

**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
PROCESS IN SMALL-SCALE MINING SECTOR:
AWARENESS, PERCEPTIONS AND ENVIRONMENTAL
MANAGEMENT STRATEGIES IN MUDZI DISTRICT,
ZIMBABWE.**



BY

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ABSTRACT

This thesis explores EIA in the small-scale artisanal gold mining sector in order to understand awareness, perceptions and environmental management strategies in Mudzi district, Zimbabwe. The study adopted a mixed methodology approach, a hybrid of both quantitative and qualitative research methods. Quantitative data was collected through closed-ended questionnaire (n = 50). Qualitative data was collected through Focus Group Discussions, In-depth Interviews and participant observations. A total of 69 respondents took part in the study. Qualitative data was analyzed using thematic content analysis and quantitative data was analyzed through descriptive statistics. Results from the study show that small-scale artisanal miners are very aware of the EIA process although the level of EIA adoption is still very poor because of high charges of consultants. Results also show that small-scale artisanal miners have mixed perceptions on the EIA process. Some value it as a necessary tool for environmental protection while the majority views it as an unnecessary process. Finally, while small-scale artisanal miners have various platforms like radios, TVs, newspapers, internet where they can access EIA information they are too busy to look for the information. Based on the research results, it can be concluded that small-scale artisanal miners are aware of the EIA process although most of them are operating illegally. The study recommends that small-scale mining should be formalized so that the adverse effects of mining can be monitored through the use of an EMP.

Key words: environmental impact assessment, small-scale artisanal miner, awareness, perceptions

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Dedication

I dedicate this thesis to my beloved husband, Takunda and to my lovely kids Tinotenda, Takunda Junior and Tawananyasha.

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List of Acronyms

BSAC	British South African company
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
DA	District Administrator
EA	Environment Africa
EMA	Environment Management Agency
EMA	Environmental Management Act
EPOs	Exclusive Prospecting Orders
FGD	Focus Group Discussion
ITDG	Intermediate Technology Development Group
KAP	Knowledge Attitude Practice
LEAP	Local Environment Action Plan
LVR	Lombard Vocal Response
MeHg	Methylmercury
NEPA	National Environmental Policy Act
NGOs	Non-Governmental Organisations
RDC	Rural District Council
SAFIRE	Southern Alliance for Indigenous Resources
SSAM	Small-Scale Artisanal Miner
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNIDO	United Nation Industrial Development Organisation
WES	Wildlife and Environment Society
WHO	World Health Organisation
ZMDC	Zimbabwe Mining Development Corporation
ZRP	Zimbabwe Republic Police

CHAPTER ONE

1.0. INTRODUCTION

1.1. Background

Environmental Impact Assessment (EIA) is a comprehensive and systematic process designed to identify, analyze and evaluate the environmental effects of proposed projects (Noble, 2006). In general, it has been promoted as a means for achieving more sustainable development (Gilpin, 1995). EIA was first legislated in the United States through the National Environmental Policy Act (NEPA) of 1969. It significantly influenced the development of EIA in other parts of the world (Sadler, 1996; Fischer, 2003; Glasson et al., 2005). NEPA is an act aimed at encouraging productive and enjoyable harmony between man and the environment.

Principle 17 of the Rio Declaration adopted in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, states that, (EIA should be done for all projects that are likely to have negative impacts to the environment” (Rio Declaration, 1992). The need for a preventive approach to environmental protection was re-emphasized in the Earth Charter published in 2000, which asks to “prevent environmental damage”.

It is broadly accepted that the basic intention of EIA is to anticipate the significant environmental impacts of development proposal before a commitment is made to a particular course of action (Cashmore, 2004). EIA is perhaps the most widely used tool of environmental management in the mineral sector. This study sought to find out if artisanal gold miners are aware of the EIA process and if they are aware, what are their perceptions on its ability to mitigate negative impacts of mining activities in Zimbabwe?

1.2. Statement of the Problem

The EIA process has been widely recognized internationally, as one of the key mechanisms by which environmental protection and sustainable development maybe achieved (Cashmore, 2004; Isah, 2012). The Brundtland Commission highlighted that EIA and sustainable development are important for human well being (Gilpin, 1995). EIA is a process having the ultimate objective of providing decision-makers with an indication of the likely consequences of their actions. It enables proponents to carry out Environmental Cost Benefit Analysis of projects at an initial stage (Dutta & Bandyopadhyay, 2010). Despite indications that EIA plays an important role in facilitating development and environmental conservation there is dearth in literature of its importance in small-scale mining.

1.3 Objectives

Specifically, the study sought to:

- Investigate small-scale artisanal gold miners' awareness of the EIA process in Zimbabwe.
- Understand small-scale artisanal gold miners' perceptions on the EIA process.
- Identify environmental management strategies employed by small-scale artisanal miners to mitigate negative environmental impacts of mining.
- Assess how small-scale artisanal gold miners access environmental impact assessment information.

1.4 Justification of the Study

This study can be justified from different perspectives. Firstly, the study identifies effective ways in which various stakeholders can support small-scale miners to carry out EIA prior to any mining activity. The study is useful to policy makers and regulatory authorities such as Government of Zimbabwe, Local governance authorities, Environmental Management Agency that are involved in protecting the environment. The study contributes to measures for enhancing the adoption of EIA in poor local community settings. Results from the study can be a catalyst in designing, developing and implementing appropriate, suitable as well as viable environmental policies and strategies in developing countries context. The intention was to enhance the level of EIA adoption by small-scale gold miners in order to support sustainable development.

1.5 Definition of Terms

Environmental Impact Assessment (EIA): is a comprehensive and systematic process designed to identify, analyse and evaluate the environmental effects of proposed projects (Noble, 2006).

Small-Scale Artisanal Mining (SSAM): is largely a poverty-driven activity, typically practiced in the poorest and most remote rural areas of the country by a largely itinerant, poorly educated populace with few employment alternatives (World Bank, 2013).

Perception: is a particular way of thinking about something. (Macmillan English Dictionary, 2007). In this case it is a way of thinking about the EIA.

1.6 Thesis Outline

This thesis is divided into five chapters. Chapter one is the introduction of the research. It contained background, statement of the problem, objectives, justification and definition of terms. Chapter two situates this study in the context of previous research, presents a synthesis of empirical literature according to relevant themes, justifying how the study addressed a gap in the literature and also outline the conceptual framework of the study. Chapter three contains the methodology used in the study. This chapter situates the study in a particular methodological approach, providing a rationale for that approach. It offers sections on sampling procedure, instruments, data collection, fieldwork, data analysis procedure and ethical issues. Chapter four is a detail of research results. Finally, chapter five encompasses discussion of the results, conclusion and recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Introduction

The chapter focuses on the evolution of artisanal gold mining in Zimbabwe and gives the distribution of gold panning sites in the country. It details the environmental impacts of artisanal gold mining. The chapter also focuses on the legal and institutional framework governing artisanal mining in Zimbabwe. The chapter closes with a presentation of environmental education and awareness. Sources of literature to be reviewed include journal articles, case studies, EIA reports, policy documents and other researches. This helped the researcher to fully analyse and discuss the results of the study and juxtaposed them with the previous findings of other researches.

2.2. Historical Development of Artisanal Gold Mining in Zimbabwe

The history of small-scale or artisanal mining in Zimbabwe can be traced through three historical epochs namely pre-colonial period (before 1890), colonial period (1890-1979) and post-colonial period (after 1980) (Masiya et al., 2012).

Gold mining and trade in Zimbabwe predates the advent of colonial rule in 1890 (Maponga and Ngorima, 2003; Mberengwa, 2010). Pre-colonial mining consisted of small works in gold, copper and iron. These were mined using open stopes and vertical shafts (Masiya et al., 2012). The open stopes was mostly used with deep trenches which followed more or less vertical ore bodies going as far down as the water table. On the other hand the shafts were mainly for relatively horizontal ore bodies and the shafts rarely exceeded 6 to 25 metres (Summers, 1966). For breaking up the ore containing rocks, the miners had to rely on alternately heating and cooling the rock by a process known as fire-setting.

Besides extraction of ore from open stopes and underground works, the pre-colonial small-scale miner was also involved in alluvial gold panning either in or beside rivers (Phimister, 1974). Alluvial gold panning was significant along Angwa, Mazoe and Ruenya rivers. Both reef and alluvial gold mining were seasonal activities to the pre-colonial and were mostly done in winter after harvesting and before planting commenced (Masiya et al., 2012). Gold mining formed the basis for the wealth and power of many kingdoms (Randles, 1998:58). Gold was used for trade with the Portuguese and Arabs and they usually traded it with cloth in the Pre-colonial Africa (Phimister, 1974).

During the colonial period, Small-scale gold mining became a commercial activity in Zimbabwe. In the late 19th century Cecil Rhode's British South African company (BSAC) received charters from the British Crown to administer Southern Rhodesia in 1889. The first mining legislation was specifically to promote the working of gold deposits by large companies as it allowed BSAC to claim 50 percent share in mining operations (Viewing, 1984). In 1903/04 the mining legislation was revised permitting individuals and syndicates to mine on a small-scale. The small-scale operations exploited the small deposits that were not profitable for large-scale mining and they also took advantage of the cheap African labour (Metcalf, 2008; Hollaway, 1999).

In 1905, there were 20 small-scale operators and the number increased to over 400 in 1923 (Anderson, 1961) each producing not more than 1000 ounces of gold yearly. In 1910, small-scale operators employed about 34 494 African workers (Metcalf, 2008). The government of that time played a critical role in supporting the small-scale operators. They set up infrastructure from regional to district levels to support small-scale mining operations (Masiya et al, 2012). In 1938, small-scale operations rose to 1 548.

The return of service members from World War 11 to the country offered an opportunity to encourage individuals into small-scale mining. In 1945 the government introduced the ex-service men scheme whose aim was to first train returned soldiers in mining at Guinea Fowl school and this was followed by giving them loans to start up their own mining operations or to reopen mines closed during war. The scheme was considered as a success as it trained 221 men and 279 mines were re-opened which by 1952 had produced gold worth \$51 million (Viewing, 1984). Although colonial Zimbabwe had a vibrant small-scale gold mining sector, this was restricted to whites. No black indigenous people legally owned or operated a mine (Masiya et al, 2012). Black people were mostly involved in alluvial mining along the major rivers.

With the end of colonial rule in 1980, the mining sector opened up somewhat with several new small-scale mines being established with support from the Ministry of Mines and the state owned Zimbabwe Mining Development Corporation (ZMDC) which was formed in 1982 to invest on behalf of the state, oversee the development of the mining sector and support mining co-operatives. Zimbabwean government initiated registration of mining claims by charging low registration fees in a bid to promote small-scale mining sector.

Support programs like plant hire purchase scheme and government loans were introduced. (Masiya et al, 2012).

This support saw an increase in the number of registered claims from an estimate of 1000 in 1983 to 10 000 by 1990 (Dreschler, 2001) and to more than 20 000 by the year 2000 (Maponga & Ngorima, 2003). The new mining regulations of 1990 allowed Rural District Council (RDCs) to licence artisanal miners and regulate environmental impacts through Statutory Instrument 275 (1991, Regulations on Alluvial Gold Panning in Public stream). This was done to control the impacts of panning, with local government responsible for coordinating training centres for panners (Maponga & Ngorima, 2003). The Ministry of Mines also licensed gold panning under section 275 of the 1996 Mines and Minerals Act, which has also led to clashes and overlap between central and local government licences. The Ministry of Mines and Mining Development, with assistance from the University, engineering department, provided technical training for artisanal miners. Miners were trained on how to secure access to prospecting and mining licences as well as mining technology and micro financing.

In 1993, Zimbabwe hosted a World Summit on artisanal mining, which produced the Harare Guidelines on small/medium-scale mining. The declaration provided commitments to poverty-oriented development assistance for artisanal mining in developing countries. The Harare Guidelines reflected the vision to promote the legalisation of artisanal mining and was heralded as a useful model globally (Jennings, 1999; Sinding, 2005). From 1996, the Reserve Bank of Zimbabwe's gold buying agency, Fidelity Printers and Refineries started to accept gold in small amounts (as low as 50 grams). Small miners were offered relatively high prices for gold deliveries as reported in the Sunday Mail of 5 November 2017.

Non-Governmental Organisations (NGOs), private sector and international organisations have also assisted the post-colonial small-scale mining sector through setting up of central processing facilities for use, for example, the Shamva milling centre established through the initiatives of Intermediate Technology Development Group (ITDG). The Shamva milling centre was ranked the best in small-scale mining in Africa (Hentschel et al., 2002). Cleaner production technologies trainings and awareness campaigns for example UNIDO's Global Mercury Project was carried out.

NGOs and International organisations which provided a wide range of financial and technical support to the sector include EU Micro Project, GTZ (Germany), Comic Relief,

SNV (Netherlands), TDH and AFSM (Austria). The private sector, especially the large mining companies, has also assisted the small scale miners with training in areas such as occupational health and safety through the Chamber of Mines. Between 1990s and early 2000, there was no doubt, that Zimbabwe was a leader in Africa's gold mining sector giving incentives for small-scale artisanal miners to be formalised. In 1996, the number of people involved in alluvial gold panning alone in Zimbabwe was estimated to 300 000 (Maponga & Ngorima, 2003; Masiya et al., 2012).

Economic and political upheaval in Zimbabwe around 2000 constrained livelihoods in rural areas and there was a shift in patterns of resource access and control (Rutherford, 2014; Alexander and McGregor, 2013; Scoones et al, 2012; Chimhowu and Woodhouse, 2008). Unemployment increased to 80 percent and illegal small-scale mining became a source of livelihood for many people (Zwane et al., 2006; Kamete, 2008; Mabhena, 2012). There is a marked correlation between the growing numbers in artisanal miners and economic situation in a country. When economic conditions deteriorate, artisanal mining increases (Bello & Bybee, 2014).

In 2000, large-scale mines downsized their operations and even closed due to high operational costs and political uncertainty releasing many people to small-scale mining (Kusemamuriwo, 2004). The collapse of large-scale commercial farming activities following the Fast Track Land Reform Programme in the early 2000s (Shoko, 2005) worsened by poor agricultural yields due to poor rainfall patterns (Katanha, 2005:9) pushed people into artisanal mining.

In 2002, the total number of people directly dependent on small-scale mining (of gold and other minerals) including those who provide services to the miners as well as dependants was estimated at over two million (Dreschler, 2002; UNIDO, 2007), a greater percentage of which was related to gold panning. The steep rise in numbers of people who returned to gold panning between 2003 and 2006 may be attributed to social, economic and political changes that took place in Zimbabwe then (Metcalf, 2008). Gold panning was seen as a viable livelihood strategy in such harsh living conditions.

In 2006 and 2007, the government of Zimbabwe insisted that all gold to be sold to RBZ (in accordance with the Gold Trade Act Chapter 21:03). Local authorities were disempowered and alluvial panning was made illegal in 2006 when government repealed the law Statutory Instrument 275 of 1991. The government launched Operation Chikorokoza Chapera in

November 2006. The operation left many people jobless and involved the arrest of tens of thousands of miners. The country's gold output declined from 11 tonnes in 2006 to 3 tonnes in 2008 (Central Statistics Office of Zimbabwe, 2008). The decline itself indicated that the operation was a failure- if the policy intent was to increase official gold collections by the government (Spiegel, 2015).

It is estimated that more than 15 tonnes of gold, worth over \$400 million, were smuggled out of Zimbabwe between 2002 and 2007 (Chronicle, 26 September 2016). In 2014, reports say that Zimbabwe Republic Police (ZRP) intercepted more than 20kgs of gold being smuggled out of the country while 180kgs was intercepted from illegal panning sites. It was on the back of these developments that governments agreed to decriminalize activities of gold panning and formalise small-scale and artisanal miners. And the country began to see a significant increase in their contribution as gold started flowing through normal channels (Chronicle, 26 September 2016).

