

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

An assessment on the environmental impact of small-scale artisanal miners in rural Zimbabwe. A case of Rosa communal area, Chiweshe.



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***A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS OF THE BACHELOR OF (BSc Safety Health and Environmental
Management)
(4.2)***

Date: 06/2025

Abstract

The study investigated the environmental consequences of small-scale artisanal mining in the Rosa area of Chiweshe Communal Lands, Zimbabwe, through the dual lenses of the Environmental Kuznets Curve (EKC) and Human-Environment Interaction (HEI) theories. The findings reveal significant ecological degradation; deforestation, water contamination, air pollution, and soil erosion. These are largely driven by unregulated mining practices and weak enforcement of the Mines and Minerals Act. From the EKC perspective, Rosa remains in the early phase of development, where economic gain is prioritized over environmental sustainability. The HEI framework underscores the reciprocal impact between human activity and environmental health, as mining diminishes biodiversity, agricultural productivity and community well-being. While mitigation strategies such as land rehabilitation, environmental education and alternative livelihoods are emerging, they remain sporadic and under-resourced. Opportunities for sustainable transition through eco-tourism, agro-development and NGO collaboration are present but require stronger policy enforcement and active community engagement.

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Date: **06/ 2025**

Dedication

I would like to dedicate this dissertation to my family, who have always encouraged me to pursue my dreams and have been a constant source of love and support. I would also want to dedicate this project to me, who took the time and effort to produce this work, and to all those who have supported me along the way.

Acknowledgement

Firstly, I want to thank the Lord Almighty for the courage and strength, He provided me in order to complete this research project. Secondly, I want to thank my supervisor, Mr. Dzvene for going an extra mile in supporting me with ideas and being available every time that I needed assistance in regards to this project. In addition, I want to thank my family for inspiring confidence in my ability to succeed. I want to express my gratitude which extends to, the Department of Environmental Science at Bindura University of Science Education. To all my lecturers, I thank you. Last but not least, I would like to express my gratitude to the practitioners, lecturers, and students who supported me when I was conducting this research. God bless you.

List of abbreviations and acronyms

DRC: Democratic Republic of Congo

MDG: Millennium Development Goals

NDS: National Development Strategy

EKC: Environmental Kuznets Curve

ASM: Artisanal Small-scale Mining

HEI: Human Environment Interaction

ASGM: Artisanal Small-scale Gold Mining

EMA: Environmental Management Agency

WNRM: Ward Natural Resource Monitors

NGOs: Non-Governmental Organisations

GPS: Geo-Positioning System

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CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 INTRODUCTION

In this chapter of the study, the researcher will provide a background to the study, objectives of the enquiry and hypothesis. The chapter will further provide a justification to the study and description of the area under study before looking at limitations of the study and giving a summary of the chapter.

1.1 BACKGROUND TO THE STUDY

Artisanal mining has become one of the core economic activities in both developed and developing countries. A number of scholars have written effusively on this economic exertion with serious variations in opinion on both its merits and demerits to the societies it is under taken in. A sundry of scholars who have written on the issue have raised a lot of nihilism over its impact on the environment.

Studies that have been undertaken in in other countries and continents have painted a negative picture of this mineral extraction method on the environment in South America. According to Naeem (2013) experiences in South America especially Brazil of artisanal have shown that artisanal mining has had a lot of a negative effects on the environment. According to the scholar this form of mining is a noteworthy pecuniary bustle in the rural communities of the country where the majority of the populations eke a living from searching for minerals like gold and tin at small scale level. Tuomisto (2017) says in artisanal mining in the country has been blamed for a number of sins against Mother Nature which include among others deforestation of the Amazon Forest where artisanal mining is confined to, pollution rivers using mercury and other toxins used in mineral processing as well as soil contamination which makes agricultural activities near cul-de-sac in the areas of mining.

