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FACULTY OF ARTS

DEPARTMENT OF DEVELOPMENT STUDIES

**THE EFFECTS OF ARTISANAL SMALL-SCALE GOLD MINING ON THE
ENVIRONMENT: THE CASE OF WARD 25 (CHISINA 3) GOKWE SOUTH DISTRICT**

BY

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Research supervision acknowledgement form

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Declaration

I, Peter Mapfumo, declare that this thesis I have submitted is my own effort and also it has not been submitted anywhere for any degree purposes in any other university. I certify that the information in the thesis which is not my effort has been acknowledged. This thesis is being submitted in partial fulfillment of the requirements of the Bachelor of Arts in Development Studies Honors Degree at Midlands State University, Zvishavane campus.

Signature

Date

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Dedication

I dedicate this thesis to my lovely wife Ethel Mwilawasa and son Kundai Nathanael Mapfumo, My late father Shadreck Dzingayi Mapfumo, my mother Rhoda Musemwa, My two sisters Juliet and Lucia Mapfumo and lastly my brothers Emmanuel Mapfumo, Simbarashe Mapfumo and Abraham Mapfumo for their financial support they gave to me during my study.

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Abstract

The main aim of this research is to examine how artisanal small-scale gold mining undermines the environment which in the long run affect the livelihoods of the future generations in ward 25 (Chisina 3) in Gokwe south district. In Particular 10 operational mines 5 being Legal (registered) and 5 illegal (not registered) were under study. Qualitative research methodology was used in gathering relevant information from the respondents; this was done through the use of data gathering instruments which include interviews as well as questionnaires. 130 participants were reached through interviews as well as questionnaires. In terms of sampling method purposes sampling method was used, respondents were selected from the ward 25 residents, artisanal miners, mine associates as well as from village heads. Result from the study shows that there are several factors that triggered artisanal mining in the ward and these are ,droughts, massive unemployment, economic decline, abundance of gold deposits, the gold panning mindset amongst the local people, gold rush (riches) as well as easy accessibility of gold mines. In addition results from the study shows that artisanal small-scale gold mining result in environmental damages. The noted and observed environmental effects of artisanal gold mining include, land degradation, soil erosion and siltation, deforestation/vegetation, pollution (water, land, noise and air), destruction of soil organisms as well as the endangering of human beings.

Acronyms

COTTCO.....Cotton company of Zimbabwe

EMAEnvironmental Management Agency

GMB.....Grain Marketing Board

SAPs.....Structural Adjustment Programmes

ZISCO.....Zimbabwe Steel Company

ZRP.....Zimbabwe Republic Police

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Introduction

This research is looking on the effects of artisanal small-scale gold mining to the environment in Ward 25 (Chisina 3) in Gokwe south district found in Midlands province in Zimbabwe. Mineral mining is the mainly industrial sector which mostly results in the destruction of the environment as well as causing some health problems to the local communities as well as the mine workers. Chenje (2000) is of the view that mineral extraction is considered to be the most destructive industry to the environment. Musingwini and Sibanda (1999) in Phiri (2012) connotes that the definition of artisanal mining varies from country to country. Phiri (2012) shared the view that artisanal mining encompasses small, medium, informal, legal, illegal miners who use rudimentary methods and processes to extract mineral resources.

These types of miners are less skilled as compared to commercial mining; they also lack knowledge as well as technology particularly on the use of mining equipment which may harm the environment in most of the cases. These miners pay little attention to the environment. Phiri (2012) shared the view that these mines are individual or enterprises owned mines or small family owned companies and not affiliated to multinational companies, These small-scale mines can be cooperative owned for example in Zimbabwe the Shamva mines. Environment literally means the surroundings and everything that affects an organism during its lifetime. It is “the sum total of water, air and land, the interrelationships among them and also with human beings and other living organisms and property”.

Artisanal small-scale gold mining sustains a lot of livelihoods in Zimbabwe mostly in rural areas as compared to urban areas. This activity becomes more practiced in areas which are most prone to droughts. Maponga and Ngorima (2003) shared the view that artisanal small-scale gold mining

sustains livelihoods which claimed to be above 2 million in Zimbabwe directly or indirectly through ancillary services and secondary economic activities. There are several factors that triggered artisanal small scale gold mining in many developing countries. These include, economic decline, massive unemployment, droughts, abundance of gold deposits, legislation, gold rush, the gold panning mindset among the local people as well as the easy accessibility of gold mines. Bugnsen (2002) in Lovitz (2006) pointed that artisanal gold mining serves as a social safety net to people who are unemployed and have no other opportunities as well as subsistence farmers who are affected by droughts. Viega and Hinton (2002) alludes that in many rural areas in many developing countries artisanal small scale gold mining is a poverty driven economic activity.

Artisanal small scale gold mining is associated with many environmental impacts. Henstchel et al (2002) in Arko and Kessey (2013:16) gave the causes of the various negative environmental impact of small scale gold mining as lack knowledge, education and training of miners, inefficient technology for mining, inefficient public administrative, challenges in human control, lack access to better techniques, lack of information on best practices as well as lack of control and enforcement of policies. The noted environmental impacts of artisanal small-scale gold mining include air pollution, land degradation as well as water pollution as a result of the use of toxic liquids in gold purification as well as the amalgamation process like cyanide and heavy metal like mercury. Hilson and Van der Vorst (2002) shared the view that mercury is used in gold amalgamation in artisanal small-scale gold mining .The amalgamation process transforms elemental mercury into methyl mercury a toxic organic compound which poses threat to the health of animals, humans and aquatic life. Artisanal Small-scale gold mining involves the

digging in river banks and river beds causing soil erosion as well as siltation as huge amounts of sediments are being released into the river systems.

This research is important in the sense that besides looking on the environmental impacts of artisanal small-scale gold mining the research is going to look on the mining measures and strategies that can be taken into consideration so as to lessen the effects of artisanal small-scale gold mining on the environment as well as health problems to the workers as well as the local community and providing a good and favourable environment for livestock as well as wildlife. The research is also going to provide information on how can these artisanal miners can have an appreciation of the environment as to create sustainability of the environment as well as mining industry.

Background of the study

Artisanal small-scale gold mining appeared to become the major economic activity in Zimbabwe. There are several factors which led to the rise of artisanal gold mining in Zimbabwe and these include the economic decline, massive unemployment, recurrent droughts, legislation on small-scale gold mining, as well as gold rush. Zimbabwe faced economic hardships during the period 2000 to 2008. The problems which Zimbabwe encountered during this period include hyperinflation as well as very low salaries to the workers. The World Bank (2007) pointed that this has left many households living far below the poverty datum line. During this period many families faced income hardships alongside the rising inflation rates. Artisanal gold mining appeared to be the possible solution to the majority's hardships and as a result this period witnessed the sudden rise in the numbers of artisanal gold miners in many parts of Zimbabwe including Gokwe south district ward 25.

Massive unemployment is another factor that particularly leads to the rise in artisanal small-scale gold mining in many parts of Zimbabwe including Gokwe south. Unemployment was as a result of the economic decline which then resulted in the closure of many companies and industries in the country. Moss and Busse (2006) articulates that due to the economic decline, many companies closed resulting in most workers losing jobs. They pointed that unemployment is said to have been rise to 80% in Zimbabwe in 2008.

In Gokwe south ward 25, massive unemployment is seen as the factor that is leading to the rise of artisanal gold mining. Due to the reduction in the numbers of employees by large scale companies like ZISCO steel company, unemployment rates also increased in Gokwe south specifically ward 25 as some of the family members who were employed at ZISCO were retrenched. Other small scale companies in Gokwe south which include Notsure mine as well as Bushdale mine retrenched some of its workers due to the decline in their production. This directly increases the rates of unemployment in the district. Massive unemployment left people with no choice but to opt to artisanal small-scale gold mining as the only source of income for them to survive in such harsh conditions.

Droughts as a challenge have become a common feature in many Parts of Zimbabwe including Gokwe south which is the area of study. Recurrent droughts considered to be another factor that triggered artisanal small scale gold mining in Zimbabwe. Many people in ward 25 as well as from other areas resorted on artisanal mining for them to provide food for their families in their so called drought suffering areas. Masiya et al (2003) shared the view that over the past decade subsistence agriculture has continued to decline due to frequent droughts across the country and this has forced households to diversify into artisanal gold mining along rivers as well as in disused mines.

Artisanal gold mining has become rampant in Gokwe south ward 25 due to continued occurrences of droughts and it became their main source of livelihood as many households diversify into artisanal small-scale gold mining for them to be able to access food and other basic requirements. In support of this view Dreschler (2001) pin pointed that an estimated number of over two million people in Zimbabwe are deriving their livelihood from artisanal small-scale gold mining.

Legislation is another factor to be considered as a factor that triggered artisanal small-scale gold mining in Zimbabwe. Phiri (2012) noted that it can also be argued that artisanal small-scale gold mining has received a boost in Zimbabwe in the past decade from new government policies which encouraged small-scale mining through the Ministry of small and medium enterprises in which artisanal gold miners were encouraged to register claims and operate formally or legally led to the rise in artisanal small-scale gold mining in many parts across Zimbabwe including Gokwe south district. Nkiwane (2012) noted that Zimbabwe since 2000 has witnessed a number of policy changes promoting indigenisation which has seen the liberalisation of mining operations with many people going into small-scale gold mining. Sivotwa and Mtetwa (1997) pointed that small-scale mining sector comprises of more than 20 000 registered mining claims with about 10 % in full operation and about 300 000 unregistered illegal mines in Zimbabwe.

However, in Gokwe south specifically Ward 25 diversification into artisanal small-scale gold mining although it provides some kind of source of employment and income generating to many households simultaneously it is posing a lot of environmental problems as well as causing the health problems to the people residing around the area of mining and even those people who are far from the mining area but make use of water from the polluted water bodies for consumption.

Noted environmental effects of artisanal small-scale gold mining in Gokwe south ward 25 include, deforestation/ vegetation destruction, soil erosion and siltation, land degradation as well as pollution. Soil erosion and siltation has affected mostly water systems in the ward, rivers and dams are drying up as a result of soil erosion. Artisanal miners are causing huge soil erosion due to their rudimentary methods of extracting gold as the soil is loosened and easily eroded by flowing water into the water systems.