The number of small-scale gold miners began to rise again with a total of 500 000 small-scale miners recorded in 2015 and more that 700 000 recorded in 2016 (Zimbabwe Miners Federation, 2016). However, only 25 000 were registered in accordance to the Mines and Mineral Act as of 2015. Government has availed several facilities aimed at improving the operating conditions of the small-scale miners and statistics have shown that their contribution to gold output has been gradually increasing since 2014. Government has introduced gold mobilisation strategies, including setting up of 11 gold buying centres across the country for the purchasing of the mineral from artisanal and small-scale miners by Fidelity Printers.

Removal of presumptive tax and reduction of royalties from 5 percent to 1 percent has gone a long way in encouraging small-scale miners to sell their gold to Fidelity Printers. Fidelity Printers is also paying small-scale and artisanal miners cash for deliveries as it seeks to encourage more gold to be sold via official channels (Daily News, 17 July 2018). Government has allocated \$100 million in its national budget to small scale miners and plans are afoot to formalise their business through an Act of Parliament. This year Zimbabwe expects to get 30 tonnes of gold from 24 tonnes in 2017 mainly by expected increase in small-scale miners.

The Governor of Reserve Bank of Zimbabwe proposed to scrap 2 percent EMA fee, reduce EIA fee to a rate of 0,05 percent of the total project cost from a rate of up to 1,2 percent and

also to reduce custom milling fees from \$8 000. Recently, the Environmental Agency and the Zimbabwe Miners' Federation reached an agreement to simplify the EIA exercise. The development which will see the miners only having to fill blank spaces of a template as opposed to the previous dispensation where miners had to submit a comprehensive environmental management plan, which then saw them engaging consultants who were charging \$5 000.

2.3. Environmental Impacts of Small-Scale Mining

Small-scale gold mining has positive impacts on socio-economic welfare of local communities. However, its overbearing negative environmental impacts outweigh the socio-economic benefits (Ncube et al., 2015). Available literature (Hentschel et al. 2003; Aryee et al., 2003; Maponga & Ngorima, 2003) have revealed that small-scale mining is detrimental to the environment. Some of the environmental problems include destruction of the forest cover, destruction of farms, disturbance of the natural habitats of game species, water pollution, air pollution, noise pollution and land degradation (Gandiwa & Gandiwa, 2012; Maponga & Ngorima, 2003; Kitula, 2006). Environmental impacts of small-scale mining activities can be put into three categories including damage that are caused to the lithosphere, the hydrosphere and the atmosphere (Aryee et al., 2003).

Damage to the lithosphere includes widespread land degradation, loss of biodiversity, natural resources and deforestation. Land degradation is the continuous loss in the worth and the productive ability of the land (UNEP, 1999). Land degradation threatens the economic and physical survival and also threatens the ecosystem (UNEP, 1999). Zimbabwe has a total land area of 39, 6 million hectares and it is estimated that 200 500 square meters of that land has been extensively damaged by illegal artisanal mining activities (Parliament of Zimbabwe, 2017). Zwane et al., (2006) reported that gold panners in Zimbabwe generally work not less than 50 tonnes of earth per panner per month; this produces the physical effects of the activity.

A site observation at the Wozoli mining site in Kwekwe has shown that small-scale mining practices are detrimental to the environment, particularly on the ecological environment (Mapuva & Dube, 2016). In the event that gold is exhausted in working pits, they are then abandoned without even reclaimed and new pits are sunk, leading to the destruction of the ecological environment (Aryee et al., 2003; Crispin, 2003; Zwane et al., 2006). The abandoned unprotected pits expose both domestic and wild animals at risk of falling into the

pits (Mapuva & Dube, 2016). Once filled with water, the pits serve as breeding grounds for malaria-infected mosquitoes (Hilson, 2002). In Shurugwi district artisanal miners have destroyed river banks and dams on either side in cases where mineralisation continues beyond the banks (Shoko, 2005). In Kwekwe, Zhombe and Silobela Environment Management Agency (EMA) officers have raised concern that artisanal gold miners have been digging a lot of deep pits, which are almost 30 metres deep.

Closely linked to land degradation is the case of soil erosion and subsequent siltation of water bodies (Donkor et al., 2006). Shoko (2005) argues that siltation in Zimbabwe, Mozambique and Tanzania is reported to have been increasing at the rate of more than 5 percent per annum. The debris leads to siltation of rivers and may result in flooding during the rainy season (Maponga & Ngorima, 2003). In typical mining communities in Zimbabwe, lands which are virtually devoid of vegetation cover after mining operations are quite common to be found in many small-scale mining zones throughout the country (Hilson, 2001). As a result of intense prospecting and excavation activity, pristine Zimbabwean rainforest has been removed (ibid). It is estimated that 100 000 hectares of land are cleared each year in small-scale mining regions (Maponga & Ngorima, 1995).

According to Hilson (2002), these problems could have been prevented if resident small-scale miners are provided with the requisite geological knowledge of the locations of prospective ore bodies. Overpopulation in panning regions results in accelerated deforestation (Maponga & Ngorima, 2003). In Manicaland province, estimates are that 600 hectares of prime timber owned by Allied Timber in Chimanimani has been extensively damaged by illegal mining activities. Elsewhere artisanal gold panners have damaged public infrastructure with media reports suggesting deep tunnels being dug in Kwekwe town area (Parliament of Zimbabwe, 2017).

Besides the damage to the lithosphere are the impacts of small-scale mining upon the hydrosphere. One of the most pressing environmental problems in African small-scale mining regions is the release of mercury (Hilson, 2002). Mercury which is used for amalgamation in artisanal gold mining, the largest of the small-scale mining industry, is typically dispensed untreated into the atmosphere and waterways where it is transformed by microbes into toxic methylmercury (MeHg) (UNEP, 2002).

The use of mercury in small-scale mining techniques has health and environmental consequences (Donkor, 2006). In sufficient quantities, MeHg threatens the health of virtually

every invertebrate, birds, mammals and humans especially when used carelessly (Hilson, 2002). In Zimbabwe, an estimated 6 tonnes of mercury is used annually by illegal miners (Maponga & Mfote, 2001). However, about 50 percent of the mercury is lost on amalgam plates barrels, to the atmosphere, and during retorting, and it pollutes the environment (Maponga & Ngorima, 2002). It is estimated that artisanal gold mining is the largest contributor to mercury emissions, accounting for over 37 percent of emissions in 2010 (Klein, 2014).

In a study by Tunhuma et al. (2007), in Zhulube catchment in Zimbabwe, results indicated an elevation of sulphate entering water bodies and an introduction of the toxic metal mercury into the aquatic environment. Similarly, Maponga(1997) confirmed that inappropriate usage of mercury causes water pollution along the Mazowe River in Mashonaland Central Province. Shoko et al., (1993) reported that 64 percent of Zimbabwean gold miners exhibit “poor chemical management” and because of financial constraints, small-scale miners cannot optimise the use of expensive chemical cleansing agents. Ore and waste stockpiles established on surface commonly contains significant amount of sulphides which are later leached out by precipitation into water sources (Shoko, 2005).

Gold panning activities have been described by Borkowski (2003) cited in Mihaye (2013), as characterised by cyanide heaps leaching which is also another common technique of gold panning, but by using that technique, gold panners release cyanide. Cyanide is an extremely toxic material and it poisons and pollutes the water sources. The effect of mineral pollution on an ecosystem may be so detrimental and may wipe out aquatic life from the receiving waters (Ravengai et al., 2005).

Most of the activities of artisanal miners are meant to reduce the water table or divert watercourses away from the mining sites. In 2014 Mazowe River had 155.85km of life destroyed by alluvial mining (Parliament of Zimbabwe, 2017). The damaged areas are now characterised by deep pits, with sections of the river heavily silted and part of its course way has been diverted (ibid). This disrupts the natural watercourse which eventually leads to surface water pollution. Miners put up unplanned mining compounds sited close to water resources, with poor sanitary facilities, resulting in considerable pollution from human waste (Ashton et al., 2001; Dreschler, 2001).

Most small-scale activities increase sedimentation in the rivers (Smith et al., 2016), especially through the use of hydraulic pumps and suction dredges, which sometimes leave scars on the

landscape (Mahiye, 2013). Tunhuma et al., (2007) assessing small-scale gold mining in the Limpopo Basin of Zimbabwe linked artisanal mining with sedimentation of rivers and pollution, attributing the most significant pollution to gold panning.

Damage to the atmosphere is yet another environmental problem of artisanal gold mining. Air pollution is the introduction of particles, biological molecules, or other harmful materials into the Earth's atmosphere, possibly causing disease, death to humans, damage to other living organisms such as food crops, or the natural or built environment (WHO, 2001). The major air pollutants from mining operations include particulate matter of various sizes and also gases such as Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂) and Carbon Monoxide (CO) (WHO, 2016).

Some of these pollutants that affect the air quality have been identified as airborne particulate matter, emissions of black smoke, dust. Hilson (2002) called for the adoption of retorts when miners were observed burning amalgam freely, thereby, causing harm to the immediate environment. The principal potential sources of air pollution are associated with drilling, blasting, crushing and milling operations, particularly of the finer fractions, and loading and tipping of fine aggregates. The use of pestle and mortar generates fine quartz dust which if inhaled by those involved in the process may cause health problems (Dreschler, 2001).

Dust particles have negative impacts to the workers and even the local populace. Dust is a significant risk factor for a number of health conditions including respiratory infections, heart disease and lung cancer. Dust from gold mining operations has a high silica content, which has been responsible for silico-tuberculosis in the mining area (Akabzaa & Darimani, 2001).

Another environmental challenge of small-scale mining is noise. Noise in general is sound, which is composed of many frequency components of loudness distributed over the audible frequency range (WHO, 2001). The most common and universally acceptable scale is the A weighted scale which is measured as dB (A). This is more suitable for audible range of 20 to 20 000 Hz. Noise can be as a result of drilling, blasting, or hauling, crushing, milling to mention a few. Exposure to noise levels above the internationally accepted level of 90 decibels can cause noise induced hearing loss, fatigue, annoyance, hypertension, high blood pressure, high blood cholesterol, temporary shift of threshold limit of hearing (Green et al., 2015).

In addition, noise can have a detrimental effect on wild animals, increasing the risk of death by changing the delicate balance in predator or prey detection and avoidance and interfere with the use of sounds in communication, especially in relation to production and in navigation. Noise can affect animal population by terrifying them and hinder their mating processes thereby causing them to have abortions. Noise also makes species communicate more loudly, which is called Lombard Vocal Response (LVR).

2.4. Distribution of Gold Panning Sites in Zimbabwe

The history of small-scale gold panning in Zimbabwe dates back to the period before colonisation in the late 1890s (Mberengwa, 2010). Gold mining were seasonal activities to the pre-colonial and were mostly done in winter after harvesting and before planting commenced (Masiya, 2012). The production of alluvial gold, present along all the major rivers draining the greenstone belts, has largely been the domain of illegal gold panners (Maponga & Ngorima, 2003).

Small-scale artisanal gold panning is no longer restricted to the banks and beds of rivers following the ban of Alluvial gold mining in 2006. Panning is now taking place away from river banks, where miners work reef deposits to recover gold. Gold panning is now being done all year round and has become a primary source of livelihood in many rural communities. Artisanal mining is estimated to support the lives of over 2million people in Zimbabwe (Maponga & Ngorima, 2002).

There are over 4000 recorded gold deposits, nearly all of them located on ancient workings. The country remains under-explored to discover new deposits as well as realising full potential of known deposit (Ministry of Mines and Mining Development, 2018). The majority of gold deposits in Zimbabwe occur in greenstones of the Bulawayan Group. Artisanal miners are now distributed all over the country following the greenbelts and major rivers like Mazowe, Angwa, Ruwenya, Odzi etc. Figure 2.1 shows the distribution of Gold panning sites in Zimbabwe.

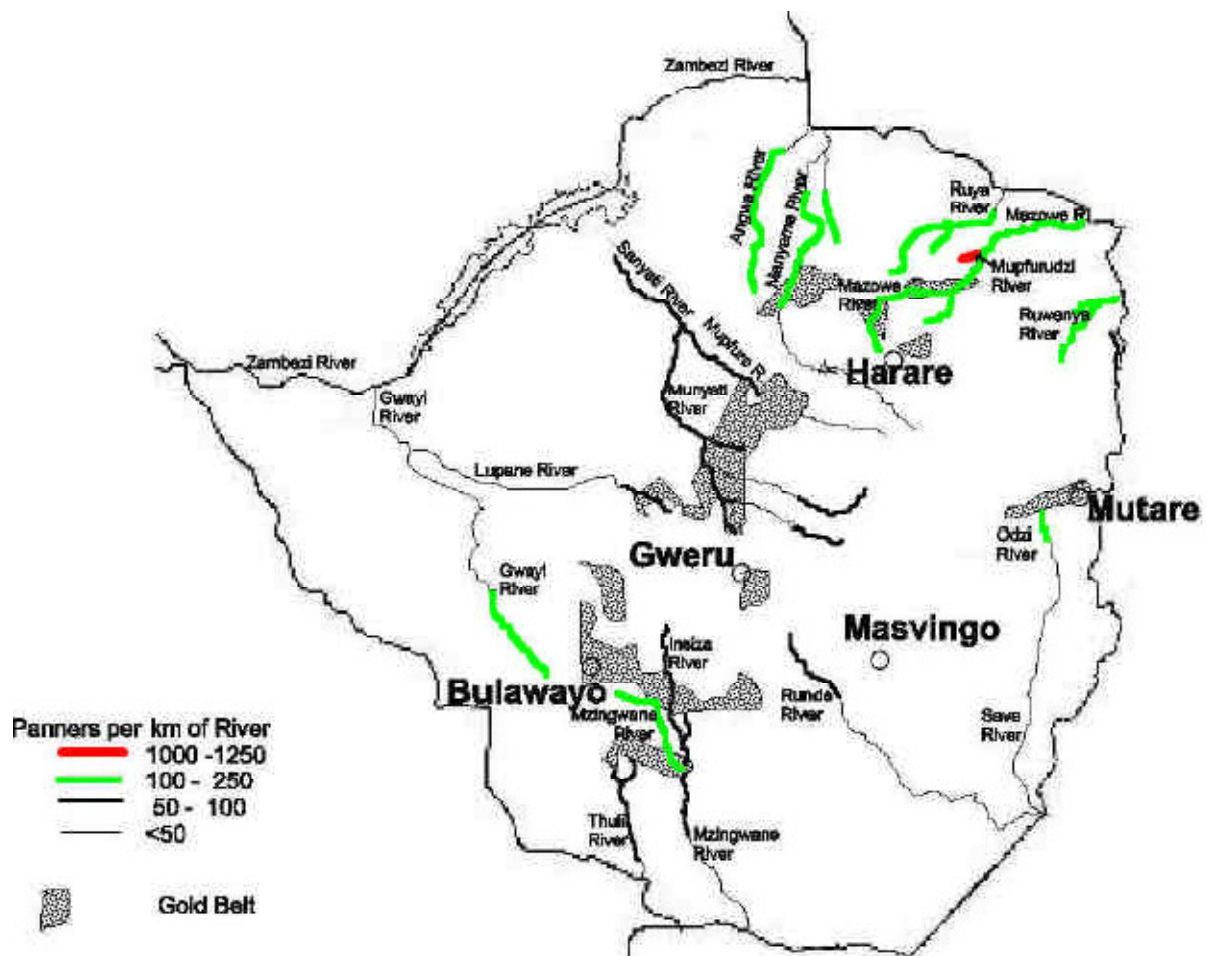


Figure 2.1: Map showing Distribution of gold panning sites in Zimbabwe. *Source: Shoko & Veiga (2004)*

2.5. Zimbabwe’s Legal Framework for Mining

Legal frameworks are very important for the establishment, and functioning of EIA within each jurisdiction. Munn (1979) and Bekhechi et al., (2002) highlighted that legal frameworks are the instruments for transforming environment and development policies into action for an effective EIA system. This section will discuss two major Acts that are of paramount importance to the mining sector and these are the Mines and Mineral Act Chapter 21:05 and the Environmental Management Act Chapter 20:27.