While artisanal mining has and is found in both Brazil (Latin America) and Rosa Area in Zimbabwe (the area under study in this enquiry) and has been accused of the same transgressions against the environment, the regulatory experiences of this mining system in Brazil is more intricate as the country many regulatory frameworks that seek to contain it unlike in Zimbabwe where only the Ministry of Mines and Mineral Resources and the Environmental Management

(EMA) through the *Environmental Management Act (2002)* seek to control the activity. This multi-layered regulatory system in Brazil has seen artisanal mining confined to the Amazon Region while in Zimbabwe the system is way too extensive raising a possibility of extensive damage to the environment (Tuomisto, 2017). It is therefore the focus to this study to establish the impact of extensive artisanal mining in Zimbabwe on the environment focusing on the Rosa Mining Area in Chiweshe Communal Lands.

In North America, the issue of artisanal mining is also a common challenge. Bryceson (2010) In the United States of America, artisanal mining is common especially for gold mining and has been blamed for malevolent desecration of the environment which has resulted in total shift of the biodiversity. According to the scholar in the United States this form of mining is rampant in states like California, Alaska and Colorado where the environment and vegetation have been destroyed by fortune seekers who hunt for the precious stones. Bryceson (2010) further says in other parts of North America this mining system is also common in Canada in but areas like British Colombia, Ontario and Quebec.

However, while artisanal mining in Zimbabwe has been principally done using traditional mining methods like panning and handmade tools which have been blamed for environmental degradation the European experience is much more modernized where the miner uses more sophisticated mining approaches that have less negative impact on the environment. This study therefore seeks to traditional mining methods employed by the Zimbabwean artisanal miners have more deleterious impact on the environment than those employed in North America as argued by Bryceson (2010).

Schowalter (2022) the artisanal mining contagion which has become prevalent in the Americas and Africa has not left Europe untouched. According to the scholar the mining *modus operandi* the system of mineral extraction is also common in Spain and Portugal. In Spain is approach is common for the extraction of gold and silver while in Portugal the system is used for mining gold, tin and tungsten in the north of the country. While in European countries like Spain and Portugal have been raised as matters of concern as in Zimbabwe, the thrust of the matters raised differs grossly as in Europe matters to do with the environment are more to do with acid mine drainage and pollution while in Zimbabwe such matters raised concern total annihilation of the environment through deforestation, and soil degradation. This study seeks to evaluate whether or not the systems of artisanal mining in Zimbabwe at the Rosa Mining Area in Chiweshe are in any way

more lethal to the environment that it is in Europe and if so, explain why. The study will evaluate Schowalter (2022)'s perceptions of artisanal mining in Europe and contrast the to the Rosa experiences in Zimbabwe.

Asia as a continent has not been left in the 21st century hunt for fortune. According to Lahiri-Dutt (2015) say India as one of the largest economies of the Asian continent also has issues of artisanal mining rampant in it. According to the scholar gold is the most sought-after mineral in the country with artisanal mining being dominant in the states of Karnataka, Andhra Pradesh and Tamil Nadu. The scholar however says other than gold other minerals such as zinc, copper and iron are also mined. The World Bank Report on mining says as with anywhere in the world artisanal mining has not been without blemish on matters environment but however the system in India according to According to Lahiri-Dutt (2015) uses more sophisticated machinery which limits the levels of environmental degradation when compared to the panning and migratory nature of artisanal miner in Zimbabwe. In this enquiry the researcher will try to evaluate the nature of environmental impacts of artisanal mining in Rosa area in Chiweshe and this evaluation will not be done in isolation but in the context of other societies like the Indian experience to bring out its picture in relation to world dynamics.