Water systems have been noted as the key area affected by artisanal small-scale gold panning legally or illegally. Drying up of rivers in the ward for example Chikombera/Mwembesi River as a result of mining methods and activities done by Movis gold miners is as a result of artisanal gold mining. Shoko (2002:1) in Phiri (2012) Siltation of rivers reduces river conveyance and the storage capacity of reservoirs, which in turn will make several areas prone to flooding. Phiri (2012) is of the view that gold panning processes on river banks, beds and surrounding areas discharge huge amounts of loose silt and heavy metals into the river systems. Eventually these are carried into the water bodies hence an increase in siltation, Flooding and drying up of water reservoirs.

Artisanal small-scale gold mining in Gokwe south district specifically ward 25 is also leading to land degradation. The diggings by artisanal gold miners lead to land degradation. Artisanal gold miners cut down trees and also digging a lot of pits as well as destroying arable land for agricultural purposes. Pollution is another environmental effect of artisanal small scale gold mining. Four major forms of pollution are occurring as a result of artisanal mining these are Air pollution, Water pollution, Land pollution as well as noise pollution.

Water pollution comes as a result of mercury use as well as cyanide use in the processes of gold amalgamation which is done by all artisanal miners which then pollutes both underground water as well as surface water in water systems (dams and rivers). Air pollution is occurring as the result of burning mercury gold amalgam on an open space which pollutes the atmosphere; this may cause respiratory diseases like bronchitis. Land pollution became rampant due to poor management of wastes by the artisanal miners and also noise pollution as a result of explosives as well as sound from the stone threshing stamps which driven away some wildlife to less noise areas

Conceptual framework

Artisanal small-scale gold mining

The economic commission for Africa pin pointed that there is no universal definition of artisanal small-scale mining, but it has some common features like being labor intensive, less skilled workers, low technology mining methods, they can be legal as well as illegal and these miners pay little attention to the environment. Phiri (2012) is of the view that artisanal small-scale gold mining can be defined as the activity of extracting gold that encompasses small, medium, informal, legal, illegal gold miners who use rudimentary methods and processes to extract gold deposits. In other words these miners are unskilled, they also lack knowledge and they have little appreciation of the environment as they use destructive methods of extracting gold. These types of mines can be individually or small family owned enterprises.

In this study artisanal small scale gold mining is going to be referred to as miners that use less technology skills, destructive methods of extracting gold ores illegal as well as legal,

characterized by low capital and paying little attention to the impacts of their activities on the environment.

Artisanal small scale gold mining in this study is going to be seen as the most economic activity for the livelihoods in ward 25 Gokwe south district. And also as the most sector that is responsible for posing a lot of effects to the environment.

Environment

Environment accurately means the surroundings and all that affects a creature during its lifespan. It is the sum total of land, water and air, the interrelationships among them and also with human beings and other living organisms and property.

In other words environment involves all living and non-living organisms. It involves the interaction of living organisms, natural resources, weather and climate change which affect human livelihoods

Statement of the problem

This study is focusing on assessing the effects of artisanal small-scale gold mining on the environment. Artisanal mining has become a key to development of many developing countries which include Zimbabwe. There are several reasons why this activity becomes a key to development in many developing country for example in Zimbabwe artisanal small-scale gold mining has become a key to development as it become the major source of foreign currency. Noetsaller (1997) in Nkiwane (2012) noted that in addition to the direct employment

opportunities artisanal small scale contributes to the generation of substantial number of indirect jobs in other sectors of the economy as it creates demands for inputs, transportation and other services as well as benefits due to increased income and consumer spending.

Due to economic decline, massive unemployment as well as recurrent droughts artisanal gold mining has become the major economic activity for many people in developing countries. This is the same scenario in Zimbabwe specifically Gokwe south district ward 25. Due to economic decline, massive unemployment, recurrent droughts, gold rush and legislation artisanal gold mining has become the major source of livelihood as the people were forced by the harsh conditions to diversify into artisanal gold mining. However artisanal small scale gold mining is resulting in environmental degradation due to the fact that artisanal miners use poor and destructive mining methods which lead to land degradation, soil erosion and siltation, deforestation/ vegetation destruction as well as pollution to the environment which cause health problems to both human beings as well as animals and also which in the long run may hinder the basic needs for the future generations. One noted example for the effect of artisanal small scale is pollution. The pollution of water bodies lead to the death of 9 cattle in 2008 after drinking cyanide contaminated water near Movis gold mine in ward 25 Gokwe south district. The drying up of rivers such as Chikombera/Mwembesi and dams like Ngondoma dams were noted to be as a result of artisanal small-scale gold mining.

Theoretical framework

This study is guided by the concept of sustainable development by the Bruntland commission/the world commission. The Bruntland commission defined sustainable development as a “development which meets the needs of the current generations without compromising the ability of future generations to meet their own needs. The concept underlines the importance of

protecting the natural resource base and the environment. United Nations Economic Commission for Europe (2007) noted that the Brundtland commission concept of sustainable development heavily argued that economic and social wellbeing cannot be improved with measures that destroy the environment. World Commission on Environment and Development (1987) noted that poverty is seen as a major cause and effect of environmental degradation. The Brundtland commission argues that the solution to the problems of many developing countries lies in the economic growth that is equitable and environmentally sustainable.

Artisanal mining undermines the environment in a plethora of ways which then harm the future generations. Artisanal small-scale gold mining results in negative environmental effects which include deforestation/destruction of vegetation, land degradation, pollution of water, land as well as air. These would affect the future generation in several ways which include the scarcity of agricultural land since artisanal mining results in gullies as well as pits and shafts which left being unfilled. Artisanal mining also affects the future generations as it results in water shortages as artisanal mining activities result in dry up of water systems as a result of huge erosion/siltation in water bodies.

In addition artisanal small-scale gold mining harm the future generation by fostering the process of desertification which is the spread of deserts to areas which were not deserts before, this would come as a result of excessive deforestation by artisanal miners as they cut down and stump trees for several reasons which include constructing purposes as well as wood as a source of fuel. In addition artisanal small scale gold mining harm the future generations as it fosters negative climate change in the area this is as a result of the cutting down and burning of trees, the use of toxic gasses which pollutes the environment and these may result in negative climate change impacts which include low precipitation alongside high temperatures since trees

constitutes to precipitation through the process of transpiration and also cooling of the atmospheric temperatures. Hence the concept of sustainable development by the Bruitland commission is the guiding theory to this research.

Objectives

- ❖ To examine factors that triggered artisanal small-scale gold mining in Gokwe south ward 25.
- ❖ To assess the effects of artisanal small-scale gold mining to the environment in Gokwe south ward 25
- ❖ To identify strategies that artisanal small scale gold miners can adopt to protect the environment in Gokwe south ward 25

Research questions

1. What are the factors leading to the rise of artisanal small-scale gold mining in Gokwe south ward 25?
2. What are the environmental effects of artisanal small-scale gold mining in Gokwe south ward 25?
3. What strategies that can be adopted by artisanal small-scale gold miners so as to protecting the environment in Gokwe south ward 25?

Significance of the study/ Justification

Due to artisanal gold mining in Gokwe south ward 25 as a source of livelihood the environment is being heavily degraded. This issue of environmental degradation as a result of artisanal gold mining motivated the researcher to undertake this study. The issue of what will happen to the future generations if artisanal gold miners continue using these destructive mining methods was also in the researcher's mind-set which then motivated the researcher to undertake this study.

The research is important to the studies undertaken by the author since the practices under the research affects the community and the economy and thus affecting the livelihoods of the people. The study is relevant in the sense that it seeks to pinpoint some ways of extracting gold by the artisanal gold miners without affecting the environment. In addition the future generation will also benefit from this study since the resources and the environment are going to be protected and this means their basic needs specifically on the environment would be available as a result of this study.

Limitations

One of the limitations the researcher will encounter is that some artisanal small-scale gold miners especially those who practice illegal mining (gold panning) may not be able to be open up to crucial information as they are afraid of arrest by the police as in many cases police officers visit those type of mines in casual dressing. Besides arrest they may be in fear that their mines can be banned to operate. Transport problem in the process of collecting data is another challenge the researcher is going to encounter as most of the small-scale gold mines are found in hard to reach areas in ward 25 by road transport, however other modes of transport will be used include bicycles to reach those areas for data to be gathered

Research methodology

Qualitative research methodology was used for data collection from the respondents. There is no universal definition of qualitative research but it is characterised by being more of exploratory as well as more of descriptive. It doesn't put emphasis in numbers and it uses non probability sampling methods. This research used qualitative research methodology through the use of interviews and questionnaires to gather data from the respondents.

Data gathering instruments

1. Interviews

In undertaking this study interviews played the center part in collecting data for this study. Different facts and views concerning artisanal gold mining and environment were obtained through interviews. Face to face interviews were the interviews conducted by the researcher. In carrying out these interviews the most technique of open ended questions were used and this allows the participants to explore all their views without any limit.

Interviews were conducted to different sections of people in the area which include; the mine associates, mine claim owners, miners, the community, political representatives and from stakeholders like EMA and ZRP departments. Interviews were relevant to this study as they have high response rate as compared to questionnaires. Interviews also allow the exchange of information between the researcher and the correspondent which lead to gathering of relevant information to the study. Interviews on the factors that triggered artisanal mining were most conducted by the researcher with the miners since they are the one with information on what makes them to be on that activity.

2. Questionnaires

Questionnaires are another data gathering instrument used in data collection for this study. Questionnaires were given to the selected participants to complete the questions. Different groups of people in the community were given questionnaires to complete. This is relevant to the study since different views about the artisanal gold mining and the environment were obtained through questionnaires. One of the advantages of questionnaires in this study is that questionnaires provide data that is very easy and quick to analyse since the questions are very clear as well as the answers. This instrument is one of the fast and quick instruments in collecting data from large numbers of people within a short period of time.

Sampling

Sampling is the process of identifying a portion or fraction of population that will participate in the research. The importance of sampling is that through different correspondents of participants different issues can be raised concerning the topic the researcher will be researching on.