2.5.1. Mines and Mineral Act (Chapter 21:05)

The Mines and Mineral Act was enacted in 1961 and has over the years been amended several times. It is the major Act that regulates all mining activities in Zimbabwe. The Act stipulates that every mineral in its natural state under or upon land in Zimbabwe is vested in the President in trust for the people of Zimbabwe. In view of this, chunk of the revenue goes to the national government than to the local people. Shoko (2005), comments that due to lack

of ownership to mineral resources, communities have not been given the chance to get involved in the management of mineral resources in their localities. As a result, communities employ any opportunity to quickly access these resources to their best advantage.

The Act contains regulations for prospecting of claims, working them, maintaining healthy and safety and abandonment of claims. Mining rights can be acquired by individuals, companies or partnerships. The rights are in the form of a permit that gives the holder access to mine minerals within the registered mining location. No more than six persons shall be registered as the joint holders of a mining location. The main criteria for issuing a permit are technical and financial competence. However, implementation of the Act has disadvantaged artisanal miners' operations. High licensing fees impede artisanal miners' ability to obtain Exclusive Prospecting Orders (EPOs) or to register claims. The Mines and Minerals Act does not segregate between an artisanal miner and a large-scale miner, all are equal before the act. Most of the mining activities by artisanal miners are, therefore illegal in nature as the process of getting mining rights is difficult.

Although there is provision in the Act for registration of small claims of less than 20 000 square meters, there is no policy specifically to regulate artisanal mining more broadly. The general mining legislation has never made explicit provisions for the small-scale miner. Recognising this problem, the Ministry of Mines and Mineral Development attempted to regulate artisanal mining with Statutory Instrument 275, the mining (Alluvial Gold) (Public Streams Regulations) which was later banned in 2006 after environmentalists reached to a conclusion that the environmental costs emanating from alluvial gold mining activities far outweigh the benefits accruing to the panners (Mambondiyani, 2008).

The Mines and Minerals Act was amended several times since 1961 but still did not address the plea of artisanal miners for them to be formalized (Spiegel, 2015). Dreschler (2001) argued that the Mines and Mineral Act enabled large companies to hold EPOs that covered large mineral-rich areas, thereby preventing small-scale miners from obtaining prospecting and mining licenses in these areas. Apart from the Mines and Mineral Act there are other pieces of legislations, which govern the use and management of natural resources and these are; The Forestry Act (1982), The Water Act (1976), The Parks and Wildlife Act (1975), The National Museums and Monuments Act (1972), The Natural Resources Act (1975), The Atmospheric Pollution Prevention Act (1975), The Hazardous Substances and Articles Act (1971), The Pneumoconiosis Act and The Interim EIA Policy (1995).

2.5.2. Environmental Management Act (Chapter 20:27)

The formulation of the Environmental Management Act (EMA, Chapter 20:27) of 2002 was aimed at promoting environmental management and economic growth in Zimbabwe. The Act provides guidelines for sustainable management of natural resources, protection of the environment and prevention of pollution including water, air and environmental degradation. The Environmental Management Act is now the principal environmental management law in Zimbabwe to the extent that if any law is against it, EMA shall override (EMA, Chapter 20:27 section 3) but then eases its power where mines are concerned (section 114).

In terms of section 97 of the Environmental Management Act, an Environmental Impact Assessment should be carried out for any prescribed activity that is likely to have negative effects to the environment. The Act also provides for the establishment of an Environmental Management Agency and an Environmental fund. Environmental Management Agency is in charge of the implementation of EIA application generally grounded in legal frameworks. Gu. et al., (2005); Morrison-Saunders & Bailey (2009); and Polonen et al., (2011), pointed out that governing bodies are the key actors in ensuring implementation to promote effective environmental management and protection. Their roles include providing essential processes including a center for information, communication, and coordination with various stakeholders of a proposed project (Polonen et al., 2011). Thus, along with some legislation or regulation for EIA, it is necessary to have clearly defined governing body in order to implement EIA procedures established in a legal framework (Sok, 2014).

2.6. Environmental Impact Assessment Process

Since EIA emerged in the 1970s, a lot has been written about it. Its development, procedures and use has been analyzed and criticized (Cashmore et al., 2010). Environmental impact assessment emerged in reaction to growing concerns over environmental pollution and degradation (Glasson et al., 1999). As a result of such pressures, the 1960s and early 1970s witnessed the passage of legislation concerning resource protection, hazardous waste management and control of water and air pollution (Noble, 2006). Prior to the 1970s development projects were still being assessed, but assessment was limited to technical feasibility studies and, in particular, cost-benefit analysis (ibid). Zimbabwe initiated the process of environmental impact assessment policy formulation in response to the Rio Local Agenda 21 Declaration (1992) resulting in the policy being codified in 1994 (Ministry of Environment and Tourism, 1997). In 2003, the EIA policy was incorporated into law with the Environmental Management Plan Act (Chapter 20:27).

Several stakeholders are involved in the EIA process. The main stakeholders are the proponent, the competent authority, the public and the EIA team (Mbengo, 2007). The proponent is the developer who intends to implement a project and prepares the EIA. The competent authority is the Environmental Management Agency (EMA), a parastatal in the Ministry of Environment, Water and Climate and is responsible for administering the EIA policy and grants authority for projects to proceed. The public consists of persons and or organizations that can present their views and comments during public hearings. The EIA team is responsible for the actual carrying out of the EIA study and report preparation. The EIA process is presented in Figure 2.2.

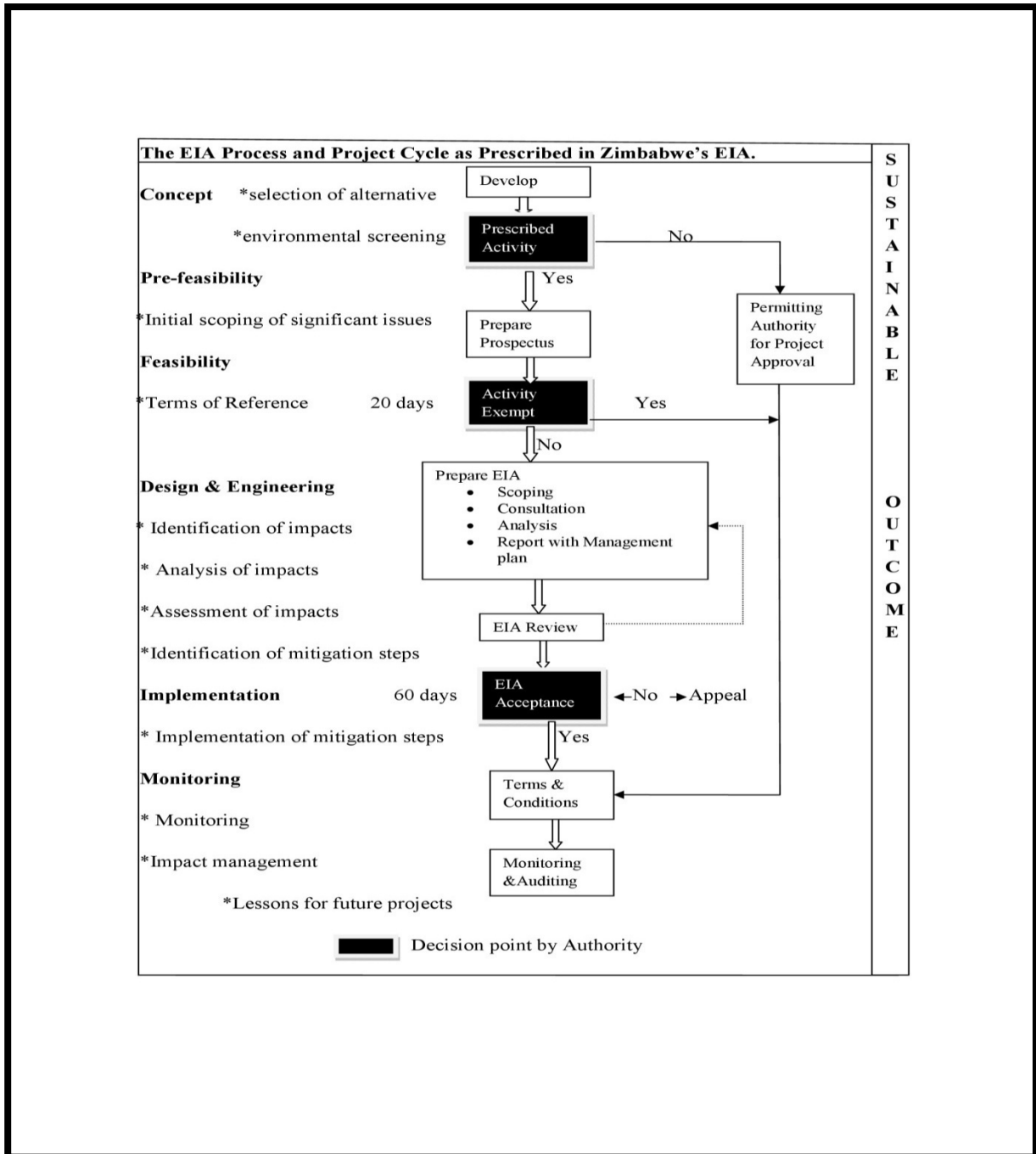


Figure 2.2: Environmental Impact Assessment Process in Zimbabwe *Source: Environmental Impact Policy. Ministry of Mines, Environment and Tourism Zimbabwe (1997).*

Proponents for a development activity are required to consider all aspects of the project with relevant authorities and interested parties and then prepare a prospectus. A prospectus is a short document informing EMA of the development activity being considered which may warrant an EIA. The prospectus provides basic description of the activity, status of the project and any known environmental impacts. Once the prospectus has been submitted, EMA has 20 working days to assess whether or not an EIA is required or else the project is exempt from

further compliance with the policy. Screening is the process of determining which projects require a full EIA.

If the EIA report is required, EMA requires that a scoping exercise be undertaken before proponents prepare the terms of reference. Scoping involves the identification from a broad range of issues, those potential issues that may need to be considered in an EIA (Bean Lands, 1984). Scoping of significant issues is based on existing information such as the results of the previous environmental impact assessment and one's professional knowledge of a subject area.

When EMA receives the EIA report, a review process will be undertaken. If the report forecast significant impacts which require more detailed study, EMA may require additional information and analysis of those impacts only. Depending on the complexity and scope of the activity, outside experts or an independent review panel may be asked to advise EMA. The experts may refer the report to other government agencies for comments and recommendations. EMA has 60 days in which to review and comment on the EIA report. If this deadline is not met, the project is exempt from further compliance with the EIA policy.

When EMA is satisfied that the EIA and any subsequent reports represent an adequate analysis of the environmental consequences of a project, it will grant "EIA Acceptance" for the project. EIA Acceptance is accompanied by recommended terms and conditions and an impact management plan, outlining the actions required of the developer and various government agencies to ensure good environmental performance on the project. Zimbabwe's EIA policy makes it mandatory to conduct public articulation. Monitoring and audits will provide feedback to the EIA process on the effectiveness of the management plan.

Zimbabwe's EIA policy is specifically designed to integrate EIA requirements naturally within the project cycle. Typically, a project begins as a concept and then moves through pre-feasibility and feasibility studies before detailed engineering design and then implementation. During construction and operation, monitoring and evaluation contributes information to the subsequent development of new project concepts, thus completing the project cycle. The prospectus is intended to be received and reviewed by EMA at the project concept or early pre-feasibility study phase so that, if an EIA study is deemed necessary, it can begin in parallel with other pre-feasibility studies. Thus it can contribute meaningfully to project planning while options are still open and designs are flexible.

An EIA study should be timed to coincide with feasibility studies and detailed engineering design when the detailed information it provides is most useful to project planners. The aim of designing the EIA requirements in this way is to encourage project proponents to include the “EIA team” within the broader project development team and to make constructive use of EIA study findings as they are generated. The result is that EIA studies should be useful both to project proponents as a planning tool in designing more environmentally sustainable projects and to government as an evaluation tool in fulfilling its environmental and natural resources management responsibilities. This study will use this framework to find out whether artisanal gold miners are aware of this EIA process as well as their comments about it.

2.7. Environmental Education

Environmental Education (EE) is an issue that means different things to various people. According to Palmer (1998) EE is a form of education that promotes sustainable natural resource conservation among people. White (2004) argued that EE is education that is aimed at participatory learning. It is when people learn skills, attitudes and knowledge about environmental conservation (Shava, 2003). The aim of EE is to develop knowledge in response to emerging environmental problems such as climate change, global warming, desertification, water and air pollution (Fien, 1993).

The main goal of EE is to make communities develop a sense of environmental stewardship. It makes communities acquire knowledge, values more appropriate to solve environmental problems, and in managing the quality of the environment (Mukoni, 2013). EE is one of the ways of developing an awareness of the environment and a sense of responsibility for its protection. It is the most effective vehicle for persuading people to adopt a positive attitude toward the natural environment and to avoid the deterioration of human life as a result of unwise exploitation and misuse of nature (Otiende et al., 1997:15).

EE can be discussed through the three dimensions of learning that is, knowledge, attitude and practice (KAP) (Palmer, 1994). Firstly, EE should provide knowledge about the environment both natural and built environments. It should enable people to evaluate information about the environment from different sources and to try to resolve environmental problems. Secondly, EE should help people to develop an attitude of concern for environmental matters and wish to improve environmental understanding. Thirdly, EE should provide experience of problem solving, decision making and participation, with considerations based on ecological, political,

economic, social, aesthetic and ethical aspects. A quote from Herbert Spencer goes, “The aim of education is not knowledge, but action”. Therefore EE is that which can bring about transformative social change (Mukoni, 2013).

Various communication channels are used to disseminate environmental information to the different user groups. Examples of such channels include mass media (electronic and print); government departments like EMA, Forestry Commission; Non Governmental Organizations (NGOs); special events/ days (e.g. World Environmental Day) (Boafo, 1993).

The media is one of the key providers of EE in Zimbabwe. As an agent of socialization, it has the potential to influence people’s views, attitudes, opinions and behavior (Giddens, 1997). There are two broad types of media in the country namely print (newspapers, magazines, brochures and posters) and electronic (radio, television and the internet). The media is geared at raising public awareness of environmental issues, and promoting a holistic management of the environment in all sectors of the community (Mapira, 2014). One major obstacle to overcome is the fact that most rural people are too busy to have time to read or listen to environmental programs on radio, television or other channels (Boafo, 1993).

Language can also serve as a barrier when the audience is denied access to the relevant information because it is presented in a language they do not understand (Boafo, 1993). Research has also shown that people who have low levels of education generally develop poor information seeking behavior with regard to printed information. Even if simple magazines or newspapers containing environmental information were provided, it would take such people a long time to read these documents (Boafo, 1993). Also because of poverty members of low monetary income group cannot afford to buy newspapers, radio or television sets as a means of obtaining environmental information.

The Environmental Management Agency also has a role to play in the delivery of EE. As an environmental watchdog agency, EMA is mandated to promote sustainable development and environmental protection (EMA’s Information Brochure, 2010). EMA provides EE through awareness campaigns, conducting meetings, seminars and workshops which target specific communities in rural, urban and peri-urban; commemorating significant days on EMAs calendar; publication and dissemination of EE information through print and electronic media. Environmental education, awareness and the showing of knowledge and experience should be promoted in order to increase the capacity of communities to address

environmental issues and engender values, attitudes, skills and behavior consistent with sustainable environmental management (Mapira, 2014).

EMA has been facing challenges, which limit its capacity in dealing with problems of environmental degradation and these according to Mapira and Mungwini (2005) include, poor funding, manpower shortages and general poverty, which drives some people into activities that promote environmental degradation such as gold panning. Poverty is known to be a major cause of environmental degradation especially in communal areas where peasants eke out a living from their environment (Chimhowu, et al. 2010; Mapira & Munthali, 2011).