In North Africa, Morocco is one country that has been grossly affected by artisanal mining. Barney (2014) says that artisanal mining Morocco is primarily concentrated in the Atlas Region which is rich in copper and silver and The Oriental Region that is rich in gold. According to the scholar artisanal mining in Morocco unlike in many Africa countries has been eulogized for creating employment in an impoverished African country. However, Barney (2014) holds that beyond the like in the rest of the world this approach in mining has also been in Morocco condemned by environmentalists and scholars for disrupting natural environment flow. Schowalter (2022) says that predominantly artisanal mining in the northern African country is unregulated and hence creating havoc with the environment. According to the scholar lack of regulation on the miners in the sector exposes the environment to wanton destruction and violation by the miners. In this study the researcher wishes to explore whether as in Morocco, artisanal mining in the area understudy here is without regulation and if that is so what then are the implication of that legal void on the environment.

On the eastern side of the Africa continent, one country that has also been affected by artisanal mining to grander magnitudes is Tanzania. Feyissa (2017) says that this eastern Africa country is

endowed with a myriad of minerals like gold, tanzanite, diamond among other minerals. Mwaipopo (2018) says artisanal mining in Tanzania is unregulated and has seen serious environmental deprivation through promotion of deforestation, river bank panning as well as soil poisoning through use of mercury and other chemicals used in mineral purification. While findings from Tanzania show that artisanal mining has to a large extent rebuffs on the environment, this paper seeks to establish whether the same negatives noted in Tanzania exist in Rosa mining area of Chiweshe in Mazowe District of Zimbabwe or not. The paper will seek to establish whether or not the impacts this system of mining has in Tanzania on the environment apply to Zimbabwe.

On the western side of the African continent, Ghana is one state that to this day grapples with issues of artisanal mining. Hilson (2002) says that artisanal mining in Ghana is an ancient trade that dates back to pre-colonial times. According to the scholar minerals like gold and iron have been mined in Ghana since time immemorial. Kumar (2015) says that while there is no debate on the origins and rise of artisanal mining in Ghana, one of the major issues of interest today on the line of duty is the issue of its implications on the environment in the country. According to the scholar like in many states of the world, while this economic function has been lauded for providing economic escape-routes for the economically pressed majority, the method of mineral extraction also stands accused of promoting the maleficent rape and defilement of the environment. Kumar (2015) says in most parts of Ghana where this is lush deforestation and land and water pollution have become the norm of the day. In this study however, the researcher does not seek to explore the Ghanaian experience in isolation but seeks to establish whether what obtains in this west African Republic has any bearing on what is happening in Zimbabwe especially the Rosa Mining area of Chiweshe in Mazowe District.

In the central Africa the Democratic Republic of Congo (DRC) is one country where artisanal mining is common. According to Teschner (2017) DRC is some country rich in diverse mineral which include among other diamonds, gold and copper especially in the Kasai River Valley and Kivu area. According to the scholar in all these areas a lot of environmental degradation is rife in these places and there is very little done in issues of regulation of the activities in the area. While the challenge of artisanal mining in DRC also exist in Rosa area of Zimbabwe, this researcher through this enquiry will try to marry the two and see if they are similarities or differences between the two. The paper will seek establish the environmental implications of artisanal mining Rosa

mining area of Chiweshe and then assess whether or not the experiences in this area can in anyway be linked to DRC practices.

In southern Africa, South Africa is one country that has been heavily affected by issues of artisanal mining. Chuma (2017) says South Africa is some country rich in gold and a lot of artisanal mining is common around the Witwatersrand region. The scholar further says that artisanal diamond mining is common in in the Northern Cape while similar mining of coal occurs in KwaZulu Natal and Mpumalanga regions. Msingo (2019) says that issues to do with deforestation, soil poisoning and degradation are the most common forms of environmental violation in south Africa. According to the scholar the South African government has established an artisanal mining policy that seeks regulate and support the sector. This study seeks to establish whether or not the situation or impacts the environment impacts of artisanal mining in South Africa are similar to those in Zimbabwe's Rosa Mining area.

