. Traditional (herbal) medicine D. Drug stores E. Other, specify

21. Give reasons for your answer in Q20
.....
.....
.....

22. Is AGA doing anything to address the health needs of the community? Yes [] No []

23. If yes, what are some of these activities?
.....
.....
.....

24. Has AGA built any health facility in this community for the service of both workers and people in the community? Yes [] No []

25. Does AGA carry out any health campaign programme to educate people in the community? Yes [] No [] 26. If yes, give any example of such campaigns you know of
.....
.....

D. ROLES OF LEGAL REGULATING AGENCIES AND OTHER STAKEHOLDER ORGANISATION WITHIN THE MINING SECTOR

27. Do you have any idea of agencies or organisations that hold stake in monitoring, regulating and addressing the activities of the mining sector in the country? Yes [] No []

28. If yes, what are some of them? (Tick all that apply) A. EPA B. Chamber of mines C. Ghana Minerals Commission D. NGO's E. Other, specify
29. Do you often hear of any of the above organisation's activities relating to mining activities in the town? Yes [] No []
30. If yes, which of them do you usually hear of (Tick all that apply) A. EPA B. Chamber of Mines? C. Ghana Minerals Commission D. NGO's (Name.....) E. Other, specify
31. Would you say that these (any of them) agencies and organisations are doing well in monitoring and regulating mining activities in the town? Yes [] No []
32. Give reasons for your answer to Q31

QUESTIONNAIRE SCHEDULE FOR STAFF OF SGM.

A. Personal Information

1. Residence..... 2. Sex.... Male [] Female []
3. Age..... 4. Department.....
5. Marital status: a. Married [] b. Unmarried [] c. Divorced []
6. Highest level of educational attainment a. Illiterate [] b. Basic [] c. Secondary (S.S.S, Training College, Vocational) [] d. Tertiary (Polytechnic, University) [] e. Others, specify

B. MINING ACTIVITIES AND IMPACTS ON THE ENVIRONMENT

7. What method(s) of extraction is/are used by the company? Tick all that apply
 A. Surface Mining B. Underground Mining C. Dredging D. Gallamsey Method E. Other, specify.....
8. Do you think the methods of operation by the mining company have some effect on the natural environment? Yes [] No []
9. If yes, what are some of the effects? A. Degradation of land and vegetation B. Water pollution C. Air pollution D. Noise pollution E. Other, specify

10. Has Simba Gold Mining(SGM) company made attempts to reduce or curtail the adverse environmental effects of mining activities? Yes [] No []

11. If yes, what are some of the measures being undertaken? (Tick all that apply) A. Re-afforestation
B. Resettlement of affected communities C. Providing alternative sources of drinking water D.
Compensation to affected communities E. Reviewing or varying methods of operation F. Other,
specify

.....

12. Are the efforts at reducing the environmental impacts satisfactory and effective? Yes[] No []

C. MINING AND HEALTH

13. Which of the following diseases do you usually suffer from or contract? (Tick all that apply) A.
Malaria B. Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)

.....

14. What diseases do people in your family frequently contract? (Tick all that apply) A. Malaria B.
Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)

.....

15. Would you say the disease(s) chosen above are related to the mining activities? Yes [] No []

16. What are the sources of medicine to address your health needs? A. Clinics B. Hospitals C.
Traditional (herbal) medicine D. Drug stores E. Other, specify

17. Give reasons for your answer in Q20

.....
.....
.....

18. Is AGA doing anything to address the health needs of the community? Yes [] No []

19. If yes, what are some of these activities?

.....
.....
.....
.....

20. Has SGM built any health facility in this community for the service of both workers and people
in the community? Yes [] No []

21. Does AGA carry out any health campaign programme to educate people in the community?
Yes [] No []

22. If yes, give any example of such campaigns you know of

.....

.....
.....
C. MINING AND HEALTH

13. Which of the following diseases do you usually suffer from or contract? (Tick all that apply) A. Malaria B. Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)
.....

14. What diseases do people in your family frequently contract? (Tick all that apply) A. Malaria B. Diarrhoea C. Skin diseases D. Fever E. Colds and catarrh F. Other disease(s)
.....

15. Would you say the disease(s) chosen above are related to the mining activities? Yes [] No []

16. What are the sources of medicine to address your health needs? A. Clinics B. Hospitals C. Traditional (herbal) medicine D. Drug stores E. Other, specify

17. Give reasons for your answer in Q20
.....
.....
.....

18. Is SGM doing anything to address the health needs of the community? Yes [] No []

19. If yes, what are some of these activities?
.....
.....
.....
.....

20. Has SGM built any health facility in this community for the service of both workers and people in the community? Yes [] No []

21. Does SGM carry out any health campaign programme to educate people in the community? Yes [] No []

22. If yes, give any example of such campaigns you know of
.....
.....
.....
.....

Appendix B: Pictures