NGOs also play a significant role in environmental management in Zimbabwe. Examples according to Lopes (1996) include: Environment Africa (EA), Southern Alliance for Indigenous Resources (SAFIRE), Communal Areas Management Program for Indigenous Resources (CAMPFIRE), Wildlife and Environment Society (WES). Although most of the NGOs are mainly involved in poverty reduction programs they also address environmental issues (Mapira, 2014).

2.8. Chapter Summary

The foregoing chapter has analyzed the available literature on awareness and perceptions of artisanal gold miners on the EIA process in Zimbabwe. The chapter explored the historical development of artisanal mining in Zimbabwe and the environmental impacts of small-scale mining. It also presents the distribution of gold panning sites in Zimbabwe which is mostly characterized by alluvial mining along major rivers in the country like Angwa, Mazowe and Ruenya Rivers. The chapter also reviews the country's legal framework that governs mining activities in Zimbabwe with more emphasis on Mines and Mineral Act Chapter 21:05 and the Environmental Management Act Chapter 20:27. The EIA process is also explained in detail. The chapter also detailed some of the sources of EE which can be accessed by miners. The next chapter considers the methodology of the study.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Introduction

The purpose of this chapter is to present the philosophical underpinnings underlying this research as well as to highlight how data was planned, executed, analyzed and also how data quality was ensured. It gives the methodology of the research, description of the study area, discusses research design, participants, sampling procedure, data collection methods and tools, data analysis, ethical considerations. The previous chapter discussed how researchers elsewhere have described EIA and artisanal gold mining. This chapter describes the research methodology used to find out if artisanal gold miners are aware of the EIA process. The study employed a mixed method approach.

3.2. Methodology

The terms ‘methodology’ and ‘methods’ are often used interchangeably even though they actually refer to two different things (Hussey & Hussey, 1997). They consider that methodology refers to the overall approach taken, as well as the theoretical basis from which the researcher comes, while method is the various means by which data is collected and analyzed (ibid). Kaplan et al., (1989:41-42) cited in Clough & Nutbrown, (2002) agreed that, methods are, “techniques and procedures used in the process of data gathering while methodology describe and analyze the methods”. Methodology provides the reasons for using a particular research recipe (Clough & Nutbrown, 2002).

Neuman (2006:6) highlights that methodology is the general procedure in which research is to be undertaken. It identifies a lot of things key among them the methods to be used in it. Creswell (2003:20) says that methodology implies more than simply the methods you intend to use to collect data but a consideration of the concepts and theories which underlie the methods. Miller et al. (2002) described research methodology as plan of how research should be conducted. The approach taken in this study is to include all facets of the research process under the overall heading of methodology. It includes the theoretical ideas and concerns that inform the use of different methods. It provides a literature review, discussing what methods researchers have traditionally used to study similar research topics and why.

Different types of methodologies are used by researchers and these include qualitative, quantitative and mixed methods. Quantitative methodologies include experimental designs and non-experimental designs such as surveys. In an experimental research design, the

researcher seeks to find out if a specific treatment has an impact on an outcome. Thus the experimental group will receive treatment and another group will act as the control group in order to find out how both groups scored on an outcome (Creswell, 2009). On the other hand, survey research quantitatively describes trends, attitudes or opinions of a population through sampling (Babbie, 1990).

Qualitative methodologies include grounded theory, ethnography, phenomenology, case studies, narratives etc. These will be briefly discussed. Grounded theory was developed by Glaser and Strauss (1967). It is a research strategy whose purpose is to generate theory from data (Punch, 2005). “Grounded” means that the theory will be generated on the basis of data (ibid). This process involves using multiple stages of data collection and the refinement and interrelationship of categories of information (Creswell, 2009).

Ethnography is the art and science of describing a group or culture (Fetterman, 1989; Neuman, 1994). Data is collected in a natural setting over a long period of time through observation and interview data (Creswell, 2007). The aim of ethnography is to study and understand cultural and symbolic aspects of behavior and the context of that behavior (Punch, 2005). Participant observation remains at the centre of the endeavour (Somekh & Lewin, 2011).

Phenomenology is a qualitative research methodology in which the researcher studies the importance of human experiences about a phenomenon as narrated by respondents (Creswell, 2005). A sample is studied over time in order to generate patterns and relationships of meanings (Moustakas, 1994). In this research design, the researcher puts aside his/her life experience so as to understand those of the participants (Nieswiadomy, 1993).

Another qualitative research design is narrative research. In this strategy, the researcher investigates the lives of individuals and asks a few to give narratives of their lives. The information gathered is then re-storied by the researcher chronologically (Creswell, 2005). Finally, views of the respondents’ life and those of the researchers’ life are combined into a collaborative narrative (Clandinin & Connelly, 2000).

This study adopted a mixed methodology approach, a hybrid of both qualitative and quantitative research methods. The idea of mixing methods started in 1959 when Campbell and Fisk used multi-methods to study psychological traits. Realizing that all methods have weaknesses, researchers thought of mixing methods to cover up for the limitations of using a

single method (Creswell, 2009). There are quite a number of studies on artisanal mining where researchers successfully used a mixed method approach to bring out the opinions and perceptions of miners. Awatey (2014) collected both qualitative and quantitative data through in-depth and questionnaires to study awareness of residents in small-scale mining communities on the perceived environmental impacts of small-scale mining in Amansie West district in Ashanti region in Ghana.

In another case Mutero (2016) studied gold panning in Mutoko district as a strategy for rural livelihoods and development and used a mixed method approach. Mutero (ibid) used narratives, focus group discussions, field observations, interviews as well as a questionnaire. Bhebhe (2006) used a mixed method approach to study environmental damage caused by gold panning in Gwanda district, Zimbabwe. In all these studies researchers managed to yield meaningful results using the mixed method approach. They all believe that both qualitative and quantitative research should complement each other to bring balance and rigor in research studies.

3.3. Study Area

Mudzi district is in Mashonaland East Province, Zimbabwe, in Southern Africa. The area is subject to periodic mining, seasonal droughts, prolonged mid-season dry spells and unreliable starts of the rain season. This leads people to exploit natural resources like gold for their livelihoods. The greater part of the area consists of greenstones which are the richest in gold (Maponga, 1995). Besides gold mining, the area is also well known for nickel mining, dolerite quarrying and pegmatite mining. The Makaha area which is ward 14 of Mudzi district was selected because of the extensive gold panning activities that are carried out there as compared to other wards. Hence this makes this area suitable to study awareness and perceptions of artisanal miners on the ability of EIA process to mitigate the negative impacts of mining activities. In addition the study assessed the various sources of information used by miners to access EIA information. Figures 3.1 show the location of the study area in the Zimbabwean context. Figure 3.2 also show a sketch map of the study area.

Mudzi communities are mainly driven into mineral panning (especially gold) by poverty and economic hardships. People resort to mineral panning to supplement their meagre household income. Mineral panning is intensified during drought years due to food shortages after failed harvests. Gold panning is rife in the Makaha area where an estimated 26.6 ha was affected (State of Environment Report for Mudzi District, 2014). Figure 3.3 below shows the distribution of gold panning sites in the district.

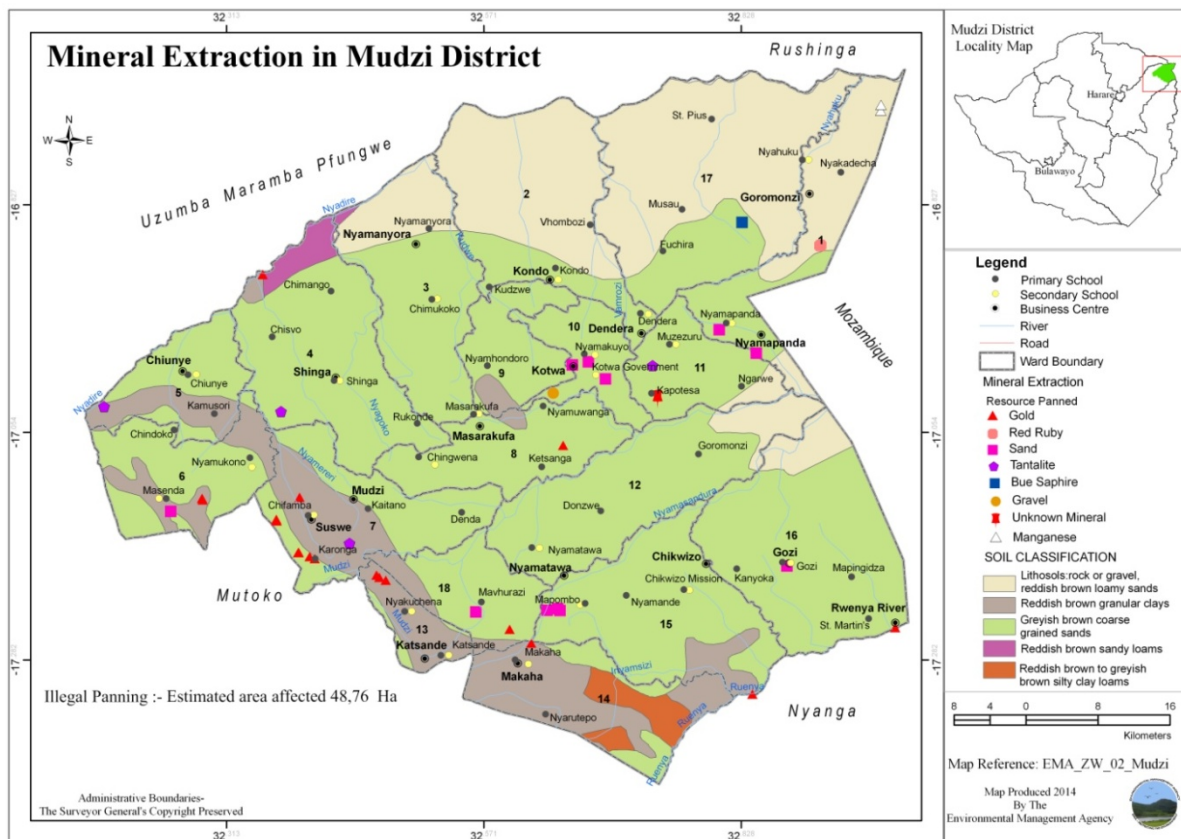


Figure 3.3 Map showing distribution of gold panning sites and other minerals in Mudzi district Source: Environmental Management Agency, 2014

3.4. Research Design

A research design may be defined as the plan of procedures for data collection and analysis i.e. planning what to be collected and planning how it will be collected (Saunders et al., 2009). It is a blueprint for the collection, measurement and analysis of data (Magwa & Magwa, 2015). The study applied a mixed methods approach (Tashakkori and Teddlie, 2003) which is a procedure for collecting both qualitative and quantitative data at different stages of the research process within a single study to comprehend a research problem more completely. The reason behind mixing both methods is that neither qualitative nor quantitative methods are sufficient by themselves to capture the complex phenomenon under study. Furthermore, using mixed research approach is an appropriate means to address

weaknesses inherent in use of a single method, that is, either qualitative or quantitative methods (Bryman, 2008).

3.5. Sampling Procedure

The target sample for this study was drawn from Makaha area in Mudzi district. Sampling refers to the process of selecting a few (a sample) from a bigger group (the sampling population) to become the basis for estimating or predicting the prevalence of an unknown piece of information, situation or outcome regarding the bigger group (Kumar, 2011). Various sampling techniques were used in drawing the sample elements for this study. In this study two stage cluster sampling design was used in which clusters of the first stage were two villages namely Amos village and Mabhande village that were the hub of panning activities and the second cluster were groups or syndicates. Cluster sampling is more appropriate when it is not practical to come up with a list of elements in a population (Babbie, 2007). Systematic random sampling was used to recruit 50 artisanal gold miners to fill in the questionnaire. The population size of small-scale artisanal miners in the study area was approximately 200. A representative sample of 50 that is a quarter of the population was selected. $N=200$ $n=50$ $200/50=4$. Therefore, every 4th small-scale artisanal miner was approached and interviewed. The sampling technique ensures generalisation of sample to the whole population.

Purposive sampling was used to recruit key informants for in-depth interviews. Oliver (2010) and Saunders et al., (2009) point out that a purposive sample is one in which the researcher identifies certain respondents as being able to give significant data in the study. Six in-depth interviews were carried out with relevant stakeholders who are in charge of environmental information. Convenient sampling was used to recruit participants for FGDs. According to Flick (2011) convenient sampling refers to selecting cases that are most easily accessible under a given circumstance. Convenient sampling was chosen because it is inexpensive, quick and convenient. The researcher simply used participants who were available at the mining sites. Table 3.1 is an overview of objectives, methodology and data analysis tools used in study.

Table 3.1: Objectives, Methodology and Data Analysis Tools

Objective	Methodology	Method	Sampling Technique	Data Analysis Tools
To investigate artisanal gold miners’ awareness of the EIA process	Grounded theory	Focus Group Discussion	Convenient	Content Analysis
		In-depth interviews	Purposive	-Content Analysis -Thematic Analysis
	Survey Research	Questionnaire	Systematic random sampling	Descriptive statistics
To understand artisanal gold miners’ perceptions on the EIA process	Survey Research	Questionnaire	Systematic random sampling	Descriptive statistics
	Grounded theory	Focus Group Discussion	Convenient	Content Analysis
		In-depth interviews	Purposive	-Thematic Analysis -Content Analysis
To identify strategies small-scale miners employ to address negative environmental impacts of mining.	Grounded Theory	Focus Group Discussion	Convenient	Content analysis
		In-depth interviews	Purposive	Thematic Analysis
		Questionnaire	Systematic random sampling	Descriptive statistics
To assess how artisanal gold miners get EIA information	Survey Research	Questionnaire	Systematic random sampling	Descriptive statistics

	Grounded Theory	Focus Group Discussion	Convenient	Content Analysis
		In-depth interviews	Purposive	-Content Analysis -Thematic Analysis

3.6. Data Sources

Data for this thesis data was collected from primary and secondary data sources.

3.6.1. Secondary Data

Cohen and Manion (1989) described secondary data as existing literature around a topic, which provides background information. Secondary data was gathered from published scientific papers, journal articles, books, reports, conference and symposium papers, workshops. Secondary data from organizations such as Ministry of Mines and this include geology, temperature and rainfall data were used to describe the geography of the study site. The researcher gathered data from EMA on the mining methods used by small-scale gold miners as well as their impacts on the environments. Also some EIA reports carried out in the district were revealed. Similarly, other data and information from Non-Governmental Organizations (NGOs), with regards to EIA process in the district and mining development activities, will be gathered.

3.6.2. Primary Data

Primary data was obtained from the field through focus group discussions, questionnaire administration, in-depth interviews and participant observations which all provided an assessment of the perception of small-scale miners on the EIA process.

3.6.2.1 Focus Group Discussions

The first phase of the study was to carry out FGDs, to define concepts, to assess if artisanal gold miners are aware of the EIA process, how they get EIA information as well as their perceptions on its ability to mitigate the negative environmental impacts of small-scale mining. The FGDs also helped to examine issues for inclusion in the interviews and the

questionnaire that followed. According to Babour (2009), any group discussion may be called a focus group as long as the researcher is actively encouraging of, and attentive to the group interaction. A focus group is essentially an organized discussion among a selected group of individuals with the aim of eliciting information about their views (Gray, 2014:468). It is a type of group interview, which concentrates in-depth on a particular theme or topic with an element of interaction (Wallisman, 2016).

Krueger (1988) emphasized that these discussions should be carried out in a permissive, non-threatening environment and should comprise of people ranging from 6-12. One of the most beneficial features of focus group discussion is their 'robust' versatility for shedding light on almost any topic or issue (Stewart et al., 2007:42). The purpose of the FGDs was to see areas of agreements and disagreements amongst the gold panners (Kallet, 2004; Brace, 2008, Freeman, 2006). Focus group discussion is a highly qualitative method which provides some quality controls on data collection as participants tend to provide checks and balances on each other that weed out false or extreme views and make it easy to assess the extent to which there is a relatively consistent, shared view among participants. For this study two focus group discussions were held. The groups were of mixed gender.