Target Population

This research was conducted 10 operational artisanal small-scale mines 5 legal operating as well as 5 illegally operating mines in ward 25 in Gokwe south district and the number of participants will be 130 with age and gender disaggregated. These participants are going to come from several sectors which include stakeholders like EMA, ZRP, Business owners, community, mine associates, mine owners, mine workers, gold panners as well as ministry of mines. However the researcher gathered much of the information from the community as the community is the one which recognize the benefits of the mining activities as well as the environmental problems

Sampling method

Purposive sampling was used in the research data collection. Teddlie and Yu (2007) pointed that Purposive sampling is selecting a sample based upon the researcher's judgement and specific purpose rather than randomly. Purposive sampling is allowed for ease access to artisanal small-scale miners and household heads in ward 25 of Gokwe south district. The most advantage of this method of sampling is that in is cost effective as well as time effective meaning to say it saves time at the same time is so cheap and in another point of view it also provide relevant data to the researcher as relevant participants are going to be selected during the gathering of information.

Literature review

General overview on Artisanal small scale gold mining

Akabzaa and Darimani (2001) pointed that Ghana has a long history of artisanal small-scale gold mining dated from the eighth century as a household economic activity, but at the peak of colonial exploration Europeans introduced large scale gold mining which led to the abolition of artisanal small-scale gold mining activities with the passage of the mercury law in 1933 by the colonial government. As artisanal small-scale gold mining was a major source of surviving for many households the people did not give up the mining activities not considering the banning of those activities, rather a law made the artisanal small-scale gold miners to operate underground.

In the context of Ghana Hilson (2001) in noted that the government has defined 25 hectores of land size for artisanal small-scale gold mining activities. Scholars like Albert Etal (2015) pointed that in Ghana gold mining sector consist of both small scale mining and large scale mining each of which has varying environmental impacts. They also indicated that illegal small scale gold mining activities which in Ghana locally call ‘Galamsey’ involves surface mining which is the dominant method of mining used by these miners due to its cost effectiveness, low capital intensity and minimal technical skill requirement. Ghana National Commission for UNESCO noted that the national statistics indicates that gold mining industry is a major source of employment.

It is estimated that it employed over 520 000 Ghanaians, with about 4% working in large scale gold mining and 96% in small scale subsector. Ministry of land and natural resources (2010) noted that out of 2,930,328 ounces of gold produced in Ghana In 2009 the small scale miners produced 18% while 82% was produced by large scale mining companies. Hilson (2001) pointed that Ghana is the second largest producer of gold in Africa. Cobbina Etal (2013) gave a research on artisanal small-scale gold mining and how it affects the quality of water for drinking. In this research Cobbina Etal (2013) pointed that artisanal small-scale gold mining in Ghana is mostly practiced in rural areas and in some cases river bank and beds mining is mostly witnessed. They also mentioned the use of cyanide and mercury in gold recovery and amalgamation process.

Scholars like Kitula and Kiangi (2002) on his research on artisanal small-scale gold mining indicated that mineral extraction and exploitation in Tanzania began in the 1880’s following the establishment of German administration. Also other scholars like Tesha (2000) noted that in Tanzania there is evidence that local people using traditional methods of mineral extraction centuries before the establishment of the colonial administration. Kitula and Kiangi (2002) pin

pointed that Tanzanian most gold fields are found in Geita, Musoma, Tarime, Chunya and Mpanda regions.

Knight (2001) shared the view that currently Tanzania ranks third in the continental gold production behind South Africa and Ghana. The scholar also pointed that artisanal small-scale gold mining is mostly practiced in most Tanzanian rural areas as the people find it as their way of generating income and as their source of employment, However these people pay little attention to the environment as the methods of mining they use are so much destructive to the local environment. Tesha (2000) noted that gold panning in most cases is done in the river banks and beds. The scholar further pointed that even if it is done in the forest in the process of panning which require a lot of water the people then conduct this process in water systems which affect the water systems in most rural areas of Tanzania.

Spiegel (2009) noted that artisanal small-scale gold mining has long been an important economic sector and a contentious arena for policy making in Zimbabwe. Artisanal small-scale gold mining has long been an important activity to the economy. Maponga and Ngorima (2003) is of the view that the history of artisanal small-scale gold mining in Zimbabwe is dated back to the 1890's the period before Zimbabwe was colonized. The decline in Zimbabwe's agricultural sector especially subsistence farming in rural areas resulted in many rural households diversify into artisanal small-scale gold mining as their way of earning a living and cope with the situation. Dreschler (2001) is of the view that Zimbabwe experienced an increase in artisanal small-scale gold mining in the 1990's this was largely due to the decline in the agricultural sector in the country as well as the adverse impacts of Structural Adjustment Programs (SAPs) which exacerbated unemployment, inflation and poverty on the citizens.

Hilson (2001) pointed that the mining systems used in the sector have low technology, labor intensive, and feature manual procedures using homemade tools such as hoes and panning dishes some of them made by wood which are in Shona termed *zamba*(*Wooden gold panning dish*) . Maponga and Ngorima (2003) are of the view that in Zimbabwe artisanal small-scale miners includes both legal and illegal operators and in most cases they face financial problems that in the process adversely affect their production, safety and environmental regulations.

Due to the structural adjustment programs (SAPs) in Zimbabwe there was an increase in the rates of unemployment to an estimated 80% in the past decade which mostly force people to engage in artisanal small-scale gold mining as a way of generating income and earning a living and as the only way to cope with the situation but at the same time posing adverse effects to the environment and health problems to the local communities.

Scholars like Phiri (2012) conducted some research on how artisanal small-scale gold mining affect the environment and causing some ecological disasters in Mzingwane district in Matabeleland south province in Zimbabwe. The scholar pointed some crucial issue that the district for the past two decades experienced a sharp decline in subsistence agriculture as a result of unemployment and recurring droughts, this view is also pointed by Taylor (1998). Mudyazhezha and Kanhukamwe (2012) conducted a research on the effects of artisanal small-scale gold mining on the quality of water for drinking and other consumption in Ngwabalozzi River in Southern Zimbabwe. In this research they pointed out that artisanal small-scale gold mining boosts as a result of the decline in agricultural production due to re occurring droughts as well as unemployment as a result of the Structural adjustment programs (SAPs) which made most rural people to engage in small-scale gold mining activities.

Gokwe south district specifically ward 25 Chisina 3areas have also the same situation for past two decades when agricultural production declined due to severe droughts in the area. The area is currently receiving very low rainfall which cannot sustain the life of crops like maize as well as cotton as the area was the producer of cotton as the only cash crop that can be able to grow in their type of soils. This made living so hard to the residence and many households forced by the situation to diversify to artisanal small-scale gold mining legally and illegally (gold panning) as a way to earn a living without considering its effects to the environment, due to this so many environmental problems which include land degradation, deforestation, land pollution as well as water pollution occurred as a result of these inefficient and destructive mining activities as the miners have no an appreciation of the environment.

Effects of Artisanal Small scale gold mining on the environment

In Ghana several researches on the effects of artisanal small-scale gold mining on the environment were carried out by several scholars. Ntibery Etal (2003) in Adiyah Ba (2014) is of the view that in Ghana illegal gold mining damage the environment most as compared to the legal ones. He also pointed that legal small scale miners must have licenses to operate and they have to be monitored regularly. The most noted environmental effects of artisanal small-scale gold mining in Ghana includes,

- ❖ Land degradation
- ❖ Pollution of water systems by mercury and cyanide used in gold purification and amalgamation process
- ❖ Pollution of underground water by mercury , cyanide and other mining wastes
- ❖ Atmospheric effects from burned mercury fumes during gold mercury recovery

- ❖ Siltation of surface waters
- ❖ Deforestation due to wood used for stabilizing mining shafts in some instances called timbering
- ❖ Infrastructure damaging due to undermining roads and houses

However this seems to be more similar to the case of Zimbabwe. Artisanal small-scale gold mining also presents several environmental challenges due to inherent digging of soil and rinsing involved in artisanal mining, siltation, erosion and soil degradation. Phiri (2012) conducted a research on how artisanal small-scale gold mining affect the environment in Zimbabwe in Mzingwane district found in Matabeleland south province.

Phiri (2012) noted environmental problems like drying up of river systems due to increased siltation as a result of gold panning activities, Land degradation due to digging of shafts, air pollution, water systems pollution, underground water pollution as well as deforestation. These problems also existed in Gokwe south district specifically ward 25 where artisanal small-scale gold mining is rampant in the district causing drying up of rivers and dams like Ngondoma dam which is the supplier of the Ngondoma irrigation scheme found in the borders of Zhombe district and Gokwe south district.

Ethical and moral values

The researcher in the processes of data collection is not going to harm the participants or to do what is wrong according to the correspondent's culture. The researcher is also not going to force those who do not want to participant or accuse the participant or the miners about the way they are carrying out their mining activiti

CHAPTER ONE

An Overview of artisanal small-scale gold mining in ward 25 (Chisina 3) in Gokwe south district

Chapter introduction

This chapter seeks to give an overview of artisanal small-scale gold mining in Gokwe south district specifically ward 25(Chisina 3). Factors that triggered artisanal small-scale gold mining in ward 25 are going to be identified and explained. Responses from the artisanal miners are going to be indicated. Factors that triggered artisanal small scale gold mining in ward 25 include droughts, massive unemployment, economic decline, abundance of gold deposits, the gold panning mindset amongst the local people, gold rush (riches) as well as easy accessibility of gold mines.

Factors that lead to the rise of artisanal small scale gold mining in Gokwe south ward 25

Droughts

Droughts have become the common feature in many parts of Zimbabwe but the regions being affected most include Matebeleland province, Masvingo Province and Midlands province. Gokwe south in Midlands province is one of the areas that have been affected by severe droughts for the past two decades. Droughts occurred in Zimbabwe south results in the suffering of many households and a struggle for food.

It is noted that subsistence farming in the ward decline as a result of frequent droughts. Marwendo Etal (2011) shared the view that small scale mining activities in Zimbabwe increased

due to unprecedented poverty, recurrent droughts and economic structural adjustment programmes.

However this forced many households in the ward to diversify into artisanal small-scale gold mining as the only way left for them to raise income so as to purchase food and other basic needs for example, paying of school fees for their children. Droughts in Gokwe south resulted in the decline in agricultural production due to low precipitation as well as high atmospheric temperature that affects plant growth. There was a decline in both cash crop production (cotton) as well as food crop production (maize) which forced many households to indulge in artisanal small scale gold mining legally as well as illegal. In support of this view Mangwende (2014:1) shared the view that Zimbabwe has an agricultural and mineral backed economy, most of the populations in the countryside practices agriculture and when disasters like droughts strikes these people are left entirely dependent on donations or food handouts. One can agree that due to droughts in Gokwe south many households were situational forced to diversify into artisanal small scale farming so as to raise income to purchase food stuffs.