Back home, a number of scholars have also written on the environmental implications of artisanal mining on the environment. Bryceson (2010) says a number of areas in Zimbabwe have been affected by artisanal mining to the point that the environment lies in comatose with future generation left with nothing to inherit while Dzoro et al (2023) say that as exemplified by the destruction of Chiwore South Safari destruction of vegetation, the natural environment in Zimbabwe is under siege from artisanal miners. The media in Zimbabwe is awash with cases of buildings and schools in the Midlands collapsing owing to activities of artisanal miners in the country.

While scholars who have written on the impact of artisanal mining on the environment in the world, Africa and Zimbabwe could have been right on their assessments of the areas where their studies were carried out, this enquiry seeks to establish whether or not what they observed where their enquiries were conducted reflects the same experiences in Rosa mining area in Chiweshe Communal lands. This study will not seek to take a blanket generalization of what they saw in the areas they studied and claim it applies to the area under study in this enquiry but will seek to assess whether or not the experiences in the areas they studied reflects the experiences of the area under the microscope in this enquiry (Rosa of Chiweshe Communal lands).

1.2 GENERAL OBJECTIVE

The principal objective of this enquiry is:

- To establish the impact of artisanal mining on the environment.

1.3 SPECIFIC OBJECTIVES

The following specific research objectives underpin this study:

- To identify the negative impacts caused by artisanal mining on the environment in Rosa mining area of Chiweshe Communal Lands.
- To determine the magnitude of negative impact on the environment as a result of the artisanal gold mining.
- To develop environmental remedies towards the negative impacts.

1.3 RESEARCH QUESTIONS

The following research hypotheses guide this enquiry:

H₀: Artisanal mining does not cause environmental degradation.

H₁: Artisanal mining causes environmental degradation.

1.4 JUSTIFICATION OF STUDY

In undertaking this enquiry, the researcher was of the view that the findings of the enquiry would benefit a number of stakeholders in matters environment in the country. It was the researcher's hope that the following would be principal beneficiaries of the study:

MINISTRIES OF ENVIRONMENT AND TOURISM AND MINING AND MINERALS

It was the researcher's hope that at the close of this enquiry, the ministry responsible for managing environmental issues in the country (Ministry of Environment and Tourism) and the one that regulate mineral extraction in the country (Mining and Minerals) would be informed of the implications of artisanal mining on the environment in the country which would then enable them to formulate policies for sustainable mining in the country.

ARTISANAL MINERS

By undertaking this enquiry, it was the researcher's hope that that the findings of this enquiry would provide artisanal miners with an insight into sustainable mining and enable them to learn better mining methods that are environmentally friendly that would allow them to carry on with their ventures without destroying the environment.

THE RESEARCHER

It is also the researcher's hope that at the completion of this enquiry she as an aspiring Health and Safety officer will gain insight into effective environmentally friendly mining systems which will enable her to advise aspiring and practicing miners on the best way to go around effectual mining that is environmentally friendly. It is her hope as well that this enquiry will assist her complete her degree and get gainful employment in the mining sector which has always been her priority area of employment since childhood.

EDUCATION 5.0

This research plays a vital role in advancing Education 5.0, particularly in the areas of environmental sustainability, policy formation, and responsible mining practices. The framework emphasizes teaching, research, innovation, industrialization, and community engagement, aligning with the study's goal of equipping communities with knowledge and actionable strategies for protecting natural ecosystems.

VISION 2030

The study supports Zimbabwe's Vision 2030, which aims to create an upper middle-income economy by promoting sustainable mining, environmental conservation, and community-led resource management. By highlighting eco-friendly solutions, the research contributes to economic resilience while mitigating ecological degradation, helping to fulfil long-term national development targets.

MDGS MILLENNIUM DEVELOPMENT GOALS

This study aligns with MDGs objectives related to environmental sustainability, poverty alleviation, and public health by addressing pollution risks and advocating for responsible resource utilization.