Focus group discussions can achieve what Lindlof and Taylor (2002) called a chain or cascade effect, where listening to other people's memories and experiences, triggers ideas in other participants. This is particularly the case where participants realize that they share a common experience, and feel that their views are validated and supported by others. According to Kitzinger (1994), focus groups can encourage a greater variety of communication between participants and encourage participation from people who do not want to be interviewed on their own. Through the provision of a 'safe' environment, focus groups aim to promote self-disclosure among participants, through generating group dynamics within discussions (Freeman, 2006).

Themes covered during FGDs include awareness of the EIA process, miners' perceptions on the ability of EIA in mitigating negative impacts of artisanal gold mining, environmental impacts of artisanal gold mining, sources used by miners to access EIA information. The FGDs were also used to solicit recommendations on ways of managing environmental damage. The FGDs were held at the mining sites. On average each group discussion session lasted for about an hour. The researcher combined discussion facilitation and recording of proceedings.

FGDs offer several advantages. According to Silverman (2007), FGDs provide a way of collecting data relatively quickly from a large number of research participants at a relatively low cost. Krueger (1988) noticed that an FGD is a socially oriented procedure. People are social creatures who interact with others. This interaction is evident in the discussions as colleagues, friends, peers share their experiences and knowledge on the issues under debate. The interactions found in group dynamics are closer to the real-life process of sense-making and acquiring knowledge (Bryman, 2012). Silverman (2007) added on and said that FGDs are more 'naturalistic' than interviews (that is they are closer to everyday conversation) in that they typically include a range of communicative processes such as storytelling, joking, arguing, boasting, challenges and disagreements.

Due to the exploratory nature of the study, FGDs were very useful in that even the illiterate were able to understand the issues under discussion and to articulate their thoughts well during the discussion. Unlike research methods such as interviews, focus group discussions allow for the synergistic building up of data as respondents add to the views expressed by others (Gray, 2014). This flexibility to explore unanticipated issues often leads to the production of more elaborated accounts. Disagreements and challenges are very effective in provoking the development and elaboration of accounts. Focus group discussions also provide opportunities for the clarification of responses, for posing additional probing questions, and for observation of non-verbal responses such as gestures, smiles and frowns (Stewart et al., 2007).

However, all techniques of gathering information have limitations and FGDs are of no exception. Silverman (2007) and Morgan (1997) discovered that the researcher has less control in the group interviews as compared to the individual interviews. Participants can move out of the group and others can join in which can disrupt the flow of the discussion. Group members can also interact and influence one another, which can lead to detours in the discussion and the raising of irrelevant issues. Some members may come to dominate the discussion, whilst others may say little or nothing unless prompted (Gray, 2014).

Kitzinger (1995) also pointed out that focus group discussions are not appropriate when it is essential to maintain confidentiality, since by design; views are expressed in a group environment. Another disadvantage of focus group discussions is that they are often composed of convenient sample hence limiting the generalisability of the results (Gray,

2014). Furthermore, the responses of members of the group are not independent of each other, which further limit generalizability of results.

Focus group discussions can be used at the exploratory stage of a study (Krueger, 1998), for example, when the themes or boundaries of a subject are unknown or unclear, and when key constructs for investigation need to be identified. Focus groups are a useful starting point for exploring respondents' views about events, allowing for the subsequent design of survey questionnaire. The focus group discussions were used to validate results from, and inform content, focus and vocabulary of in-depth interviews and the questionnaire.

3.6.2.2. Questionnaire Survey

A questionnaire survey formed an important source of quantitative data for this study. Questionnaires are any written instruments that present respondents with a series of questions or statements to which they are to react either by writing out their answers or selecting from existing answers (Brown, 2001:6). Chiromo (2006:24) echoes that it is that form of inquiry, which contains a systematically compiled and organized series of questions that are sent to population samples. Its role is to extract relevant primary data for a particular purpose. This study used a self-administered questionnaire.

In this study 50 questionnaires were administered to small-scale artisanal gold miners. Verbal consent to cooperate from qualifying miners was obtained. In order to ensure anonymity participants were not required to provide their names on the questionnaires. Prior to answering any question the researcher described the research in greater detail. Explanation of the study took the form of inviting the miner to answer the questions during the interview.

The questionnaire comprised of both open and closed questions in order to capture facts and opinions of artisanal gold miners on issues related to their perceptions on the role of EIA in addressing development induced disaster, that is, (respondents' perceptions, priorities, preferences, opinions, on the problem under study). Adams et al. (2007) noted that open-ended questions allow freedom of expression in conveying views and it also allows for more depth and exploration of the area. Similarly, closed questionnaires are easy in terms of processing answers.

The technique is favored because it enables the standardization of the questions being asked and the answers recorded. This standardization helps reduce errors that may arise from variations in the questions, thus providing greater accuracy and ease when processing the

respondents' answers (Bryman, 2008). According to Walsh (2001), questionnaire method can collect large amounts of data relatively quickly and it can be a cheap and efficient way of collecting data.

However this does not necessarily mean that a questionnaire is a perfect method of data gathering. Neuman (1994) noted a number of disadvantages. In a situation where pre-coded responses are given as choices to the respondents, they may be frustrated because their desired answer is not a choice. Where multiple responses to a question are expected, the open-ended questionnaire is more appropriate. Clerical mistakes are possible on entering the responses or marking a wrong response altogether.

Gray (2014) also argued that, unless we can make completing the questionnaire intrinsically rewarding, the response rate can be depressingly low. Gray (2014) advises that questionnaires should not be too long otherwise the return rate may be adversely affected. During the study, the researcher tried to guard against these shortcomings. A review of each day's work in the evening improved data collection, clarify issues and give guidance on how to proceed the following day.

The questionnaire on its own cannot yield enough data to answer the research questions hence it was complimented by interviews, focus group discussions and structured observations.

3.6.2.3. In-depth Interviews

In-depth interviews formed part of the qualitative method of data collection in this study. An interview is a conversation between the interviewer and the interviewee with a purpose (Robson, 1997). Similarly, Cohen and Manion (1989:307) argued that an interview is a conversation initiated by the interviewer to obtain information relevant to research objectives. It is a verbal interchange, often face to face, though the telephone may be used, in which an interviewer tries to elicit information, beliefs or opinions from another person (Burns, 1997:329) The main aim of in-depth interviews is to obtain detailed information. This technique use predetermined questions and topics, but allow new topics to be pursued as the interview progresses since most aspects of the interviews are informal and conversational, but carefully controlled (Grenier and International Development Research Centre, 1998).

In-depth interviews were held with purposively selected key informants in the community and with officers from relevant institutions in the district. Key informants are experts or

people with experience on the population or construct under study. Six informants were interviewed. Interviews were done in a free atmosphere that was conducive for the interviewees to freely express themselves without fear of being overheard and quoted. Before beginning the interview, the researcher created rapport with the participants in order to create a relationship of mutual trust between the researcher and the participants, an environment that enabled participants to pour out everything they knew on areas they would have been asked (Kallet, 2004). To establish rapport, it is particularly important to make the respondent relaxed (Gray, 2014). Springwood and King (2001) argued that rapport is often associated with themes such as empathy, immersion, participation, friendship, honesty, collaboration, trust and loyalty.

Interviews were recorded using a tape recorder, transcribed and translated. Notes were taken during the interview. The researcher also stressed the issue of confidentiality, highlighting that the research was purely academic and all the responses were kept in strict confidence. The method helped to find out whether artisanal gold miners are aware of the EIA process or not, their perceptions as well as to identify sources where miners can get EIA information. The researcher will use semi-structured interviews which are non-standardised. The semi-structured interviews allow for probing of views and opinions where it is desirable for respondents to expand on their answers. Gray (2014) said that such probing may also allow for the diversion of the interview into new pathways which, while not originally considered as part of the interview may help towards meeting research objectives.

In research interviews are conducted for several advantages that they offer, which include the fact that they are a flexible and adaptable way of data collection. The method provided an opportunity to capture information which was difficult to observe or obtain through the use of other techniques such as questionnaire survey. In-depth interviewing provides the window to explore and analyze not only what a given population thinks about a given course of action but also how to draw upon its knowledge (Derman, 1998). At the same time face-to-face interviews offer the possibility of modifying one's line of inquiry. In semi-structured interviews one can easily follow up and probe interesting items coming up during the interview (Brace, 2008). There is immediate feedback. Non-verbal cues may give messages which help in understanding the verbal response, possibly changing or even, in extreme cases, reversing its meaning (Magwa and Magwa, 2015).

However they also have their own disadvantages for example, they demand time both from the interviewer and the interviewee and sometimes people may not cooperate. The lack of standardization that it implies inevitably raises concerns about reliability. Bias is difficult to rule out (Magwa & Magwa, 2015). Key informants played a critical role of recruiting other research participants. Results from the interviews were used to triangulate and also to authenticate the data from other data collection methods on research objectives.

3.6.2.4. Participant Observations

An observation is a purposeful, systematic and selective way of watching a phenomenon as it takes place (Kumar, 2011). This study employed structured field observations because it is more appropriate for fieldwork that occurs on a short time scale. Information that was not adequately covered during focus group discussions, in-depth interviews and questionnaires was gathered using participant observations. Participant observations were undertaken through the creation of a predetermined checklist of physical characteristics that require analysis.

The checklist captured mining practices; environmental impacts of artisanal gold mining, observed important environmental conservation methods and practices that miners adopted in their mines. The researcher took photographs to reflect the actual prevailing situation in the study area. Chiromo (2006) asserts that observation is the most direct means of ascertaining what people think and do by watching them in action as they express themselves in various situations and activities. It consists of observing behavior and interactions as they occur but seen through the eyes of the researcher. Such information is free from the influence of respondents' behavior, intentions and attitudes (Creswell and Clark, 2011). All observations were recorded in a field diary.

3.7. Fieldwork

The fieldwork process took 10 days from 20 to 30 October 2018. The researcher was aware that entry into the field is a very important stage in research which needs to be strategically managed. The researcher first sought permission from the DA who wrote an approval letter (Appendix 2). The researcher realized that gaining access into the settings of small-scale miners who are harassed by state officials and are suspicious of strangers is not easy. The Headman played a crucial role in this research by introducing the researcher to the small-scale miners. Had it not been his efforts this research was going to remain a pipedream.

Despite the limited timeframe for data collection, the researcher managed to build trust sufficient enough to amass deep, detailed, useful and interesting data. Two Focus Group Discussions (FGDs) were held with small-scale artisanal miners to investigate if they are aware of the EIA process as well as to hear their perceptions on the process. Consequently, conclusions from the FGDs were used to determine content and focus of subsequent in-depth interviews, questionnaires and structured observations.

Interviews were held with officials like DA, EMA, RDC as well as the Headman. Interviews were tape-recorded after being granted permission to do so by the respondents. 50 small-scale artisanal miners filled the questionnaire. The questionnaire was administered by the researcher hence respondents got the opportunity to ask questions where clarity is needed. Structured observations were made through transect walks.

After 10 days the researcher exits the field through the entry points that is through the respondents, Headman and lastly the DA. This was done to make sure that everyone was aware that the fieldwork is over. Hessler (1992) recommended that researchers should not just disappear at the end of their fieldwork. Researchers should inform participants that they are through and now going in case they may want to return and so as to set a good standard for other researchers who may want to come.

3.8. Data Analysis

Data analysis started from organization of the gathered data, transcription of the recordings of both in-depth interviews and FGDs. Thematic content analysis was used to analyse qualitative data. Braun and Clarke, (2006) defined thematic content analysis as a method of identifying, analyzing and reporting patterns in a data set. The information was analyzed through coding which involve systematic examination of the text in order to identify phrases, sentences and passages that represent different conditions, phenomena and opinions as expressed by different participants during fieldwork. Interpretation was done by relating information obtained to different themes in the study (Weiss, 1995). This method of analyzing data is important when investigating an under-researched area (Braun and Clarke, 2006). Thematic content analysis is suitable for this study because there is dearth in literature on awareness and perceptions of artisanal gold miners on the EIA process. Qualitative data was presented in narratives, theme-based issues.

The questionnaire with the data on age, gender, education level, occupation, mining methods, and miners' knowledge on EIA was analyzed through the use of Statistical Package for Social

Sciences (SPSS) version 20 for windows. After data cleaning, the data was analyzed and summarized into various categories, and relationships assessed. Given the overall goals of the survey, descriptive statistics were employed. Descriptive statistics specifically the percentages and frequencies were used to describe each of the variables. Data was presented in charts and frequency tables. Data was presented in various formats for visual appeal (Khotari, 2004)

3.9. Ethical Considerations

In all social research it is vital to consider ethics, which set the standards of any research. Ethics distinguish what is legitimate or acceptable in any society as one mingles with research subjects (APA, 2002). Research ethics are the laws or moral principles guiding research from its inception, through data collection, analysis and publication of results and even beyond (Derman, 1998). Ethics has to do with respect for human rights (Chikoko & Mhloyi, 1995). In conducting research therefore, effort is put to make sure that no individual is adversely affected by the survey.

In the beginning of each interview, sufficient knowledge of the issues under investigation as well as the purpose of the study was explained to participants, thus allowing them to make an informed decision on whether to participate or not. The researcher took into cognizance that gaining informed consent is a fundamental process. No participant was coerced to take part in the research. The researcher sought informed consent from gatekeepers like District Administrator, headmen, village heads and participants. Apart from gatekeepers, the researcher sought consent from individual participants or key informants.

The researcher took into cognizance of the fact that all key informants have the right to privacy and proper treatment so as to prepare the correct research field. Results from the research were used solely for academic purposes and nothing else. On anonymity as was advised by Hammersley and Atkinson (1995), the researcher did not use the actual names in the final write-up.

3.10. Reliability and Validity

Quality of any research work is important for its results to be trusted and even be put into practical use by the consumers. This then brings the issue of how credible and trustworthy were the method used in the research process as they justify why and the extent to which they can yield results to be trustworthy, credible, precise and accurate so as one can really believe (Neuman, 2006; Cohen et al., 2000; Babbie, 2010). It is from this viewpoint that validity and

reliability ought to receive an ideal treatment in both qualitative and quantitative research (Bashir et al., 2008).

Cohen et al., (2007) argue that, reliability is the stability and consistency of the measurement used, which ensures that each time the measurement is used it is capable of yielding same results. Babbie (2010) and Kothari (2004) define validity as a term describing a measure that accurately reflects what exactly is intended to be measured. It deals with whether the researcher is measuring what he/she thinks is measuring (Adler, 1994). To ensure validity and reliability of the findings to be achieved the researcher pre-tested the instruments, subjected the questionnaire to several EIA experts for the aim of getting it reviewed and also used different research methods for triangulation purposes.

3.11. Chapter Summary

This chapter presented a detailed discussion on the methodology employed in this study. It has been argued that in order to fully understand the perceptions of artisanal gold miners on the EIA process; a mixed method approach should be adopted. It is typically a strategy for improving validity and reliability of research or evaluation of findings (Patton, 2001). The data collection methods are focus group discussions, in-depth interviews, questionnaires and structured observations. These were designed, pre-tested and successfully administered. The next chapter presents results of the current study.

CHAPTER FOUR

4.0. RESULTS

4.1. Introduction

This chapter presents results in consistence with research objectives. The objectives were to investigate small-scale artisanal miners' awareness of the EIA process, to understand their perceptions, to identify environmental management strategies employed by small-scale miners to address negative environmental impacts of mining as well as to assess how small-scale artisanal miners access EIA information. Both quantitative and qualitative results will be presented concurrently. The section will begin by presenting the demographic characteristics of respondents.

4.2. Demography of Respondents

Demographics of small-scale artisanal miners covered gender, age, marital status, level of education. Systematic random sampling was used to recruit 50 artisanal gold miners to fill in the questionnaire. The population size of small-scale artisanal miners in the study area was approximately 200. A representative sample of 50 that is a quarter of the population was selected. $N = 200$ $n = 50$ $200/50 = 4$. Therefore, every 4th small-scale artisanal miner was approached and interviewed. The survey was done in two villages namely Mabhande and Amos which are a hub of panning activities in Ward 14 of Mudzi district.