Declines in Cotton Production

Cotton is the main cash crop the people in this ward used to grow and largely rely on for income generating. But for the past two decades due to severe droughts cotton production declined. Cotton companies like Cotton Company of Zimbabwe (COTCO), Cargill, Grafax and Alliance used to provide inputs to the farmers and they then purchase the harvest from those farmers they have owed inputs. However the COTCO representative for the past 31 years, Mr John Tezie Chikaki during the interview with the researcher indicated that farmers in ward 25 were used to produce huge harvests of cotton, he mentioned that an average number of 2300 to 2350 cotton

bells were used to be produced each and every year during the period 1986 to late 1999. However due to the decline in the precipitation as well as the increase in temperatures for the past two decades, there was a great decrease in cotton production in the ward. According to the Chronicles newspaper of 2nd June 2016 the article written by Patrick Chitumba, the Gokwe south district administrator, Edwin Mashandi said,

“Most parts of the district were affected by droughts and the most areas being affected include chief Sai, Masuku, Nemangwe and some parts under chief Njelele”

Mr Chikaki (COTTCO representative in the ward) noted that during the period from 2001 to 2012 the average number of cotton bells per year during this period ranged from 800 to 850 this figure clearly shows that there was a great downfall in cotton production. Judah Johanes one of the farmers who is now engaging in small-scale gold mining indicated that in 2002 he failed to pay back the amount of inputs he borrowed from cotton companies due to cotton failure as a result a decrease in precipitation alongside the increase in atmospheric temperatures.

He then alluded that the scenario forced many households which used to depend on cotton for income to diversify into artisanal small-scale gold mining as the only way to survive in such terrible conditions. Mr Judah Johannes during the interview concerning what lead people in to artisanal and small-scale gold mining quoted in shona language said;

“Nekusanaya kwemvura uye kupisa kwe kunze donje harichaiita kurima kupedza nguva ne mari, nokudaro vanhu takutongo korokoza goridhe ndiyo nzira yasara yekuti vanhu vakwanise kuwana mari”. (Mr Judah Johanes)

“Due to low rainfall and high atmospheric temperatures cotton production becomes difficulty and to grow cotton becomes a waste of time and resources, therefore artisanal gold mining

becomes the only way for the people to generate income for the to earn a living “. (Mr Judah Johanes)

The view that droughts in ward 25 which led to the decline in agricultural productivity is one of the leading factor that triggered artisanal small-scale gold mining is supported by the Umzingwane district Agritex (2006:23) in Phiri (2012:2) noted that over the past decades subsistence agriculture has continued to decline due to frequent droughts in the area and this forced many households to diversify into gold mining legally as well as illegally. Chimonyo and Mupfumi (2009) shared the view that some rural populations depend on artisanal gold mining as a primary source of income or as a critical supplement to meagre farming revenues. So the decline in cotton production as their main crop resulted in them opting for other ways of supplementing their meagre farming revenues thereby engaging in artisanal small scale gold mining.

Decline in maize production

Maize is the main food crop grown in ward 25. Most households used to heavily depend on maize production for food as well as income generating by selling their maize produce to the Grain marketing board (GMB) as well as on black market. The ward councilor Mr Shungu Maruza pointed that in ward 25 since the independence up to 1998 people used to produce high maize yields. He pointed that most of the farmers used to sell their produce to GMB but from the late 1990s up to date people are striving to have food just for consumption

Severe droughts which came as a result of low precipitation as well as increases in temperatures affected maize production. Many households were not even able to produce food just for consumption. Due to this situation many families struggled for food which forced them in to

small scale gold mining legally as well as illegally. Ward 25 youth officers Mr Peter Muduma and Mr. Lloyd Chishato shared the view that the decline in maize production affected many household as the people struggled for food, however being forced by the situation many people diversify in to artisanal small-scale gold mining as the only way to have a better livelihood. The chronicles news article of 2nd June 2016 noted that in Gokwe south there was drought in 2015. It continued saying due to these droughts older children are leaving school for either gold panning or vending for them to provide for their young siblings. Therefore recurrent droughts left people in ward 25 with no choice but to opt for artisanal small scale gold mining as a way to generate income to enhance food security by purchasing food stuffs.

Krima area is one of the most drought prone areas in the ward and that is the reason why most of the artisanal small scale gold miners found in this area as compared to other parts in the ward, gold mines which include Vhelapi, Togara, Majuzi and Francis mine are found in Krima. This is because artisanal gold mining is their only way left for surviving from the impacts of climate change and its effects which led to the decline in agricultural production. This shows how the droughts have affected crop production in ward 25 which therefore made it very difficult and miserable for the people to survive under those harsh conditions. This finally forced many people to diversify into artisanal small-scale gold mining as the only hope for a better livelihood. Hence droughts a noted factor that triggered artisanal small scale gold mining.

Economic decline

Zimbabwe faced economic hardships during the period 2000 to 2008. The problems which Zimbabwe encountered during this period include hyper inflation as well as very stumpy salaries to the workers. This also affected the people in ward 25 Gokwe south district. People strive for money and after having money inflation rises which made it difficult for the people to survive

under such harsh conditions. Taylor (1998) notes that small scale gold mining is perceived by many Zimbabweans as one of the few coping strategies employed by people to master, tolerate or minimize the adverse effects of economic hardships.

Response from the participants made the researcher to argue that many households in ward 25 were living under the poverty datum line. During this period many families faced income sufferings alongside the escalating inflation rates. Artisanal gold mining appeared to be the possible solution to the majority's poverties and as a result this period witnessed the sudden rise in the numbers of artisanal gold miners in many parts of Zimbabwe including Gokwe south district ward 25. Marwendo Etal (2011) shared the view that economic hardships in Zimbabwe which resulted in inflation, low salaries as well as lack of employment drives many households into artisanal small scale gold mining as the only way for them to have a livelihood.

In addition due to economic decline there was also the deterioration of markets especially the farm produce markets. The deterioration of farm produce markets also triggered artisanal small-scale gold mining in ward 25. Grain marketing board can be blamed for the increase in artisanal and small scale gold mining in ward 25. This is because of its delay payment as well as very low prices which affected most the farmers who mostly depend on maize production as their main economic activity. This issue demotivated the many farmers in ward 25 forced them to diversify in to artisanal small-scale gold mining as a way of generating income. Cotton companies also did the same, Mr Sungai Moyo one of the artisanal miners in Kamupaundi village who was previously cotton farmer during the interview pointed that COTCO during 2001 to 2002 season failed to give payments to the farmers maybe due to shortage of finance and this situation continued up to the extent that it becomes a wasting of time to continue growing cotton and this is the reason why most households in this ward engaged themselves into artisanal small-scale

gold mining as a way of generating income to earn a better living. This then clearly shows how economic decline have triggered artisanal small-scale gold mining in ward 25 Gokwe south district.

Massive unemployment

Massive unemployment is another factor that particularly leads to the rise in artisanal small-scale gold mining in Gokwe south ward 25. Unemployment was as a result of the economic decline which then resulted in the closure of many companies and industries in the country. Moss and Busse (2006) articulates that due to the economic decline, many companies closed resulting in most workers loosing jobs. They pointed that unemployment is said to have been rise to 80% in Zimbabwe in 2008.

In Gokwe south ward 25, massive unemployment is seen as the factor which triggered artisanal small scale gold mining. Due to the reduction in the numbers of employees by large scale companies like ZISCO steel company, unemployment rates also increased in Gokwe south specifically ward 25 as some of the family members who were employed at ZISCO were retrenched. Other small scale companies in Gokwe south which include Notsure mine as well as Bushdale mine retrenched some of its workers due to the decline in their production. This directly increases the rates of unemployment in the district. Massive unemployment left people with no other choice but to go for artisanal small-scale gold mining as the only source of income for them to survive from these effects. Logan (2004) noted that in Zimbabwe small scale gold mining has become important and increasingly practiced due to escalating poverty, lack of employment opportunities in the formal sector. This clearly shows how economic hardships in Zimbabwe as well as Gokwe south district triggered artisanal small scale gold mining.

Due to massive unemployment in ward 25 many people look forward to self employment. Artisanal small-scale gold mining then appears to be one of the self employment sectors. Ward youth officer during the interview with the researcher shared the view that in ward 25 there are so many youths and he gave an estimated number of 1300 to 1500 youths aged from 15-24 years. In his explanation he pointed that most of these youths are not employed, he noted that even the farming sector can not be able to employ them since the farming sector is the most deteriorating sector and continues to be worse than ever before. Due to this situation many youths and adults are now engaged into artisanal small-scale mining as a way for the people to survive. The researcher conducted some interviews with the youths in this ward and their main response to the question concerning what factors triggered artisanal small scale mining was that of employment. One of the youth in the ward specifically Machengere area Simbarashe Keruza during the interview said;

"I excelled well in my "o" level studies but due to the fact that my parents are not employed anywhere and also the decline in agriculture made it difficult for me to continue with school and as a result I engage in gold panning (chikorokoza) so that I may raise funds to continue with education and I managed to get money which made me to further my education to "A" Level at Sidakeni high school in Zhombe"

From this response it is clear that massive unemployment triggered artisanal small-scale gold mining in ward 25 Chisina 3. The ward councilor Mr Shungu Maruza pointed that decline in agricultural production is responsible for this huge unemployment, in the previous years specifically 1980's up to the late 1990's people used to be self employed in their farms producing huge harvests of cotton as well as maize for feeding themselves as well as selling their produces for income, but however due to rainfall shortages and the increase in temperatures the sector was

grossly affected which then lead to the rise in the numbers of unemployed people in the ward. He then pointed that, massive unemployment in the ward made it difficult for the people to survive and they indulge in artisanal small scale gold mining.

Mrs Ratidzo Maripise one of the women who are into artisanal gold mining pointed that people did not engage in artisanal small-scale gold mining deliberately but situation forced the people to diversify in to artisanal small-scale gold mining as the only way to generating income for purchasing food stuffs, paying school fees as well as to conduct in some form of business for example groceries tuck-shop. In support of this view Shoko (2001) pointed that artisanal small scale gold mining is a poverty driven economic activity in many parts of Zimbabwe.