NATIONAL DEVELOPMENT STRATEGY 1 (NDS1)

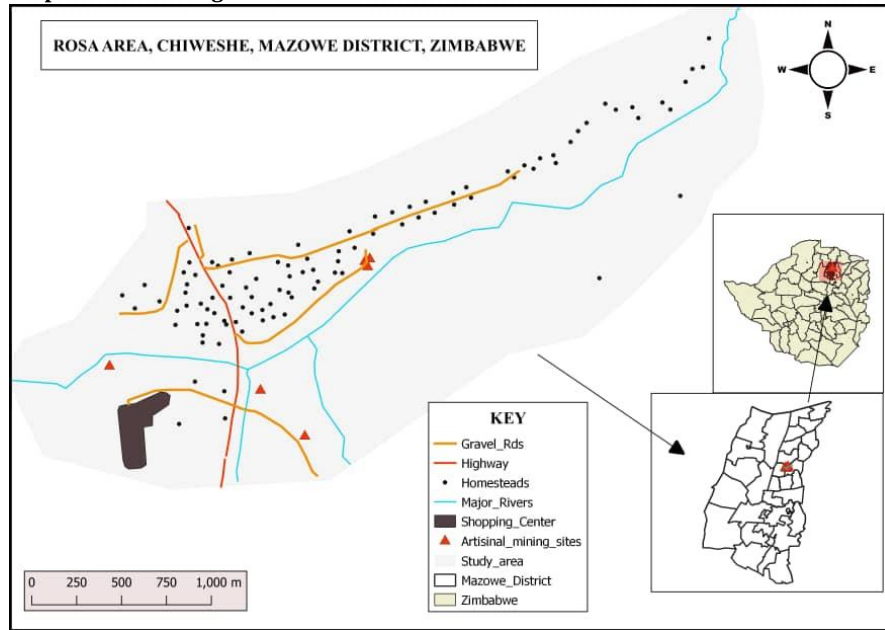
As NDS1 prioritizes economic growth, governance, and environmental protection, the findings from this research offer policymakers a foundation for improving regulations and promoting sustainable artisanal mining practices that benefit both the environment and local communities.

DESCRIPTION OF THE STUDY AREA

This study is centred on Rosa Mining area in Mazowe District of Mashonaland Central Province. The map below provides the outline of the place in which this study will be undertaken.

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Map of Rosa Mining area



Commented [DD2]: Reference your map

Fig 1.0 shows study area map

Chiweshe Communal Lands is an area in Mazowe District of Mashonaland Central province whose geographical coordinates are Latitude: 17.0833° S and Longitude 31.4667° E. The following are the area's physical characteristics.

PHYSICAL CHARACTERISTICS

Topography of the area: The land of Chiweshe where Rosa Mining area lies is generally level to moderately sloppy with isolated hills and ridges. The general elevation of the place ranges between 1200 to 1500 meters above sea level.

Climatic conditions: The area predominantly has a subtropical climate which is characterized with warm summers and mild winters. The area generally receives most of its rainfall during the summer months which are from November to March. The area receives annual rainfall that ranges between 800 to 900 mm per year. Temperature in Chiweshe area are rather seasonal during summer high temperature are around 26° to 28° and low temperature are around 15° to 18° .

Vegetation: In terms of vegetation the area is characterized by a mixture of grasslands, savannas and woodlands with minhondo and misasa being the dominant trees.

Hydrological set up of the area: The area of Chiweshe has an intricate hydrological set up which is made up of an intricate labyrinth of streams and revivers with the major rivers being Mwenje, Ruya and Mazowe rivers.

Soils set up of the area: The Chiweshe Communal area is covered mostly by sandy to sandy-loam soils and some lower-lying areas like Jaji being covered with clay-loam soils. The fertility levels of the area low being aided by its acidic nature.

SOCIO-ECONOMIC NATURE OF THE AREA

Population and economic activities in Chiweshe Communal and Rosa Mining Area:

Chiweshe area has an estimated population of about 30 000 people residing in a 541 square kilometre piece of land, with a population density range of 50 to 60 heads per square kilometre. The vast of the people in Chiweshe Communal Area are youths and children below the age of 15. The sex ratio is slightly biased towards females.