Gender distribution of small-scale artisanal miners' shows that the sector is male dominated ($n = 32$, 64%) males and ($n = 18$, 36%) females (Table 4.1). The Table also shows that the mining sector is largely dominated by people who are energetic. This is largely because of the physical nature of work which demands physical fitness. The majority of the respondents ($n = 20$, 40%) were between 31-40 years, while a few respondents ($n = 14$, 28%) were 41⁺ years.

Table 4.1. Age and Gender Distribution of Small-scale artisanal miners in Mabhande and Amos villages

Age	Gender				Total	
	Male	%	Female	%	Number	%
20-30	8	25	8	44.4	16	32
31-40	13	40.6	7	38.9	20	40
41 ⁺	11	34.4	3	16.7	14	28
Total	32	64	18	36	50	100

Marital status and level of education were also considered (Table 4.2).

Table 4.2: Marital Status and Level of Education of Small-scale Gold Miners

Marital Status	Highest Level of Education				Total
	Illiterate	Primary Education	Secondary Education	Tertiary Education	
Married	7	7	13	6	33
Single	1	1	8	3	13
Divorced	0	1	0	2	3
Widowed	0	0	1	0	1
Total	8	9	22	11	50

More married people ($n = 33$, 66%) than unmarried that is the single, divorced and widowed ($n = 17$, 34%) were involved into mining. This can be explained by the fact that most married people want to take care of their families. They have no other options except gold mining especially considering the aridity of Mudzi district. Results showed that ($n = 8$, 16%) of the miners who participated in the survey were illiterate, ($n = 9$, 18%) attained primary level, ($n = 11$, 44%) attained secondary level while ($n = 11$, 22%) have attained tertiary level.

4.3. Awareness of the EIA Process among Small-scale Artisanal Gold Miners

An EIA is an important process that facilitate development and environmental conservation hence the need for proponents to at least have some knowledge of it. Results from both quantitative and qualitative research confirmed that most small-scale artisanal miners are aware of the EIA. Figure 4.1 shows that ($n = 33$, 66%) of small-scale artisanal miners were aware that they should carry out an EIA before they start their mining activities while ($n = 17$, 34%) were not aware.

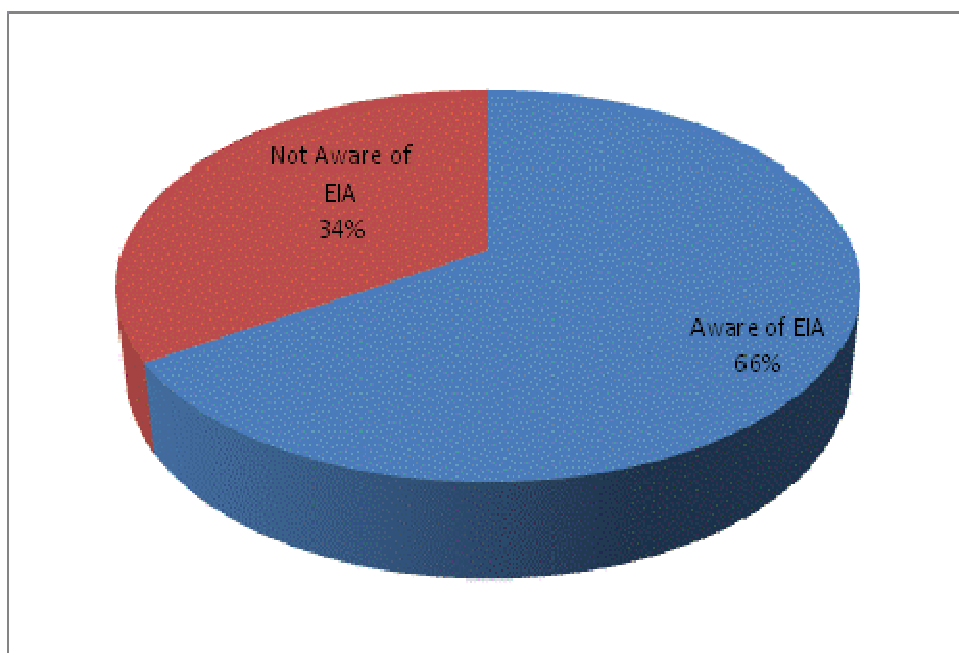


Figure 4.1: Number of Small-scale artisanal miners who were aware of the EIA Process.

Although small-scale artisanal miners were not aware of the various aspects of the process, they knew that they should carry out an EIA before they start their mining activities. One of the officers at EMA Head office reported that,

‘If you go to Mudzi makorokoza angatadza hawo kuziva zita rekuti EIA asi ukataura nezvegwaro rekuchengetedzwa kwenharaunda vese vanoriziva. Gore rapera takaenda kuMudzi tikaputsira vanhu matengi ecyanide kunyanya muMakaha, tikadzidzisana kuti kana tichichera goridhe tinofanira kuita sei kuti tichengetedze nharaunda nezvipfuyo’. (If you go to Mudzi, small-scale miners might fail to understand the word EIA but if you talk of environmental management document, they all know. Last year we went to Mudzi, and we destroyed cyanide tanks especially in Makaha. We carried out awareness campaigns and we taught them about sustainable mining. He also emphasized that whenever EMA officials destroy peoples’ properties they make sure that they educate them on how to do the correct thing) (Interview with EIA Officer, 16 October 2018, EMA Head office).

Small-scale artisanal miners confirmed that they are aware of the EIA.

‘Kana tawana gwaro kubva kuMinistry of Mines, tinozofanirawo kuva nemapepa ekuEMA kuti tichere zviri pamutemo’ (After getting a mining licence from the

Ministry of Mines, we are then supposed to get an EMA certificate so that we mine legally) (FGD with small-scale artisanal miners, 20 October 2018, Mudzi).

The District Administrator, Rural District Council as well as the Headman confirmed that small-scale miners are aware of the EIA process but they will always try to avoid it because of the higher costs of hiring a registered consultant to carry-out the EIA process.

Although small-scale miners were aware of the EIA process most of them were not really sure how the process can be implemented at their mining projects. Respondents reported that

‘EIA zibhuku reEMA, hatizivi kuti rinoshandei asi kana raitwa unenge usisanetswi neEMA uye basa rako rinofambira mberi’ (EIA is a book for EMA, we are not sure about its purpose but once it’s done you will not get any trouble from EMA plus your work will progress) (FGD with small-scale miners, 21 October 2018, Mudzi).

This is an indication that to the small-scale miners EIA process is just a licence to get an EMA certification and not a process to be implemented.

The majority of small-scale miners in Mudzi district are operating without an EIA certificate, which is a violation of the law. There are quite a number of factors that are pushing people to mine illegally without EIA certificate in Mudzi district. EMA district officer mentioned that,

‘The geographical location and the geology of the area are some of the factors that are pushing people into illegal gold mining. The area is rich in minerals like gold, lime, chrome, manganese etc hence it attracts miners to come to the district’ (Interview with EMA District Officer, 19 October 2018, Mudzi).

Makaha area has got the highest number of gold deposits in the district since early 1960s. Due to the abundance of gold in Makaha, the researcher discovered that some people are carrying their mining activities right at the doorsteps of their homes like what is shown in plate 1. This poses a danger to human life and livestock due to open pits and trenches. These pits are also serving as breeding grounds for malaria infested mosquitoes especially during the rainy season.



Plate 1: Small-scale mining carried out at Doorsteps. Source: M. Jomboro, 2018.

People are being forced into illegal gold mining because of poverty. The District Administrator highlighted this,

‘Artisanal gold mining is a source of livelihood for many people in this area. The district is characterized by low rainfall and high temperatures and because of this, crop production is impossible hence people are forced by circumstances to do gold panning to sustain their lives. Although small-scale miners are aware of the EIA, they cannot afford it because they are poor’ (Interview with DA, 18 October 2018, Mudzi).

Another factor which is pushing people into illegal gold mining is unemployment. During one of the focus groups one respondent mentioned this,

‘Tinoziva chose kuti tinofanira kuve nemapepa eEMA kuti tichere zviru pamutemo asi nemaomero akaita zvinhu kuti hakuna mabasa hapana chatinokwanisa kuita asi kuita chikorokoza ichochi’ We are quite aware that we should have an EIA certificate so that we mine legally but considering the limited employment opportunities we have no other option except panning (FGD with small-scale miners, 21 October 2018, Mudzi).

The common methods of mining in the area of study are shaft, adit, open cast and alluvial mining and these have various detrimental impacts on the environment. Small-scale miners reported that residents are not complaining about their mining activities because they are also benefiting in one way or the other. They said the locals collect water from the shafts to use

for various purposes. They collect the rubble or powder from the shafts and they reprocess it at their homes using panning dishes and blankets.

Small-scale artisanal miners were quite aware of the negative impacts of their mining activities but one may ask if these people have a choice or any other means of survival. One respondent reported that the area is so dry to the extent that gold panning is the only source of livelihood. Awareness on some of the environmental impacts of small-scale mining reflects knowledge of the EIA among small-scale miners. Study respondents were asked whether they were aware of environmental impacts of mining and they gave the following responses (Table 4.3).

Table 2.3: Awareness on Environmental Impacts of Artisanal gold mining

Village Name	Responses		Total
	Yes	No	
Amos	29.4	0.6	30
Mabhande	19.6	0.4	20
Total	49 (98%)	1(2%)	50 (100%)

Notes: Contained in this table are number of respondents who gave a response.

Analysed data from the questionnaire indicated that ($n = 49$; 98%) were quite aware of the negative environmental impacts of mining whilst only ($n = 1$; 2%) is not aware. Environmental impacts such as land degradation, deforestation, soil erosion, pollution, siltation of rivers were mentioned during focus group discussions with small-scale miners and during in-depth interviews with various stakeholders.

In Mudzi district artisanal gold mining has caused serious environmental degradation. The majority of small-scale artisanal miners ($n = 47$; 94%) confirmed that deep open pits have been left unattended after mining. Plate 2 shows a degraded area left by artisanal miners after gold mining.



Plate 2: Degraded area left by Small-scale artisanal miners. Source: M. Jomboro, 2018.

Land degradation was ranked the greatest challenge brought about by artisanal mining during the interview discussions. The majority of respondents ($n = 39$; 78%) reported that the open pits are a danger to domestic animals while ($n = 11$; 22%) said they are not. An Environment Officer from Mudzi Rural District Council confirmed that residents from mining communities are complaining that unattended open pits are a danger to their livestock. Cases of livestock falling into these pits are always witnessed on many occasions (Interview with Environment officer from Mudzi RDC, 18 October 2018, Mudzi). The nomadic and migratory nature of small-scale artisanal miners has also caused the depletion of grazing lands as witnessed in plate 3.



Plate 3: Open pits and rubble dumps posing a hazard to domestic animals. Source: M. Jomboro, 2018.

During the rainy season these pits serve as breeding ground for malaria-infected mosquitoes. However, respondents said that these open pits are no longer a threat to wildlife since they have come to extinction due to hunting. One of the respondents in a Focus Group Discussion reported this,

‘Isu kuno mhuka takapedza saka hapasisina mhuka ichawira mumakomba’ ‘we have finished all wildlife so these open pits are no longer a threat to them’ (FGD with artisanal gold miners, 20 October 2018, Mudzi).

Small-scale artisanal mining can also destroy infrastructure. Plate 4 shows mining activities being done right at the back of Makaha Shopping Centre. Small-scale miners are now using gold detectors to detect the mineral and because of this technology gold panning is now being done everywhere even along road sides whenever it is detected. This new technology of using detectors has in another way exacerbated haphazard gold panning in the study area.



Plate 4: Destruction of Infrastructure due to mining. Source: M. Jomboro, 2018.

Closely linked to land degradation is deforestation. Research respondents in all the two focus group discussions agreed that before carrying out their mining activities, they first clear the land.

‘Tisati tatanga kuchera, tinotanga tatema miti tichivhura patinoda kuzochera mashafts edu. Kana mugodhi usisabude mari tinosiya toenda pamwe’. Before we begin our mining operations we first clear the land and after the mining we just

abandon the area and look for another one (FGD with artisanal gold miners, 21 October 2018, Mudzi).

Plate 5 shows a deforested area at one of the mining sites visited by the researcher.



Plate 5: Deforestation due to Artisanal gold mining. Source: M. Jomboro, 2018.

Small-scale artisanal miners also use timber for primary construction as shown in plate 6. This also results in mass deforestation. The shafts are not properly supported and the overhanging walls are prone to collapse and landslides due to undercutting. This poses a danger to the miners.



Plate 6: The use of timber in primary construction of mining shafts. Source: M. Jomboro, 2018.

Some small-scale artisanal gold miners are still using mercury to purify gold. The Headman had this to say,

‘kuchine vamwe vachiri kushandisa mercury kunyangwe EMA yakadzidzisa vanhu maringe nenjodzi iripo pakubata mercury necyanide nemaoko. Kana mvura yonaya mercury iya inokukurwa ichipinda munzizi. Asi vazhinji vanoendesa goridhe ravo kumill kune nzira dzekuchengetedza nharaunda ‘ (There are some few individuals who are still using mercury for gold purification despite all the awareness campaigns by EMA on the dangers of handling mercury with bare hands. However, most of the gold processing is now being done at the mills using cyanide, nitric acid, or hydrochloric acid where measures are in place to avoid pollution) (Interview with Headman, 20 October 2018, Mudzi).

Small-scale mining can also cause water pollution. A Likert scale was used to measure respondents’ perceptions on the quality of water. A Likert scale is a summated rating scale that indicates the intensity of feeling a subject has about a topic (Wallisman, 2016). One of its advantages is that it does not expect a simple yes/no answer from the respondent, but rather allow for degrees of opinions, and even no opinion at all. Respondents were asked to rate the quality of water on a four point Likert scale where 1 = Poor, 2 = Average, 3 = Good, 4 = Very Good and the results were as follows (Table 4.4).

Table 4.4: Respondents Perceptions on Quality of Water

	Item: How do you rate the quality of your water?				
Village	1.Poor	2.Average	3.Good	4.Very Good	Total
Amos	6	5	18	1	30
Mabhande	3	1	14	2	20
Total	9 (18%)	6 (12%)	32 (64%)	3 (6%)	50

n = 50

Analysed data shows that the majority of the respondents (*n* = 32, 64%) rated the quality of water as good. They reported that they got their drinking water from boreholes which they believe are not contaminated by mining activities.

Most of the activities of small-scale miners have resulted in depletion of water tables. *‘Dambudziko guru rave munharaunda ino nderekuoma kwenzizi nekuda kwekuchera goridhe. Ikezvino makorokoza ave kushandisa mapombi kutora mvura munzizi achiendesa kwavanochera kuti vashandise pakuvonga. Saka chero zvipfuwo hazvichisina mvura yekumwa’*. The major challenge in the ward is now the drying out of water bodies due to panning. Small-scale gold panners have come up with a new

strategy of siphoning water from rivers and wells using water pumps and pipes to their mining sites where they create ponds for panning (Interview with the headman, 20 October 2018, Mudzi).

Plate 7 below shows one of the ponds created by an artisanal miner for his panning activities as he explained to the researcher how he processed his gold.



Plate 7: Temporary water pond for gold processing. Source: M. Jomboro, 2018.

Most panners do not use chemicals in the process but they rather use blankets (*machira*), panning dish (*zamba*), sluice box (*chikochokocho*), water pond (*chikombora*) and a makeshift James Table as reported by the miner (Interview with an artisanal miner, 21 October 2018, Mudzi). Dust is yet another environmental challenge of small-scale artisanal mining. Dust from loading and tipping of ore and also from moving trucks carrying ore to mills as shown in plate 8 was noticed during fieldwork.