One of the artisanal miners Mr Elisha Gundani during the interview with the researcher agreed that unemployment is one of the most influential factors that triggered artisanal small-scale gold mining in ward 25. He pointed that in this ward massive unemployment was also as a result of retrenchment of workers. He stresses that the retrenchments of workers by the Not Sure mine as well as the Bushdale mine contributed to the increase in unemployment rates in the ward. Due to these retrenchments most households find no way out than to engage in artisanal small-scale gold mining as to earn a living. In support of this view Marwendo Etal (2014) shared the view that small scale mining activities in Zimbabwe has also increased due to the Economic structural adjustments programmes which were adopted in Zimbabwe in the 1990's which resulted in massive retrenchments in both public and private sectors. This triggered artisanal small scale gold mining since people have no other economic opportunities for them to earn a living.

Gold rush

Gold rush is considered to be another factor that triggered artisanal small-scale gold mining in ward 25. The issue of gold rush wrapped up Gokwe south ward 25. Since gold seems to have higher market prices many people engage in artisanal gold mining in pursue of fast riches. Due to the issue of riches no matter the area is inaccessible or hard to reach the people find ways to access the area as they are in need of riches. Most people especially the youths in ward 25 are in artisanal small scale gold mining because they are in need of fast riches since it is said that the area is rich in gold ore deposits.

During the interview with the researcher Mr Takunda Shonhiwa indicated that many of the youth in the ward including him are into artisanal small-scale gold mining because they are in need of riches. Response from the questionnaires respondents indicated that most of the artisanal miners although they are in search of income to buy food and other basic needs their main agenda are to have riches since gold has higher market prices which could make it easier for one to be rich so quick. Esau Madzikure a young man aged 20 pointed that he managed to purchase a Honda fit from Japan as he managed to get many gold ores in this area. Therefore gold rush is considered one of the factors that have triggered artisanal small scale gold mining in Gokwe south district ward 25. In support of this Heemskerk in (2002) in Lovitz (2006:7) alluded that some miners are in the sector with the dream of becoming rich.

Abundance of gold deposits

Abundance of gold deposits in ward 25 could be another factor that triggered artisanal small-scale gold mining. This is because the area is believed to be rich in gold ores so many people are travelling form far distances to ward 25 in search of gold ores. Village head Chirima in Krima in

response to questionnaires on the factors that triggered artisanal small scale gold mining pointed that in ward 25 there is a lot of artisanal small-scale gold mining due to several reasons but the most reason is that this area is rich in gold deposits. In his explanation he pointed that many parts in the ward 25 that are rich in gold ores.

Mr Adfree Musavengana one of the artisanal miners noted that although there are other factors that triggered artisanal small-scale gold mining in ward 25 the abundance of gold deposits also triggered artisanal small-scale gold mining in the ward as gold mines are many in the area. Due to this it becomes easy for everyone in the area who is willing to engage in artisanal gold mining to conduct the activities.

Easy accessibility to gold mines

Easy access to gold mines is another noted factor that triggered artisanal small-scale gold mining in the ward; this is because for one to be an artisanal miner no skills are required since less technology is used in carrying out their activities. In response to the questionnaire one of the youths in artisanal small-scale gold mining pointed that the most issue that triggered artisanal mining in this ward is the fact that in terms of job recruitment no education criteria used to get the job so this means that even each and everyone in the ward has got the opportunity to get a job although some these claims are not registered. Mr. Takunda Shonhiwa during the interview with the researcher pointed that the easiest job to get is to work on an artisanal mine, as there is no certain education limit required for one to get a job or even for one to have his or her own mine claim.

Another point of view shared by Miriam Jongwe who is one of the women engage in artisanal mining is that besides working on someone's mines most of the people are working on their own

claims since some gold deposits are found in their farms and no one can stop them to mine in their own fields. The easy accessibility of gold mines could be as a result of the legislation by the government of Zimbabwe which encouraged artisanal miner to formally register their claims and operate formally as small scale miners. This legislation also resulted in the alarming rates of artisanal small scale gold miners in ward 25 as well as other parts across Zimbabwe. Therefore the easy accessibility of gold mines and legislation are other factors that triggered artisanal small scale gold mining in ward 25.

The gold panning mindset among the local people

The gold panning mindset among the local people is one of other factors that triggered artisanal small-scale gold mining in ward 25. This is because due to this mind set even other young generations end up thinking of artisanal gold mining as the main economic activity each and everyone in the area have to undertake so as to earn a living. Nkosihlati Phiri one of the youth who is in artisanal small-scale gold mining pointed that the gold panning mindset is all that brings him into artisanal small-scale gold mining in his words he said

“Ndichiri mudiki ndaingoona vana mukoma vangu vachienda kukorokoza uye vachidzoka vanemari ndichingoshuvirawo kuti pandichakura ndichabva ndatongopindawo mazviri zvinova izvo zvakatozoitika” (Nkosihlati Phiri)

“When I was young I used to see my brothers undertaking artisanal gold mining and they used to have a lot of money after selling their gold and to be in artisanal gold mining was my wish to be fulfilled I when grew up which was a dream that comes true” (Nkosihlati Phiri)

This shows that the gold panning mindset among the local people is another factor that triggered artisanal small-scale gold mining in ward 25. Brave Jackson in support of this during an

interview with the researcher shared the view that some of the adults conduct these activities together with their children and at the end of the day children grow to adults with that same thinking of being gold panners and again they will continue by recruiting their children in to it, in other words it becomes an activity that passed from generation to generation. This explanation clearly shows how the gold panning mindset among the local people is considered to be one of the influential factors that triggered artisanal small scale gold mining activities in ward 25 (Chisina 3) in Gokwe south district.

Chapter conclusion

There are several factors that triggered artisanal small-scale gold mining in Gokwe south specifically ward 25 Chisina 3. These include droughts which came as a result of low precipitation alongside high atmospheric temperatures which resulted in crop failure and then lead to food insecurities in the ward which then forces people to diversify into small-scale artisanal gold mining as the only way out for them to earn a living. Other factors that triggered small scale mining are; the economic decline in Zimbabwe, Massive unemployment, gold rush, abundance of gold deposits in the area easy accessibility of gold mines, as well as gold panning mindset among the local people. However responses from the respondents strongly indicated that poverty as an umbrella term is the main leading factor that triggered artisanal small-scale gold mining in ward 25 Chisina 3 in Gokwe south district.

CHAPTER 2

The effects of artisanal small scale gold mining on the environment in Gokwe south ward 25 (Chisina 3).

Chapter introduction

This chapter is going to look on the environmental effects of artisanal small scale gold mining activities in ward 25 Gokwe south district. There are so many effects of artisanal small-scale gold mining on the environment which also harm the local community's livelihoods as well as the miners. The noted effects of artisanal small scale gold mining on the environment in ward 25 include Land degradation, soil erosion and siltation, deforestation/vegetation, pollution (water, land, noise and air), destruction of soil organisms as well as the endangering of human beings.

Deforestation/ Vegetation destruction

Deforestation involves the cutting down of trees for several purposes. This is one of the environmental effects of artisanal small scale gold mining observed by the researcher in ward 25. Artisanal miners use tools such as iron axes as well as mattocks to cut down as well as stump trees. Many forest has been and being destroyed by artisanal gold miners. The researcher observed that deforestation due to artisanal small scale gold mining if it continues as the local people are doing , in an estimated 60-70 years to come the area would be a semi desert if not a desert especially if some preventive measures are not taken into consideration by the miners as well as other stakeholders. The destruction of trees as well as vegetation cover results in massive soil erosion.

Trees are being cut for several reasons, firstly trees are being destroyed in land clearing for constructing and digging purposes, secondly during the construction of structures many timber used by these miners since they built temporary constructions of timber since it is cheap to acquire. Thirdly due to poverty artisanal gold miners tend to use wood as their source of fuel which means huge of timber is going to be harvested. The multiplication in numbers of artisanal small scale miners on a certain area means more wood is going to be harvested from the forests. In the case of ward 25 artisanal small scale gold mining activities fosters deforestation most due to harvesting timber for construction purposes especially in improving safety in the shafts. This is only done by those who practice shaft mining. Artisanal miners call this process of improving safety in their shafts *timbering*. Surface miners do not practice this process since surface mining is considered to be safe than shaft mining.

Straight trunks of trees are used to support the earth as to improve safety in the shafts. Alan Maripise who is one of the young artisanal miners a boy aged 14 at Togara gold mine during the interview with the researcher said,

“Hapana imwe nzira yekuti mugodhi udzivirirewe kuti usawira vanhu kunze kwekutoshandisa matanda.” (Alan Maripise).

“There is no other means of improving safety on shaft than to use timber (tree trunks)” (Alan Maripise)

This point of view shows that artisanal small scale gold miners solely depend on the cutting down of trees so as to improve safety in their mine shafts, however although these miners pointed that this would improve their safety, however deforestation becomes an environmental problem to the local community, for example if one take into consider the importance if trees in

the life of humans and animals. Trees produce oxygen in exchange with carbon dioxide with human beings and animals. It is also noted that trees purifies air by removing some sought of compounds and chemicals even dust which is found in the air and make the air clean for breathing. Furthermore trees cool the atmospheric temperature. In addition to deforestation the wildlife in ward 25 has been affected since some of those trees are habitant for some wildlife such as birds which built their nests in trees. As a result wildlife migrates from these areas to other areas where they face less challenges of habitant.

Mrs Bhudhe a female farmer who owns Chemagora farm number 49 during the group discussions pointed that artisanal small-scale gold mining is resulting in deforestation as miners are harvesting most of their timber from her farm. She argued that what these miners did affect wild life , she said, her farm used to have so many and several wildlife but currently it will be a luck to come across even with an antelope.

The researcher observed that Not sure mine , Togara mine, Vhelapi mine and Movis mine are the artisanal mines that are influential in causing deforestation in ward 25 Chisina 3 in Gokwe south district as the miners try to improve safety within their mines. This clearly shows how artisanal small-scale gold mining adversely affect the environment as well as the livelihood of the local community.

Soil erosion and siltation

Soil erosion and siltation as an environmental effect of artisanal small scale gold mining has affected mostly water systems in the ward 25. Artisanal gold mining causes huge soil erosion which then leads to siltation. Stakeholders like EMA as well as Gokwe south rural district council indicated that artisanal mining activities are the major cause of soil erosion as well as

siltation in the ward. Artisanal miners are causing huge soil erosion due to their rudimentary methods of extracting gold (digging process and stumping of trees), during these processes soil is loosened which makes it easier for the soil to be carried by flowing water into the water systems, hence affecting the environment.