Rosa mining area has a population of approximately 300 households all adding up to about 1500 people. With 45% of these being youths between 15 and 35 years of age while 25% are adult males (above 35 years) and the remaining 30% being adult females. The area has a thriving agricultural sector with females being the dominant players in the sector while most males are into artisanal mining.

Social problems arising from artisanal mining in the area: A lot of social ills arise from the operations of social mining in Rosa area. Some among the most dominant are prostitution where young women and girls batter their bodies for money to the artisanal miners in the area. Issues of school dropouts are also rampant in the area as young children leave school to join the trade of mining. There are also cases of early child marriages in the area with parents auctioning their children into early marriages for a quick buck from the artisanal miners.

In the Rosa Mining area medical facilities are readily available. There is Rosa Rural District hospital in the mining area and Mother Theresa about five kilometres from the mining area in the north. There is also a secondary school and primary school in the area to cater for children of the miners and farmers.

1.6 LIMITATIONS OF THE STUDY

In undertaking this research, the researcher envisioned the following dares as having the propensity to affect her capacity to effectually undertake the study:

Time constraints-

The researcher over and above being a student is a mother and a house wife who other social and domestic obligations have the proclivity to take her time away from the study which could interfere with the carrying out of this study. To ensure all her other commitments would not interfere with her execution of the study, the researcher had to hire a maid to assist with other domestic chores so that she could devote her time to the enquiry.

Resource limitations-

The researcher is a self-sponsoring student with the Bindura University of Science Education who financial resources are torn between her studies and family responsibilities which leaves her mostly with limited financial resources for the study. To ensure she has enough for travelling, printing and photocopying for this study the researcher had to get a loan to finance this enquiry.

1.7 SUMMARY OF THE CHAPTER

This chapter of the study provided background to the study, statement of the problem, objectives of the study (both general and specific) and hypothesis to the enquiry. The chapter also gave the justification of the study, description of the area of study as well as potential limitations to the enquiry.

The next chapter of the study (two) will review literature related to this enquiry while chapter three will outline the research methodology to employed in the study. Chapter four will provide analysis of data collected in the enquiry while chapter five will give a summary of the study, findings and recommendations to the findings.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 INTRODUCTION

This ongoing chapter will review literature related to artisanal mining. Journals, journal articles, books as well as publications ranging from global, continental and regional have been reviewed in this chapter. Guided by theories of Environmental Kuznets Curve (EKC) and Human-Environment Interaction theory, the research will unpack the effects of artisanal mining to communities, paying attention to Rosa communities.

2.1 LITERATURE REVIEW

2.1.1 ARTISANAL MINING AND SOCIO-ECONOMIC DEVELOPMENT

Spiegel's (2009) research examined the socio-economic and environmental impacts of artisanal and small-scale mining in Tanzania. The study highlighted the complexities of ASM, including its potential to generate income and create jobs, but also its environmental health risks. The researcher emphasized the need for a nuanced understanding of ASM, considering both its benefits and challenges. Spiegel's research focused on the socio-economic and environmental dimensions of ASM, providing insights into the lives and experiences of miners. In contrast to the ongoing study which focuses specifically on assessing the environmental consequences of ASM in the Rosa area of Chiweshe Communal Lands.

Smith, Ali, Bofinger and Collins (2016) argue that artisanal mining is a way of alleviating impoverishment for a myriad of people though it has detrimental effects. Their research puts forward that the health and safety risks associated with artisanal small-scale mining are not fully addressed in research, except for mercury contamination from gold mining. This gap leaves miners, their families, and communities vulnerable to various health hazards. What is unique about the present study is the need for a more comprehensive approach to addressing health and safety risks in artisanal small-scale mining, in artisanal small-scale mining, considering its diversity and complexity. Smith et al's (2016) line of argument is quite handy to the ongoing study as it points out that artisanal mining and small-scale mining poses numerous risks to their communities. The present study however differs from the ongoing study as it used surveys to collect data form a large

representative sample of participants, providing insights into the health and safety implications of artisanal small-scale mining.