Plate 8: Tipper loading ore into a truck causing air pollution. *Source: M. Jomboro, 2018.*

4.4. Perceptions on the Environmental Impact Assessment Process

The EIA was received with mixed feelings amongst small-scale artisanal miners. To some, the EIA process is a necessary process that addresses the negative impacts of mining activities while to others it is of no importance at all. Respondents were asked whether an EIA is effective in mitigating environmental impacts of mining and the following are the responses obtained (Table 4.5). Out of the fifty respondents ($n = 24$, 48%) said the EIA is effective in addressing environmental impacts of mining while ($n = 26$, 52%) said it is not effective.

Table 4.5: Effectiveness of EIA Process

Village name	Responses		Total
	Yes	No	
Amos	10	20	30
Mabhande	14	6	20
Total	24 (48%)	26(52%)	50(100%)

Some artisanal miners have negative perceptions on the EIA process. During a focus group discussion held at one of the mining site as shown in plate 9 one of the participants said,

‘Sister kuno takauya kuzotsvaga mari kwete kuzovhara makomba, kana tawana mari zvedu zvaita’. we come here to look for money not to rehabilitate the land, and once we find the money we are done (Focus Group Discussion with small-scale artisanal miners, 21 October 2018, Mudzi).

This reflects a negative attitude of some small-scale miners towards environmental conservation. They carry out their mining activities unsustainably and they are not even worried of the future generation.



Plate 9: Focus Group Discussion with Small-scale miners at a mining site. Source: Kuda, 2018

To others, the EIA process is one way used by EMA to siphon money from small-scale artisanal miners. One of the miners commented that,

‘EMA iri kuita mari nesu nekutibhadharisa mafine. Mari yatinowana mumashafts umu ishomasa zvekuti hatimbokwanisi kuita mapepa eEMA asi kutongochera zvirikunze kwemutemo’. EMA is making money by fining us. The money that we are getting from our mining operations is too little to carry out an EIA so we rather mine illegally (Focus Group Discussion with small-scale miners, 21 October 2018, Mudzi).

Some reported that EIA is an EMA document or a paper from EMA that protect the miner from being fined by EMA or being arrested by police. They reported that once the miner gets the EMA certificate no-one will bother him/her about his/her mining activities.

EIA is a necessary process that should be carried out before any prescribed project is implemented in order to identify probable environmental impacts. Analysed data shows that there are some small-scale miners who acknowledged that EIA is an important process. One respondent during a Focus Group Discussion commented,

‘Kuita mapepa eEMA kwakanaka nekuti tikada kutarisa mugodhi une mapepa neusina zvakatosiyana. Pane mapepa zvinhu zvacho zvinenge zvakarongeka uye maaccidents mashoma’. EIA is important because if we compare a mine with an EIA with the one without an EIA there is difference in the way they carry out their mining operations. Where there is an EIA mining is done in a proper way and there are fewer cases of accidents (Focus Group Discussion with miners, 21 October 2018, Mudzi).

Government has granted an EIA waiver to small-scale miners whose investment is less than \$25 000 and are registered. An official from EMA reported that “In as much as small-scale miners want to comply with EMA regulations, they are faced with the challenge of high costs of hiring the services of a registered consultant to carry out the EIA. The cost of carrying out the EIA process cannot be compared to the little output that the small-miner can get from his/her mining project” (Interview with EMA District Officer, 19 October 2018, Mudzi).

The level of EIA adoption among small-scale miners in Mudzi district is generally poor. Small-scale artisanal miners were asked to rate the level of EIA adoption on Likert scale (A = Very Good, B = Good, C = Average, D = Poor). The following results were obtained (Table 4.6).

Table 4.6: Respondents’ Perceptions on the Level of EIA Adoption

Village	Item: How do you rate the level of EIA Adoption?				Total
	A.Very Good	B.Good	C.Average	D.Poor	
Amos	2	2	2	24	30
Mabhande	1	1	3	15	20
Total	3 (6%)	3 (6%)	5 (10%)	39 (78%)	50

n = 50

The majority of respondents (*n* = 39, 78%) reported that the EIA was poorly adopted. The challenge of high costs of carrying out a full EIA was however addressed by the government through the introduction of a checklist called an EMP (Environmental Management Plan). This is a simplified template to be filled by the small-scale miner without engaging the consultant. Through this effort, EMA is looking forward to see more small-scale miners complying with EMA regulations. Most of the respondents interviewed in the district were not even aware of the recent changes except for EMA and Rural District Council. The

headman reported that in as much as small-scale miners in his area may want to regularize their activities or to adopt the EIA; most of them are not licensed to mine. The area was once reserved hence locals started to mine illegally.

4.5. Environmental Management Strategies to Address Negative Environmental Impacts of Mining

Some small-scale artisanal miners together with the communities and various stakeholders use several methods to address the negative effects of mining. These include reforestation, fencing the mining area, conservation of wetlands, backfilling open pits to mention a few. Analysed data from the survey shows that ($n = 39$, 78%) are not making any effort to rectify the negative impacts of mining while ($n = 11$, 22%) reported that they are employing some strategies to reduce environmental impacts (Table 4.7).

Table4.7: Attempts to Reduce Environmental Impacts of Mining

Village name	Responses		Total
	Yes	No	
Amos	5	25	30
Mabhande	6	14	20
Total	11 (22%)	39 (78%)	50

Use of fence to protect the mining area from stray animals was one of the measures taken by small-scale miners. Observations made by the researcher at some of the mining sites shows that some small-scale miners have a positive attitude towards the environment and are putting the EIA into good use. Efforts to protect the mining area from stray animals by way of fencing (plate 10) shows some concern to reduce the risk of domestic animals falling into the pits.



Plate 10: Fence to protect the mining area from domestic animals. *Source: M. Jomboro, 2018.*

After mining, it is recommended that the proponent should rehabilitate the land by backfilling shafts and planting trees. The researcher discovered that at some mining sites small-scale artisanal miners are making an effort to reclaim the land such as shown in plate 11.



Plate 11: Land reforestation by Small-scale miners. *Source: M. Jomboro, 2018.*

After mining the precious mineral some small-scale miners filled back the pits and reafforestate the land. Such efforts show knowledge of the EIA and a concern for the environment. There is also a marked reduction in the use of cyanide and mercury by small-scale artisanal miners in Makaha area. Following awareness campaigns by EMA, people are beginning to appreciate the importance of keeping the environment safe and using mining methods that are environment friendly. Many small-scale miners who choose not to take their

ore to the mills are now using blankets without any chemicals to purify the gold (Interview with Headman, 20 October 2018, Mudzi).

Local communities also conserve the environment through protecting wetlands. An official from EMA also reported that in other wards like ward 10 communities are making an effort to conserve wetlands by leaving them uncultivated and untouched. In line with all these efforts by small-scale miners, various stakeholders like EMA, Local Authority, Rural District Council, Forestry Commission and local NGOs are making every effort to restore Mudzi district to its former state.

The Environment Officer at Mudzi RDC reported that they have Local Environmental Action Plans (LEAP). The goals of LEAP are based on environmental protection in the local community alongside the risks of its transfer to human health, ecosystem and overall quality of life. Under this process the Environment Officer reported that the Rural District Council will try to identify degraded areas, syndicates involved and they try to engage them to rehabilitate the area. They carry-out awareness campaigns and educate artisanal miners on the benefits of formalising mining activities. On the effectiveness of their strategies the Environment Officer reported,

‘Although our efforts are not yet effective because of less effort by miners, we are expecting to reap the fruits of our strategies later’. (Interview with RDC Environment Officer, 18 October 2018, Mudzi).

EMA is also carrying out a lot of activities to combat land degradation due to mining. The District Environment Officer at EMA reported that they carry regular environmental inspections and they do environmental audits. They enforce the Environmental Management Act and other relevant statutory instruments. They also carry out education and awareness campaigns.

However, the official said that their efforts are not all that effective due to a number of reasons. Firstly, inspections are done during the day yet most illegal mining activities are done during the night. Secondly, during election times laws and regulations are relaxed and this compromises their efforts as EMA. Last but not least, both financial and human resources are inadequate. They are only two EMA district officers to monitor 16 wards. They are keeping an inventory of mining activities in the district which must be updated timely but because of shortage of resources it is no longer up to date.

NGOs are also working with the communities to reduce land degradation through establishing nutrition gardens. World Vision had established nutrition gardens in ward 14 such as what is shown in plate 12. This also helps to protect the area from any mining activity and the area will remain untouched. However the major challenge for these projects to thrive is lack of water for irrigation.



Plate 12: Nutrition garden funded by World Vision. Source: M. Jomboro, 2018.

4.6. Artisanal gold miners’ Access to EIA information

Small-scale artisanal miners in Mudzi district have access to various modes of communication like televisions, radios, mobile phones, word of mouth etc. Analysed data shows that (n = 34; 68%) have access to mobile phone, TV/Radio; (n = 7; 14%) have access to internet, mobile phones, TV/Radio; (n = 4; 8%) have access to TV/Radio; (n = 2; 4%) have access to TV/Radio; (n = 1; 2%) have access to mobile phones only while the other (n = 1; 2%) have access to internet and mobile phones. Table 4.8 is a presentation of communication channels which are open to small-scale miners.

Table 4.8: Communication Channels used by Small-scale miners

Communication channel	Frequency	Percent
Internet and mobile network	2	4%
Internet, mobile network and TV/Radio	7	14%
Internet, TV/Radio	1	2%
Mobile network	2	4%
Mobile network and TV/Radio	34	68%
TV/Radio	4	8%
Total	50	100

The general impression is that mobile phones are the commonest mode of communication amongst small-scale miners. Although most people have mobile phones, environmental education is rarely passed through this channel. Most people who were interviewed reported that they got their knowledge of EIA through word of mouth from RDC, Forestry Commission, and EMA officials during awareness campaigns and from traditional leaders. Also environment ward sub-committees created by EMA and environment monitors are helping in disseminating environmental education. An official from EMA Head office confirmed that last year they have done a mine to mine visit carrying environmental awareness campaign in Mudzi district.

During a focus group discussion respondents agreed that they have no time to listen to radio or to watch TV due to the nature of their work. One participant said,

'Isu nguva zhinji tinenge tiri mumakomba saka kuti tizowana nguva yekuringa TV kana kuteerera radio kashoma' (we spent most of our time in the shafts therefore we don't have time to listen to radio or TV) (FGD with small-scale miners, 21 October 2018, Mudzi).

EMA has a column in the Herald and Standard where they write on environmental issues. However due to the remoteness of the area, small-scale miners in Mudzi do not have access to the newspapers. One of the participant during a focus group discussion said, newspapers are for those people who are in Harare and not for those who live in the remote parts of the country.

The major challenge encountered by small-scale miners when it comes to access to environmental education is the issue of time. Small-scale artisanal miners spend most of their time in the shafts looking for the precious mineral. They do not have time to listen to radio or to watch TV or to attend to meeting by EMA. An official from EMA said that some of these small-scale artisanal miners are criminals, murderers hence they are not forthcoming when they call for meetings because they fear that they can be arrested.

The other challenge is that of transport cost. Small-scale artisanal miners interviewed said that sometimes they need to travel to the district or provincial offices to get information and that is too costly. Some communication channels used by EMA like twitter, emails, website, facebook are rarely used by small-scale miners in rural areas. EMA is also encouraging pastors to spread environmental education through churches.

4.7. Chapter Summary

This chapter was a presentation of research results. This was done in line with research objectives. Results confirmed that small-scale artisanal miners are aware that they should carry an EIA before they start their mining activities. However, in as long as they may want to adopt the EIA, they are faced with the challenge of high costs of hiring a registered consultant. The Government has however lessened their burden by exempting them from doing a full EIA but to do an EMP. The next chapter discusses research findings.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

The previous chapter presented results of the current study. The current chapter presents a discussion of the key findings in relation to related literature. This will be done in line with the research objectives laid down in chapter one. Further, the chapter presents conclusion and recommendations to address the research problem. The thesis in this research is that EIA is an important process that should be carried out prior to any development project. This chapter will bring out recommendations on how the EIA process can be utilized by small-scale artisanal gold miners to address environmental impacts of mining.

5.2. Awareness of the EIA Process among small-scale artisanal miners

Mining is a prescribed project listed in the first schedule of the Environmental Management Act Chapter 20:27 of 2002. All prescribed projects have the potential to cause environmental degradation, hence should undergo the EIA process before implementation. This is in accordance with Section 97 of the Environmental Management Act. A proponent should be aware of the EIA process because of the multiple purposes that it serves in the project cycle. EIA provides a systematic examination of the environmental implications of a proposed action, and sometimes alternatives, before a decision is taken (Gilpin, 1995; Glasson et al., 2005); it result in the selection of the best alternative that delivers on both fronts i.e environmental protection and better production efficiencies (Machaka and Bere, 2014) and it also aims to achieve sustainable development (Hanna, 2009; Noble, 2010).

It is argued that the causes of the various negative environmental impacts of small-scale gold mining is lack of knowledge, education and training of miners (Henstchel et al., 2002). Machaka et al., (2016) argued that one of the factors that are affecting compliance is lack of awareness of the EIA requirements. However results show that the majority of small-scale miners ($n = 33$, 66%) were aware of the EIA process while ($n = 17$, 34%) were not aware (Figure 4.1). About 78% of the respondents (Table 4.6) reported that EIA was poorly adopted in the district. In this case the low level of EIA adoption was not because of lack of knowledge of the EIA as was highlighted by Machaka (2016) but was due to high costs of carrying out a full EIA as was reported by EMA district officer (Interview with EMA District officer, 19 October, 2018, Mudzi).

Furthermore, small-scale miners were aware of some of the environmental impacts of small-scale artisanal mining which reflects some knowledge of the EIA. Environmental impacts of mining such as land degradation, deforestation, pollution, soil erosion were discussed during FGDs and in-depth interviews. Similarly, in a study by Ncube-Phiri et al., (2015) results on the extent of ecological problems from respondents indicated a high level of awareness of negative environmental impacts of gold mining. Aryee et al., (2003) and Zwane et al., (2006) reported that gold when exhausted in working pits, they are then abandoned without even reclaimed and new pits are sunk, leading to the destruction of the ecological environment. The abandoned unprotected pits expose both domestic and wild animals at risk of falling into the pits (Mapuva & Dube, 2016). Once filled with water, the pits serve as breeding grounds for malaria-infected mosquitoes (Hilson, 2002). These findings seem to gel with what was observed in Mudzi district. Deep open pits have been abandoned and are a danger to domestic animals and people. The nomadic and migratory nature of small-scale artisanal miners has also caused the depletion of grazing land.

As a result of intense prospecting and excavation activity, lands which are virtually devoid of vegetation cover are quite commonly found in many small-scale mining zones in Zimbabwe (Hilson, 2001). Research respondents confirmed that they first clear the land before establishing their shafts and after mining they do not rehabilitate the land. These results seems to dovetail with the findings by Maponga and Ngorima (1995) who estimated that 100 000 hectares of land are cleared each year in small-scale mining regions. In Manicaland province, estimates are that 600 hectares of prime timber owned by Allied Timber in Chimanimani has been extensively damaged by illegal mining activities (Parliament of Zimbabwe, 2017).

Elsewhere artisanal gold miners have damaged public infrastructure. Media reports suggested that deep tunnels are being dug in Kwekwe town area (Parliament of Zimbabwe, 2017). Likewise in Mudzi district gold mining is being done at the back of some shops at Makaha shopping centre (plate 4) damaging infrastructure. Another environmental problem in African small-scale mining regions is the release of mercury (Hilson, 2002). Mercury which is used for amalgamation in artisanal gold mining is typically dispensed untreated into the atmosphere and waterways where it is transformed by microbes into toxic methylmercury (MeHg) (UNEP, 2002). This echoed some of the sentiments by the headman that there are some few individuals who are still using mercury polluting water bodies during the rainy season despite awareness campaigns by EMA. Shoko et al., (1993), found that 64% of

Zimbabwe gold miners exhibit “poor chemical management”. Small-scale miners cannot optimize the use of expensive chemical cleansing agents because of financial constraints.