Artisanal small scale gold mining foster soil erosion in several ways, Firstly due to digging of pits especially those who practice surface mining using detectors soil is being loosened and by the time of heavy rain or heavy winds reach the soil can be easily eroded. One of the correspondents Mr Patrick Mugwira who is an artisanal miner at Movis mine during the interview with the researcher alludes that although artisanal small-scale gold mining provide the people with income the adverse effects to the environment overshadow the benefits since artisanal mining has no positive effects on the environment.

The methods used in artisanal mining are not environmental friendly as they result in soil erosion. They are so many small gullies and streams occurring in the ward due to soil erosion caused by artisanal miners as many mine pits and shafts are being left without being filled. Gullies are become rampant in ward 25, each and every place where the miners conducted their activities in the previous period and when they are still mining gullies are being witnessed. Mr Takaedza Stanford who once has a mine claim complained that, about 6 years ago around November 2009 artisanal mining activities introduced the gully in his field which he could not be able to control up to date. This shows the extent in which artisanal small-scale gold mining harm the environment in ward 25 Chisina 3 in Gokwe south district.

Due to soil erosion water systems are being affected in ward 25 through the process of siltation. Water systems have been noted as the key area affected by artisanal small-scale gold panning

legally or illegally. Drying up water bodies in the ward for example Chikombera/Mwembesi River as well as Ngondoma dam due to artisanal mining methods affected the local people's livelihoods. Chikombera River is the only water supplier to the *mushandirapamwe* cooperative garden in the ward, the early dry up of the river affected most households in the ward especially those who live in Kamupaundi village since the people used that cooperative to reduce food insecurity which came as a result of recurrent droughts (as a result of climate change) in the ward. One of the pioneers in Kamupaundi village Mr Timothy Sithole noted that Chikombera/Mwembesi river was a perennial river but currently the river dry up around May which clearly show that huge siltation of overburdened ore from Movis mine have filled the river. Many respondents through questionnaires indicated that the drying up of Mwembesi/Chikombera River as a result of artisanal mining activities practiced by Movis miners affected the people as well as the animals. This river was the water source for the cooperative garden known as the *mushandirapamwe* and as a result the garden does no longer exist.

This also affect the life of animals since it was the source for drinking so as for now they have to travel long distances looking for water. The decrease in water level in Ngondoma dam as a result of huge siltation of load from Jakafiriri artisanal gold mine affected most households In Gokwe south ward 25 as well as some parts of Zhombe. Ngondoma dam is the only water supplier to the Ngondoma irrigation scheme. Due to the dam decrease in water levels water become a limited resource which affected the productivity of many farmers in this irrigation which then affected the food security of the local community.

One of the farmers in Ngondoma irrigation scheme during the interview with the researcher pointed that artisanal mining directly affected their agricultural productivity since the water levels in the dam seems to decrease and also even if rainfall is well the dam water carrying

capacity has been affected by siltation as the dam is filled by load deposits from Jakafiriri artisanal mining activities. The local people also affected since many from Mutakati and Mangena Village make use of this water for consumption, other rivers which are also drying up due to artisanal mining activities include Krima River, Chevecheve River as well as Mutorahuku River. Hence, artisanal small scale gold mining a threat to environment.

Land degradation

Artisanal small scale gold mining results in massive land degradation. Through vegetation destruction by artisanal miners more land is being degraded. In carrying out their processes artisanal miners clear a large land in preparation for a digging process as well as an area for constructing their infrastructures. Good arable land for agricultural purposes also affected by the activities of artisanal miners. Large pits are being left unfilled as the artisanal miners move from one place to another in search of an area which is rich in gold deposits. Unfilled pits became the most known environmental adverse effect of artisanal small scale gold mining in ward 25 Gokwe south district.

The increase in unfilled pits endangered the life of human beings as well as animals. Village head Mavhulele in Matanda area noted that by leaving the pits and shafts unfilled artisanal gold miners are put the life of people on danger. He pointed that in 2009 a man aged 28 falls in the shafts of Francis mine and died, he then note that this mine wasn't functioning for about 4 years as the artisanal miners already done with the place. In addition village head Kamupaundi said,

“In 2010 more than 5 cattle falls in the open shafts left at Mugombi gold mine by artisanal miners and died.”

This however shows how artisanal small scale gold mining affect the environment in ward 25 by endangering human and animals life due to unfilled pits and shafts.

Destruction of Soil organisms

During the processes of gold extraction specifically the process of digging poses a threat to the environment. Firstly, during the process of digging soil organisms are destroyed and those which survive their life cycle are being disturbed. Many soil organisms are destroyed organisms like earthworms. Other animals like mice, snakes as well as lizards also affected during this processes as some are put to death intentionally as well as unintentionally. During the digging activity by artisanal miners these animals losses their habitant as they survive underground and use holes as their habitant which result in death as well as migration of those which escape to other places where there is less/no harm. Mr Brave Jackson one of the youth who indulge in artisanal small scale mining noted that

“During the process of digging we observe the death of small animals like mice as well as lizards, during the rainy season we also observe the death of earthworms during the digging process”.(Mr. Brave Jackson)

The destruction of soil organisms has a greater impact on agriculture since these organisms helps in improving soil fertility for example earthworms as they maintain the soil texture as well as structure to obtain a crumb structure which is good for plant growth. Hence artisanal small-scale gold mining adversely affect the environment as observed in Gokwe south district ward 25 (Chisina 3).

Pollution

Pollution is another environmental effect of artisanal small scale gold mining observed in ward 25. Four forms of pollution occurs due to the activities of artisanal small scale miners since they use destructive mining methods due to lack of technology, education, training, lack of self control among the miners as well as lack of capital to by efficient and effective machinery that could be environmental friendly. These types of pollution are water pollution, air pollution, noise pollution as well as land pollution.

Types of Pollution

Water pollution

Water pollution is one of the observed environmental effects of artisanal small-scale gold mining in ward 25 Chisina 3. Due to these mining activities water is being polluted in two ways there is pollution of underground water as well as water in the water systems/bodies (surface water).

Underground water pollution

Concerning the underground water, artisanal small scale gold mining adversely affect the environment due to the fact that chemicals used in artisanal small scale gold mining are polluting the underground water. These chemicals include cyanide which is used by the miners in gold extraction. Cyanide is a very poisonous element which has the possibility to harm both human beings as well as animals. It is noted that the dissolved cyanide elements in the soil pollute the underground water and this poses danger to the local people who depend on underground water for consumption as this would result in health problems. Due to leaking of chemical deposits in

the soil from the overburden ground water is directly affected. Many artisanal small scale miners especially those who practice shaft mining construct an Acid Mine Drainage (AMD), however this drainage doesn't protect the environment since the leaking of chemical residues occur and ground water then contaminated.

Cyanide is one of the poisonous elements found in chemical residues and it has a lot of environmental problems to both human beings as well as animals. The health problems associated with cyanide include the disturbance and malfunctioning of nervous system, weakness as well as skin and eye irritation. During the interviews conducted by the researcher at Not sure mine, workers alludes that it is true that cyanide elements are dissolving into the soil and due to this issue EMA Gokwe south as well as Zhombe east EMA encouraged the residence in Sitcha which is a village located near this mine to stop depending on ground water from the wells that were drilled by the mine and they were encouraged to make use of water from Chevecheve river as they argue that it is much safer for consumption.

Water systems/bodies pollution

Pollution of water systems is another is way in which water is being polluted by artisanal small scale gold miners which poses some environmental as well as health problems to the miners, their families, local communities as well as animals. Mercury as well as cyanide deposits were note as the major polluters of water systems in the ward. Artisanal miners use mercury in gold amalgamation process as well as cyanide; however the chemical deposits of these toxic elements are carried by flowing water into river systems. In response to the questionnaires Notsure mine works indicated that in ward 25 most miners use mercury in purifying gold and the residues are

dumped on the ground which then carried by flowing water into river systems put the aquatic life on danger.

Mr Jeter Bhudhe one of the villagers in ward 25 specifically in Kamupaundi village noted during the interview shared the view that artisanal mining is posing environmental problems by polluting water systems which may result in death of livestock as well as wildlife. Rivers include Mwembesi, Ngondoma, Chevecheve and Ngondoma noted as the most water systems which were and still being polluted as a result of small-scale artisanal gold mining.

The respondents also noted that Ngondoma dam is also polluted due to these mining activities. Village head Kamupaundi in support of this view during an interview with the researcher noted that due to this type of mining cyanide elements or dissolved elements are carried into river systems which endangered the life of livestock. In his words village head Kamupaundi in shona said;

“cyanide yakaipa zvakanyanya muna 2008 mombe pvumbamwe dzamuzvina purazi Amai Bhudhe dzakafa dzamwa mvura yakanga yazangana ne cyanide pakarukova kari pedyo ne mine ye Movis” (village head Kamupaundi)

Cyanide is a dangerous element in 2008 about 9 cattle belongs to Mrs Bhude died after drinking cyanide contaminated in a stream near Movis mine” (Village head Kamupaundi).

One respondent who is a worker at Not sure mine Vengai Gasa shared the view that cyanide is a very dangerous element which resulted in the death of many wildlife as they drink cyanide contaminated water at a nearby stream. This worker noted that a lot of monkey's each and every time they are found dead as a result of drinking cyanide contaminated water in this stream; he

also pointed that besides monkeys birds are also facing the same problems. Washington Mavhundutse who is also a worker at Notsure mine said,

“Pakafa mombe dzinosvika 8 dzekwa Sitcha mushure mekunge dzamwa mvura ine cyanide pas not sure mine” (Washington Mavhundutse).