Nyavaya (2021) analysed the organization, structure and legal framework of artisanal and small-scale mining in Zimbabwe, with a specific focus on the gold sector. The researcher examined two key areas, Mazowe in Mashonaland Central and Kenzambia in Mashonaland West, in a bid to understand the factors that constitute artisanal small-scale mining work, a significant contributor to Zimbabwe's mineral-driven economy. The study established that the analysis can inform efforts to address challenges and capitalize on opportunities, ultimately contributing to the development of a more sustainable and equitable mining industry. The link between Nyavaya's (2021) study and the ongoing study is that artisanal mining is not only dangerous to the miners, but pose a great deal of danger to the community's health and safety. The focus is on both instances in Zimbabwe. However, the present study will dwell much on Rosa community, in Mazowe District, with a specific focus on the effects of artisanal mining to the communities.

Hoadley and Limpitlaw (n.d.) established that countries with lower human development index rankings tend to have a higher proportion of workers employed in artisanal small-scale mining, underscoring the sector's significance in these regions. The research also established the substantial increase in artisanal small-scale mining operators as a result of the growing poverty rates in developing regions. The link between the present study and the ongoing study is that Hoadley and Limpitlaw's (n.d.) investigated the artisanal small-scale mining sector's capability to create sustainable livelihoods and communities offering recommendations on how it can enhance community well-being and sustainability. The difference is however on the case study, whilst the ongoing study will use Rosa community as a case study to examine the effects of artisanal mining, the present research used South Africa to evaluate the current legislation and its impact on the artisanal small-scale mining sector's (ASM) growth, examining the extent to which local government is empowered to integrate ASM into development plans and strategies.

Hilson (2010) examines the relationship between ASM and poverty. The researcher argued that ASM can be a vital source of income for poor communities, helping to alleviate poverty and improve livelihoods, particularly in rural areas where alternative livelihood opportunities are scarce. What is common in both studies is the focus on ASM, both studies touch on the importance of ASM as a source of livelihood for local communities. The diverging point between Hilson's (2010) and the ongoing study is that Hilson's study emphasizes poverty reduction and livelihoods,

whereas the ongoing study aims to explore environmental degradation, pollution and sustainability.

Hentschel and Priester's (2004) study provides insights into the complexities of small-scale gold mining. The research highlights the industry's potential to contribute to local economic development, generating revenue and creating jobs. Their study also notes that small-scale gold mining can be associated with environmental and social challenges. What is handy is that Hentschel and Priester's (2004) study emphasizes the need for effective governance and regulatory frameworks to mitigate these issues. Although Hentschel and Priester's (2004) research touches on environmental issues, the ongoing study will provide a more in-depth examination of the environmental impacts, including land degradation, water pollution and destruction of biodiversity habitat in a specific context.

Mkodzongi (2018) examined the dynamics of artisanal and small-scale gold mining (ASGM) in Zimbabwe focusing on its social and economic impacts. The research pointed out the significance of ASGM as a livelihood strategy for many rural communities. Mkodzongi (2018) brought to light the role played by ASGM in poverty reduction and improving livelihoods of people in Zimbabwe. The research also holds that there is need for policies that support the development of the ASGM sector. However, Mkodzongi (2018) mainly concentrated on social and economic opportunities of ASGM, whilst the ongoing study will provide a more detailed understanding of the ecological impacts of ASM in the Rosa area.

2.1.2 ARTISANAL MINING AND SOCIO-ECONOMIC EFFECTS

Campbell's (2013) research focuses on the governance and regulation of the African mining sector. The study critiques the dominant approaches to mining governance, arguing that they often prioritize economic interests over social and environmental concerns. Campbell (2013) emphasizes the importance of considering the specific contexts and needs of local communities in mining governance. The main difference between the two studies lies in the scope and focus. Campbell's (2013) research explores the governance and regulatory aspects of mining, whereas the ongoing study concentrate on the environmental impacts of ASM, providing a deep understanding of the specific challenges and opportunities in the Rosa communal area.