Small-scale artisanal mining largely contributes to water pollution yet it is rarely talked about (Chiwawa, 1998). This seems to dovetail with results of this study that the majority of respondents ($n = 32$, 64%) rated the quality of water as good (Table 4.4).

5.3. Perceptions of Small-scale miners on the EIA Process

The EIA was received with different perceptions by small-scale artisanal miners. Machaka et al., (2016) argued that some small-scale miners generally give low priority to environmental issues. They have little appreciation of the environment (Veiga and Hinton, 2002). This line of thought is synonymous with that of one of the respondents who reported that he came into the district to search for money and not to rehabilitate the land (FGD with small-scale miners, 21 October 2018, Mudzi).

Some small-scale miners are failing to comply with Environmental Management Plans mainly because of lack of understanding of the full contents of the so called “voluminous” EIA documents (The Standard, 21 October 2018). This is consistent with one of the comments by the respondents who said, “*EIA zibhuku reEMA.....*” They were not even aware of its contents making it impossible for them to implement the EMP. In order to improve compliance EMA has developed a generic and simplified EMP in line with the provisions of the Act. The guidelines will reduce the cost of the EIA process by removing the need for environmental consultant, who requires a separate fee (The Standard, 21 October, 2018).

On the other hand some small-scale artisanal miners argued that the EIA is an important and necessary process. Respondents commented that at a mine with an EIA certificate, mining is done properly and in an orderly fashion than the haphazard mining done at some mines without an EIA certificate. This seems to gel with some of the comments by Awatey (2014), that awareness is a necessary predisposing factor for behavioural change. Not only might that knowledge dramatically improve attitudes, misconceptions and consequently enhance small-scale practices but also plays an important role to ensure environmental compliance.

However, the level of EIA adoption is very low due to financial constraints. Respondents reported that they cannot carry-out a full EIA because they are getting less profit from the mining operations. This mirrors what was reported in the Standard of 21 October 2018 that

one of the reasons why small-scale miners are failing to comply with the EMA regulations is lack of financial resources to undertake the EIA process.

5.4. Current Practices to Address Impacts of Small-scale mining

A number of institutions at local level are carrying out various activities to combat land degradation. Environmental Management Agency is enforcing the Environmental Management Act and other relevant statutory instruments. Results indicated that the major drawback is lack of resources. These results are consistent with what was discovered by many scholars that most of these institutions are ill-equipped with lack of both human and financial resources. This problem is widespread (Maponga & Ngorima, 2003; Shoko & Love, 2005; Zwane et al., 2006).

NGOs like World Vision have established nutrition gardens to protect the area from mining. This is consistent with Crispin (2003) argument that the only way to eradicate small-scale mining is to create other livelihood generating activities. Mudzi RDC had Local Environmental Action Plans. The RDC officer reported that the RDC identifies degraded areas, syndicates involved and they try to engage them to rehabilitate the area. This seems to dovetail with Hinton et al., (2003)'s ideas that the involvement of the local community including the person active in panning could improve environmental protection.

According to Tunhuma et al., (2007), capacity building should not only focus on authorities and agencies of environmental protection but rather on local community. Cunningham et al., (2005) stated that such a widespread capacity building can initiate the principle of subsidiarity which is important in environmental protection. Establishing management and monitoring structure at village level promote local participation and a strong sense of ownership by the local communities (Shoko & Love, 2005).

There is a marked reduction in the use of cyanide and mercury by small-scale miners in Makaha area. Cleaner production techniques have been reported world-wide (Babut et al., 2003; Ghose, 2003; Hinton et al., 2003), which can be used in the purification of gold to reduce its impacts on the workers and the environment. In Mudzi district most of gold processing is being done at the mills where measures are in place to avoid pollution.

5.5. Small-scale artisanal gold miners' Access to EIA information

Various communication channels are used to disseminate environmental information to different user groups. Examples of such channels include mass media (electronic and print);

government departments like Forestry Commission, NGOs, EMA, special events/days for example World Environmental Day (Boafo, 1993). Results indicated that the majority of small-scale miners use mobile phones for communication. Although most people use mobile phones, environmental education is rarely passed through this channel. Respondents reported that they got EIA information through word of mouth from RDC, Forestry Commission, EMA officials during awareness campaigns. Also environment ward subcommittees created by EMA and environment monitors are helping in disseminating environmental education.

The majority of respondents 68% (Table 4.8) have access to mobile network and TV/Radio. However the major obstacle like what Boafo said is that most rural people and worse small-scale miners are too busy to have time to read or listen to environmental programs on TV/Radio or other channels. Small-scale miners reported that they spent most of their time in shafts hence have no time to listen to radio or watch TV.

The media is one of the key providers of environmental education in Zimbabwe. One of the EMA officials expressed that they have a column in the Herald and Standard newspapers where they write on environmental issues. As an agent of socialization, the media has the potential to influence people's views, attitudes, opinions and behavior (Giddens, 1997). However due to the remoteness of the study area, small-scale miners in Mudzi do not have access to newspapers.

The mainstream faith also value environmental stewardship. EMA official reported that they encourage pastors to preach environmental protection in churches. In Zimbabwe, the church of Nazarene preaches against destroying nature as they see it as an equivalent to undressing God. Stewardship is firmly embedded also in Islam, as Allah (God) created human kind and other creatures of the Earth for a purpose. God put the human being as God's 'vice-regent' of the planet, meaning that human beings are caretakers of the environment not the plunderers (Verschuuren et al., 2010).

5.6. Conclusions

Based on the research results, it can be concluded that small-scale artisanal miners are aware of the EIA process although most of them are operating illegally. Small-scale artisanal mining is a source of livelihood for most poor people in Mudzi district hence a call to formalise the sector. It provides employment to many people and it also contributes to the country's economy. It can be noted from the study that various stakeholders as well as the community are making every effort to adopt several strategies to cope with the adverse

effects of mining activities but these efforts are fruitless if the sector is not regularised. Once the sector is formalised, then through the use of the EMP adverse environmental impacts of mining can be monitored.

5.7. Recommendations

Based on the analysed data of the current research, the researcher proposed for the formalization of the sector. To ensure the effectiveness of the EIA in Zimbabwe among small-scale artisanal miners, there is need to fast track processes of acquisition of mineral rights. Government must regulate and empower small-scale artisanal miners. Since artisanal mining has proved to be a source of livelihood for many poor people there is need to sanitise it and refine it to meet the needs of rural communities and the nation at large.

Small-scale artisanal miners should be encouraged to form mining syndicates with clear leadership structures. Leaders in gold panning syndicates can work with relevant stakeholders like RDC, EMA, Forestry Commission and local Authority to rehabilitate degrade areas after mining. There must be competition based rehabilitation that is; incentives should be given to those who rehabilitate the land. Also leaders can solicit for training on environmental conservation strategies. They can collect levies to be used for rehabilitation. They can also ask for technical assistance like the use of environmental friendly machines or the use of chemicals like mercury.

The government should provide loans to small-scale miners in order to expand their operational activities. Government should also provide financial support to relevant stakeholders like Forestry Commission and Councils so that they can rehabilitate degraded areas.

Government officials should carry out awareness campaigns on environmental conservation and legal issues around mining. Also the whatsapp platform can be utilised to disseminate environmental education by creating whatsapp groups. EMA together with Ministry of Mines should educate gold panners on how to register and legalise their mining operations.

5.8. Implications for Further Research

Further research should assess the adoption and effectiveness of the Environmental Management Plan among small-scale miners. It should look at the rate of compliance now that under this new process small-scale miners are no longer required to carry out a full EIA. The present study used both qualitative and quantitative approaches but lacks scientific

precision and rigor through laboratory tests to allow for causal links and correlations between variables. Further research should therefore allow for scientific testing.

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Appendices

Appendix 1: In-depth and Focus Group Discussion Guide

Introduction

Good morning /afternoon. My name is Moreblessing Jomboro. I am a masters student at the University of Zimbabwe. I am conducting a research on awareness and perceptions of artisanal gold miners on the EIA process in Zimbabwe and I have asked you along so that I can benefit from your views and experiences as miners. You are not required to provide your name and all the information that you are going to provide is entirely private and confidential. You are also encouraged to answer all the questions. They are not all that threatening or difficult.

A. Mining Activities and Impacts on the Environment

1. What factors are pushing people into mining?
2. What method(s) of mining is/are being used by artisanal miners?
3. What are the effects of artisanal mining activities on the environment?
4. What measures are being taken by artisanal miners to rectify the problem?
5. What are some of the mitigation measures EMA. Ministry of Mines, Forestry Commission is implementing to reduce adverse effects on the environment?
6. Are the efforts effective?
7. Are residents complaining about the mining activities in the area and what is the nature of complaints over the past years?
8. Are you keeping a database of the impacts and also monitoring environmental changes due to mining?

B. Knowledge of EIA Process

9. Are artisanal miners aware that they should carry an EIA before starting their mining activities?
10. Are artisanal miners complying with EMA regulations?
11. What kind of relationships are there between small-scale miners and law enforcement agents like EMA and police?
12. What challenges are being faced by artisanal miners in trying to adopt the EIA?
13. What can be done to address these challenges?
14. Are artisanal miners aware of the latest development that they are no longer required to carry out a full EIA but now an EMP?
15. If they know what are their comments about this move?
16. How did they come to know of the changes (changes from full EIA to EMP).

C. Sources of Environmental Education

17. How do artisanal miners get EIA information?
18. How can their knowledge of EIA be broadened?

19. What are the challenges being faced by artisanal miners in trying to access environmental education?
20. Do you have functional environmental ward committees and how often do they meet to discuss environmental issues?
21. Do you have any other information that you may want to share?

Thank you for your cooperation.

Appendix 2: Questionnaire Schedule for Small-scale miners

Introduction

Good morning /afternoon. My name is Moreblessing Jomboro. I am a masters student at the University of Zimbabwe. I am conducting a research on awareness and perceptions of artisanal gold miners on the EIA process in Zimbabwe and I have asked you along so that I can benefit from your views and experiences as miners. You are not required to fill in your name in this questionnaire and all the information that you are going to provide is entirely private and confidential. You are also encouraged to answer all the questions. They are not all that threatening or difficult.

A. Personal Information

1. Residence
A) Village..... B) Ward.....
2. Sex..... Male [] Female []
3. Age.....Years
4. Occupation.....
5. Marital Status:
A. Married []
B. Single []
C. Divorced []
D. Widowed []
6. Highest Level of Education:
A. Illiterate []
B. Primary education []
C. Secondary []
D. Tertiary (Polytechnic, University) []
E. Others (specify).....
7. For how long have you been staying in this area?
A. under 1 year []
B. 1-5years []
C.6-10 years []
D. Over 10 years []

B. Mining Activities and Impacts on the Environment.

8. Do you have any idea about mining activities in this area? A. Yes [] B. No []
9. If yes what method(s) of mining is/are being used by artisanal miners (Tick all that apply). A. Adit [] B. Shaft [] C. Alluvial [] D. Eluvial []
10. What factors are pushing people into mining?.....
11. What are you benefiting from the mining activities?.....
12. Do you think that artisanal mining activities have some effects on the natural environment? A. Yes [] B. No []

13. If yes, what are some of the effects (Tick all that apply) A. Land degradation and vegetation [] B. Water pollution [] C. Air pollution [] D. Noise pollution [] E. Other (Specify)

14. Land degradation

i. Are there any open deep pits left by artisanal miners in this area? A. Yes [] B. No []

ii. If yes, do these abandoned pits have any effect to wildlife, domestic animals or people in general?.....

15. Air Pollution

i. How would you describe the quality of air in your area? A. Very good [] B. Good [] C. Average [] D. Poor []

ii. What are the air quality problems in your area? A. Dust [] B. Odour [] C. Noise []

16. Water Pollution

i. Where do you source your water from? A. Borehole [] B. Tap water [] C. Dams [] D. Other (specify)

ii. Did mining activities affected water quality in this area?.....

iii. How do you rate the quality of your water? A. Very good [] B. Good [] C. Average [] D. Poor []

iv. Do you think mining activities of artisanal miners have some effects on wildlife? A. Yes [] B. No []

If yes what are some of the effects?.....

17. a. What chemicals do you use to purify gold? A. Mercury [] B. Cyanide [] C. Other (specify)

b. Are you aware of some of the environmental and health impacts of these chemicals? A. Yes [] B. No []

c. if yes, what are some of the effects that you are aware of?.....

18. a. Are residents complaining about the mining activities in the area? A. Yes [] B. No []

b. If yes, what is the nature of complaints over the past years?.....

19. Are artisanal miners making any attempt to reduce or rectify the environmental impacts of mining activities? A. Yes [] B. No []

20. What measures are being taken by artisanal miners to rectify the problems? A. Re-forestation [] B. Gully reclamation [] C. Use of retorts D. Other (specify)

21. Are the efforts effective? A. Yes [] B. No []

C. Knowledge of EIA Process.

22. When carrying out your mining activities what exactly do you do to conserve and preserve the environment?.....

23. Are there any documents or papers required from EMA before you start your mining project? A. Yes [] B. No []
24. If yes what kind of papers are required?.....
25. Can you explain the process of acquiring the documents?.....
26. How can your knowledge of EIA be broadened?.....
27. What are your perceptions about the EIA process in Zimbabwe?.....
28. Why is it important to carry out an EIA?.....
29. In your own opinion, do you think EIA is effective in mitigating environmental impacts of mining? A. Yes [] B. No []
- If yes, why do you think so?.....
30. In your own view, what can be done to improve the effectiveness of EIA?.....
31. What other issues do you think the EIA process should cover?.....
32. How do you rate the level of adoption of the EIA by small-scale miners? A. Very good [] B. Good [] C. Average [] D. Poor
33. What challenges are being faced by small-scale miners in trying to adopt the EIA?.....
34. Are you aware of the latest development that you are no longer required to carry-out a full EIA but now an EMP? A. Yes [] B. No []
35. If yes, what can you comment about this move?.....
36. How did you come to know of all these changes?.....

D. Source of Environmental Education

- 37. How do you rate your relationship with law enforcement agents like EMA? A. Very Good [] B. Good [] C. Average [] D. Poor []
- 38. Do you have access to any of the following modes of communication in this area (Tick all applicable) A. Internet [] B. Mobile Network [] C. Newspaper [] D. TV/Radio []
- 39. How have you attained your knowledge about the EIA? (Tick all that apply) A. TV [] B. Radio [] C. Newspaper [] D. EMA [] E. NGO [] F. Other (specify)
- 40. What challenges are you facing in trying to access Environmental Education?.....
- 41. Do you have functional environmental committees in your village/ward? A. Yes [] B. No []
- 42. If yes, how often do they hold meetings? A. Monthly [] B. Quarterly [] C. Annually [] D. Dont Know []
- 43. Do you have any other information that you may want to share?

END. Thank you.

Appendix 3: Introductory Letter



Appendix 4: Approval Letter

REFERENCE:

All correspondences should be directed to the District Administrator

Telephone: 065 - 2230/2818/2687
P. O. Box 100
MUDZI
damudzikotwa@gmail



ZIMBABWE

MINISTRY OF LOCAL GOVERNMENT, PUBLIC
WORKS AND NATIONAL HOUSING
The District Administrator
Office 215 Second Floor
MUDZI GOVERNMENT COMPLEX
Kotwa Growth Point
MUDZI

18 October 2018

TO WHOM IT MAY CONCERN

Permission has been granted to Ms Moreblessing Jomboro (ID No. 29-216833 B 29) who is a University of Zimbabwe Master in Social Ecology student in the Centre for Applied Social Sciences (CASS), to carry out a research on Awareness and Perceptions on EIA process in Zimbabwe.

Please kindly assist her with the information she requires. The information will be for academic purposes only.

For DISTRICT ADMINISTRATOR: MUDZI

DISTRICT ADMINISTRATOR
MUDZI

18 OCT 2018

P. O. BOX 100, MUDZI
ZIMBABWE TEL: 2230