“More than eight cattle died after drinking cyanide contaminated water at not sure mine.” (Washington Mavhundutse)

On the same vein participants pinpointed that mercury and cyanide heavily affect the environment in ward 25 and this is seen through the issue of aquatic life. Cyanide contaminated water directly result in the death of aquatic life, the same also applies to mercury. Mercury affect the aquatic life especially fish as it noted that fish they are more sensitive to the effects of mercury as compared to humans. Mercury in the air in many cases settle into water systems and thereby affecting water quality which may affect the aquatic life and the immune system, nervous system and respiratory systems of animals which make use of that contaminated water. Youth officer for ward 25 Mr Peter Muduma said,

“Cyanide yaishandiswa nevanhu pa Movis mine yaizoeredzwa imwe yacho ichinosangana ne mvura yemu rwizi rwa Mwembesi/ Chikombera. Panosanagana karukova kanobva ku mine iyi na Mwembesi ndakoona hove dzakafa nekuda kwe cyanide”. (Mr. Peter Muduma)

“Due to an unwise use of cyanide by Movis miners at the meeting point of a stream from Movis mine and Mwembesi I witnessed the death of fish as a result of cyanide.” (Mr Peter Muduma)

Furthermore in ward 25 as a result of artisanal small scale gold mining the researcher observed some form of water systems pollution due to litter. Due to the fact that artisanal miners move

from one place to another they don't have a proper way of litter management litter like plastics bags, broken plastic panning dishes as well as sacks they in some cases use to carry the gold staff to the river systems. These plastics during rain season are carried by flowing water in to streams, rivers and then dams. Through field observations plastics were observed in Ngondoma dam due to mining activities carried out at Jakafiriri mine, Movis mine which are carried into Mwembesi River through Ngondoma River into Ngondoma dam.

On the same avenues, litter there is the issue of increased fecal matter that is being carried by flowing water into water bodies. This is because artisanal miners have no proper sanitary facilities. They mostly use bush toilet and the fecal during rain season is carried into water systems. This affects the quality of water as well as causing some diseases like diarrhea and cholera to the people who use the contaminated water for consumption purposes. Brave Jackson one of the artisanal gold miners indicated that there is no time and no value for the artisanal miners to built a toilet or having a bin to place their litter because they did not stay at a place permanently they can spend less than 4 days at one place and leave to another one so as a result they use bush toilet which then adversely affect the environment in ward 25.

Air Pollution

Air pollution is one of the environmental effects of artisanal small scale gold mining in ward 25. Air pollution came as a result of mercury and cyanide vapour. It is also noted and observed that the cutting down and burning of trees and vegetation affect the quality of air as carbon emissions are going to be discharged into the atmosphere and polluting the air. Due to the removal of trees artisanal small scale causes air pollution in the sense that, trees purifies air , they also take in carbon dioxide from humans and animals in exchange of oxygen. The reduction in number of

trees means the increase in carbon dioxide in the atmosphere which can result in respiratory diseases. One of the respondents Mr Norest Million who works at Notsure mine said;

“Artisanal mining causes air pollution and that affects the people’s health. I also experienced some respiratory challenges especially coughing due to the inhalation of carbon gases from mining processes”. (Mr Norest Million)

Response from the participants in ward 25 Gokwe south district indicated that artisanal small-scale miners’ activities affect the quality of air due to some toxic gasses disposed into the atmosphere, the burning of some chemicals like mercury in the process of gold amalgamation pollute the environment. The burned amalgam affects water quality which in the long run affects aquatic life. Continue inhalation of mercury amalgam may result in death of both humans as well as animals.

Noise pollution

Noise pollution actually occurs as a result of explosives (dynamites) as well as threshing mills or stamps. Noises from these affect both human and animals. They can cause deafness in human beings as well as the migration of wildlife animals from the area to other areas that are less noise for them to survive well. Mrs Bhudhe who owns chemagora farm number 49 (were Notsure mine is constructed) during the interview with the researcher said.

“Before Not sure mine was constructed the area does have a lot of wildlife, however after the mine was situated and start functioning most of the wildlife migrated from the area to other areas and this is because of more noise especially from dynamites which instills fear on animals.”(Mrs Bhudhe)

Noise from explosives like dynamites as well as threshing stamps terrifies animals, affect their reproduction process and also cause abortion, therefore adversely affecting the animal population around the mining area. This affects the environment because it created ecosystem imbalances where there is a breakdown in the food chain which affects the ecosystems in ward 25. This however shows the way in which artisanal small scale gold mining is a threat to the environment.

Land pollution

Land pollution is another environmental effect of artisanal small-scale gold mining in ward 25. The researcher observed that artisanal miners move from one place to another in search of gold deposits, therefore they does not have the proper management waste in other words they don't have dumping sites and this lead to dumping of litter everywhere as the miner do not have a proper dumping area so that the wastes can be managed.

During field visits the researcher observed litter dumped everywhere at artisanal mines which include Takaedza mine, Nhanha mine, Mugombi mine and Jakafiriri river bank mining. Litter that is dumped everywhere include plastic bags, broken plastic pan dishes, used up chemical containers, sacks which they use to carry their gold ore to water sources where the panning process is done. Some of the litter dumped especially used up chemical containers may harm the life of soil organisms like earth works which are important in improving soil structure as well as soil structure in order to have a crumb structure. Aquatic life is also affected as the litter is carried into the water systems and some of the wastes contains chemical that can be able to harm the environment. This observation made by the researcher clearly shows how artisanal miners affect the environment in ward 25 Gokwe south district.

Effects on Human beings

Artisanal small scale gold mining also affects the health of human beings. Mine workers, their families and the local communities affected by the activities of artisanal small scale gold mining. The most noted point in which artisanal small-scale gold mining affect human beings is through the use of Cyanide as well as mercury. Cyanide offers nothing healthier to the life of human beings the same applies to mercury. Starting with cyanide it may result in problems like nervous, immune and respiratory systems malfunction, inhalation it for a long period of time may result in death. According to EMA (2014:2) on the know your environmental internet page concerning cyanide and the environment, Cyanide is extremely toxic to humans; Long term inhalation of cyanide affects the central nervous system . Short term inhalation exposure to 100 milligrams per cubic meter (mg/m³) or more of hydrogen cyanide causes deaths in humans.

Mercury is another toxic heavy metal used in gold amalgamation processes and it has adverse effects to the health of the people. It is noted that continue inhalation of mercury burned amalgam may result in death of people, it also affects the infants and children by weakening the muscles if the mother for example ate fish that were affected by mercury during her pregnancy period, in addition it also noted that it affect the respiratory system of human beings if inhalation is for a long time.

Furthermore cyanide is very poisonous and it must not be kept at houses rather in a locked store room. Due to artisanal mining cyanide is even found in houses and this resulted in death of many people committed suicide through the use of cyanide. Village head Kamupaundi noted that in 2013 a man named Steven Banda aged 33 committed suicide using cyanide as he has easy access to cyanide as he was one of the artisanal small-scale gold miners. In the same vein litter and fecal

matter that is being disposed in to the water systems affected the health of the people. 10 correspondents who previously use water from Mwembesi River confesses that due to litter and fecal disposals water borne diseases breakouts in ward 25 became so common diseases like cholera, diarrhea as well as bilharzia.

They participants indicated that diarrhea and bilharzia were two common diseases caused by drinking water from this river and as a result people in the ward sink wells so as to have another better source of drinking and consumption water. Death of people due to down falling of mine is another way in which artisanal small scale gold mining can harm the environment. Deep shafts constructed by artisanal miners are not safe, poor material is used in improving the safety in mines they use wood for timbering which can easily break. Respondents during the interview concerning this matter indicated that more than 6 people died in the ward due to deep mining shafts falling, these occasions occurred at Vhelapi mine as well as Francis mine.

Chapter conclusion

Artisanal small-scale gold mining resulted in many environmental damages in ward 25 in Gokwe south district. These include deforestation/vegetation destruction which came as a result of the cutting down and stumping of trees for several purposes by small scale gold miners which include the construction purposes as well as wood for fuel, soil erosion/ siltation as a result of the diggings by artisanal miners, destruction of soil organisms during the diggings, land degradation and pollution in all forms (land, water, air and noise) which affects the living of people as well as well as wildlife.

CHAPTER 3

Measures that can be adopted by artisanal small scale gold miners to protect the environment in ward 25 Gokwe south district.

Chapter introduction

This chapter is going to explore measures that can be adopted by artisanal small scale gold miners to protect the environment in ward 25 Gokwe south district so artisanal gold mining can be environmentally sustainable. Most of the strategies are going to be drawn from the environmental effects of artisanal gold mining activities. The alluded measures include, the filling mine pits and shafts after the closure of the mine which reduces soil erosion, afforestation which reduces both soil erosion as well as deforestation of the natural environment, proper methods of waste management which reduces pollution to the environment, protection of cyanide contaminated areas as this would protect livestock as well as wildlife around the mining site, reuse of empty chemical containers for other mining purposes rather than dumping them and the recycle of mercury. These are the measures that can be adopted by artisanal small scale gold miners to protect the environment as this chapter is going to explore

Measures that can be adopted by artisanal gold miners to protect the environment

The filling of mine pits and shafts after the closure of the mine is one of the measures that can be adopted by artisanal small scale gold miners to protect the environment in ward 25 Gokwe south district. Through pits and shafts filling soil erosion as a threat to the environment can be reduced. A success in reducing soil erosion means also a success in reducing siltation in water systems as fewer load can be carried and deposited in water systems. Filling of pits and mine shafts also enables animals to re habitat in soil small animals like mice as well as other types of lizards

which depend on soil for shelter. In addition the filling of mine pits and shafts enables the soil to regain the fertility, structure as well as texture for agricultural purposes. This clearly shows that the filling of mine pits and shafts can be an environmental protection strategy that can be adopted by artisanal small scale gold miners in ward 25 Gokwe south district for artisanal mining to be environmentally sustainable.

Aforestation is another strategy which artisanal small scale gold miners can adopt as to protect the environment. Trees play a pivotal role in the ecological ecosystem in protecting the environment and enabling a favorable environment. Through aforestation soil erosion can be reduced since trees increases soil compactness and also covers the soil from heavy precipitation. Another reason why artisanal miners should practice aforestation is that, since artisanal mining process releases green house emissions into the atmosphere which affects the ozone layer which then cause global warming(climate change), trees are there to absorb those green house gases like carbon dioxide in exchange to oxygen from human beings and animals. The burning of mercury gold amalgam by artisanal miners in an open sauce pan releases mercury vapor into the atmosphere which affect the air quality. Trees therefore play a pivotal role of air purification. In addition aforestation results in the decrease in deforestation since the miners can harvest wood and timber for construction as well as fuel purposes from the plantations and not from the natural environment. Hence aforestation a good strategy that artisanal small scale gold miners should adopt to protect the environment and also for mining to be environmentally sustainable.

Artisanal miners have to adopt another method of burning mercury gold amalgam which did not allow too much mercury vapor into the atmosphere. Instead of using an open sauce pan in burning mercury gold amalgam artisanal miners can use empty fish tins. The tins are available and easy to access. Burning this amalgam using empty fish tins is an environmentally friendly

method since it limits the amount of mercury that is going to be dumped on the ground this is because this method allows the recycle of mercury. So this would protect the environment as few mercury elements are going to be dumped on the ground and also lessening the amount of mercury vapor into the atmosphere, this also means a decrease in levels of underground water pollution as well as water systems pollution which might enable good and favorable living conditions for both humans, animals as well as the aquatic life.

In addition to these artisanal miners can also practice other forms of purifying gold that does not involve the use of mercury at all for example the use of hydrochloric acid. It is used in the presence of sodium hydrochloride. This method is being used by artisanal miners in many countries in Africa and among these there is South Africa as well as Ghana. The use of wooden clove in shona termed *zamba* which does not involve the use of mercury in gold purification processes is another preventive strategy that artisanal miners can adopt since it reduces air pollution as well as water pollution both underground water as well as water in the water systems.

In order to protect the environment from the destructive and polluting activities artisanal miners undertake, the miners should adopt a proper management of wastes. The miners have put in place a proper way of managing litter as well as fecal wastes so as to reduce land pollution as well as water systems pollution. In other words there should be a dumping site not wastes to be dumped everywhere which then mostly pollute the environment. In terms of sanitary facilities these miners for example although they move from one place to another they can construct a simple temporary pit latrine toilet as a proper way of waste management and also they can even. Proper way of litter and fecal management protects the environment simply because it reduces two forms of pollution which are; land as well as water pollution.

Artisanal miners should protect the areas with poisonous chemicals. For example areas with cyanide contaminated water they have to be well fenced and protected even the use of electric wire is encouraged since it doesn't kill both humans and animals. This is a good measure since it protects the life of wildlife. For example due to the fact that these areas were not protected in 2008 about 9 cattle died after drinking cyanide contaminated water near Movis mine also the same scenario happened at Notsure mine where also the death of monkeys and birds was observed and indicated by the correspondents which created an ecosystem imbalance and the loss of biodiversity. By protecting these areas miners would at the same time protect the environment. Hence a strategy those artisanal small scale gold miners have to adopt so as for mining to be environmentally sustainable.

Reuse and Recycle is another measure that artisanal miners should adopt so as to protect the environment during their operations. Miners should reuse materials like empty chemical tins for other mining purposes than to dump them which in the long run affect the ground water quality, the quality of water in water bodies as well as soil organisms since most of these chemicals like cyanide are so harmful to any living organism. Some of the containers miners have to carry them back to the providers for recycle as well as reuse so as to reduce the dumping of chemical containers which affects the environment. Recycle of mercury is also encouraged as this would reduce the amount of mercury dumped on the ground at the same time reducing the levels of environmental pollution.

Last but not least artisanal miners should use better, safe and clean production technology. In this point there is the issue of energy. Instead of using energy sources that affect the environment artisanal miners can use solar energy as compared to the use of diesel and petrol generators which pollute the environment since most of them lack maintenance and end up exhausting

heavy gasses that affect the atmospheric air quality. Hence better control and production technologies a strategy artisanal small scale gold mining can adopt so as to protect the environment and promote environmental sustainability.

Chapter conclusion

To sum up this chapter, there are several measures that can be adopted by artisanal small scale gold miners as a way to protect the environment in ward 25. There include the filling of mine pits and shafts after mine closure as this may reduce soil erosion as well as siltation and also this allows the soil to regain fertility for agricultural purposes. Aforestation is another measure that can be adopted as to protect the environment since this would minimize deforestation. Other measures that can be adopted include burning of gold mercury amalgam using empty fish tins as compared to open pan sauce as this reduces the amount of mercury vapour into the atmosphere, another measure is gold purification using methods that does not use mercury for example the use of wooden clove in shona termed *zamba*, Proper waste management which includes fecal as well as chemical wastes is another measure that should be adopted by artisanal small scale gold miners in order to protect the environment and finally the recycle as well as reuse of empty chemical tins as well as the as well as the recycle of mercury amalgam this would reduce pollution of the environment. Hence measure artisanal small-scale gold miners should adopt in order to protect the environment in ward 25 Chisina 3 Gokwe south district.

Conclusion

Artisanal small-scale gold mining has become the main activity in many rural communities in developing countries. In other words it has become the main economic activity for generating income for the past two decades in Zimbabwe. Artisanal mining is being practiced both as legal as well as illegally. Artisanal miners use rudimentary methods in extracting gold which are so destructive to the environment since they lack capital to apply better advanced technology, lack knowledge, self control as well as lack of advices which resulted in their activities being so destructive to the environment. It is clearly observed that artisanal gold miners pays little or no attention to the environment their focus is on profit making since it is their main activity of generating income. In Zimbabwe artisanal small-scale gold mining has been practiced in regions which include Mashonaland as well as midlands. Gokwe south district in midlands province is one of the districts where artisanal mining has become the main economic activity for many households.

It is clearly pointed that many households which engage in artisanal small-scale gold mining were not deliberately opt for it although in some cases some others argue so. There were several push factors that lead people into artisanal small scale gold mining. The noted factors that lead or that triggered artisanal small scale gold mining includes the economic decline in Zimbabwe which created harsh living conditions for the people which include low salaries and wages alongside rise inflation rates. Massive unemployment in the country which is believed to be above 80% also lead people into artisanal small-scale gold mining as a source of self employment. Droughts in the country also pave way for artisanal small-scale gold mining legally as well as illegally, recurrent droughts in Gokwe south ward 25 lead to food insecurity to many

households and as a result they engage in artisanal small scale gold mining as way to source income for them to purchase food stuffs. Abundance of gold deposits in the area is also another factor that triggered artisanal small scale gold miners since the place is rich in gold ores many people from far areas come to this area in search of gold deposits. Other factors noted include the issue of gold rush, gold panning mindset among the local people as well as easy accessibility of gold mines. However analytically responses from the correspondents made the researcher to argue that although there are several factors that triggered small scale gold mining Poverty as a result of recurrent droughts, economic decline as well as massive unemployment is the leading factor that triggered artisanal small scale gold mining in many parts of Zimbabwe which include Gokwe south district ward 25 since it left many households with no option but to opt for artisanal small-scale gold mining legally as well as illegally.

Artisanal small scale gold mining in ward 25 resulted in many environmental effects. It is clearly observed that artisanal small-scale gold mining has no positive impacts to the environment since all it causes is destruction. The rudimentary methods of extracting gold ore artisanal gold mining resulted in destruction of the natural environment which then affects the livelihoods of the local communities. The noted and observed environmental effects of artisanal small-scale gold mining in ward 25 Gokwe south district includes, land degradation which come as a result of digging pits and construct shafts everywhere and left unfilled. Soil erosion and siltation are other effects of small scale artisanal gold mining on the environment. Soil erosion is being exacerbated by the diggings of miners which loosen the soil and during rain season those deposits are being carried into the water system hence siltation in water systems for example the drying up of Mwembesi river and Ngondoma dam as a result of artisanal small- scale gold mining activities. Pollution is another effect of artisanal small scale gold mining. Underground water is being polluted by

leaching of toxic chemicals into the ground, water in water systems is polluted since a lot of wastes are carried into water systems by flowing water which affect aquatic life as well as human beings which use water from those bodies for consumption, noise pollution as a result of explosives like dynamites as well as noise of threshing stamps which affect human beings as well as animals. Land pollution also is another observed environmental effect of artisanal small scale gold mining which came as a result poor waste management for example litter as well as fecal wastes.

Deforestation is another noted effect of gold mining since timber is harvested for constructing purposes as well as the source of fuel. The last noted environmental impact of artisanal small scale gold mining is the destruction of soil organisms. Furthermore there are some noted measures that artisanal small scale gold miners have to adopt so as to protect the environment and these includes the filling of mine pits and shafts,, aforestation to reduce deforestation and soil erosion, proper management of wastes for example (dumping sites), protection of cyanide contaminated areas, reuse of chemical containers, recycle of mercury as well as the practice of mining methods that does not require the use of mercury and this would reduce pollution of both underground water as well as water in water bodies.

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Appendixes

Appendix A: Artisanal small-scale gold miners Questionnaires guide

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FACULTY OF ARTS

DEPARTMENT OF DEVELOPMENT STUDIES

Date..../..../ 2016

To Whom It May Concern

Dear Sir/Madam

Introduction

My name is Peter Mapfumo and a final year student at Midlands State University studying for an honors degree in Development Studies which falls under Bachelor of Arts. I am carrying out **A STUDY ON THE EFFECTS OF ARTISANAL SMALL-SCALE GOLD MINING ON THE ENVIRONMENT A CASE STUDY OF WARD 25 CHISINA 3 IN GOKWE SOUTH DISTRICT**. I gently ask for your contribution in providing your ideas and views through completing the questionnaire attached to this document. All information provided shall be confidential and will be used only for academic purposes. Your role will assist in the success of this research.

No names or information of the participants will be published. You should acquire or get more details and information about the researcher, you can contact my research supervisor Mr T

a) 1- 5 Years b) 6- 10 Years c) 11- 20 Years d) 21+ Years

7) What led you into artisanal gold mining?

a) Lack of employment b) Recurrent Droughts c) Abundance of gold deposits
d) Other

8) How do you engage artisanal gold mining activities?

a) Fulltime b) Part Time c) Occasionally d) Seasonally e) Other

If other specify, _____

9) Did you receive any form training for artisanal gold mining?

a) No b) Yes

10) Do you have operational mining licenses for carrying out your activities?

a) No b) Yes

If no specify why, _____

11) How artisanal mining is affecting the environment in ward 25? _____

12) How artisanal small-scale gold mining can affect the livelihoods for the future generations?

13) How are you protecting the environment from your activities?

14) Should artisanal small-scale gold mining activities be legally recognized?

8. How artisanal small-scale gold mining can harm the livelihood of the future generations
9. What are the dangers of artisanal small-scale gold mining to the health of people and wildlife in the local communities

Appendix C: Non-Artisanal gold miners Interview Guide.

1. For how long have you been residing in this ward?
2. What made you not to go for artisanal small-scale gold mining?
3. Should artisanal small scale gold mining be banned?
4. In your own view what led people into artisanal small-scale gold mining?
5. What are the environmental impacts of artisanal small-scale gold mining in ward 25?
6. What measures should artisanal small-scale gold miners adopt in order to protect the environment from their activities
7. How can artisanal small-scale gold mining would harm the future generation's livelihoods