Keane's (2008) research highlights the health risks associated with artisanal and small-scale gold mining, particularly mercury poisoning. The research emphasizes the vulnerability of miners and

local communities to mercury exposure, which can have severe health consequences. Keane's (2008) study underscores the need for improved health and safety practices, as well as effective regulations to mitigate mercury use in ASM. Both studies agree to the fact that ASM can have adverse effects to the communities. However, Keane's (2008) research concentrates on health dimensions and risks of ASM, whereas the ongoing study focuses on environmental impacts, highlighting the ecological effects of ASM in the Rosa communal area, as well as the distinct but interconnected challenges associated with ASM.

Castro's (2017) research examines the exploitation of artisanal and small-scale miners in Mozambique. The study highlights the precarious working conditions, low incomes and limited social protections faced by miners. The researcher critiques the power dynamics and structural factors that contribute to the exploitation of miners, emphasizing the need for improved labour rights and social protections. In contrast to the ongoing study which focuses on the environmental consequences of ASM, including land degradation, water pollution and loss of biodiversity, Castro's (2017) research explores the socio-economic aspects of ASM, narrowing down to labour exploitation and social issues.

Hilson's (2019) research examines the policy vacuum surrounding ASM in sub-Saharan Africa. The study highlighted the lack of effective regulation and support for the sector, which hinders its potential to contribute to local economic development. Hilson's (2019) research emphasized the need for context-specific policies that address the unique challenges and opportunities of ASM, which is quite handy to the ongoing research as it is looking at a specific case study in a remote communal area. The research also substantiated on the governance and regulatory aspects of ASM, shedding light on the policy gaps and potential solutions. In contrast to the ongoing study which focuses on environmental impacts of small-scale artisanal mining in Rosa communal area, the present research focused on policy and governance dimensions of ASM.

Fisher (2007) explored the dynamics of ASM in Tanzania, focusing on labour integration and social exclusion. The study holds that there is a complex relationship between miners, local communities and the state. Fisher (2007) argued that there is need to understand the social context and power dynamics within ASM, shedding light on the ways in which miners navigate and negotiate their livelihoods. The research focused on the social aspects of ASM, providing insights into the lives and experiences of miners. What is unique about this study is that it explored social

dynamics and labour integration. In contrast to the ongoing study which will provide a more detailed understanding of the ecological effects of ASM in the Rosa area.

Heller (2015) explored sustainable small-scale gold mining, focusing on challenges and opportunities for improvement. The study highlighted the potential for cleaner production methods and more effective regulations to mitigate environmental impacts. Heller's (2015) research emphasized the need for a holistic approach to sustainability in ASM, considering both environmental and social dimensions. The research provides insights into strategies for improving the sustainability of ASM, which are quite handy to the ongoing study. However, while Heller's (2015) research focused on broader sustainability issues and potential solutions, the ongoing study will use a mixed method approach to provide a detailed examination of environmental impacts in a specific context, Rosa communal area.

MacGregor (2015) explored the environmental impacts of ASM gold mining in Ghana. The study highlighted the significant environmental degradation caused by ASM, including water pollution, loss of biodiversity as well as deforestation. MacGregor (2015) substantiated that there is need for effective regulations and sustainable practices to mitigate the environmental impacts of ASM. The link between the present research and the ongoing research is that it provides insights into the environmental challenges associated with ASM and the importance of balancing economic development with environmental protection. The main difference between MacGregor's (2015) research and the ongoing study lies in the geographical focus, MacGregor (2015) focused on Ghana, whereas the ongoing study focuses on Zimbabwe, with a key focus on Rosa area.

Maponga's (2017) research examines the environmental impacts of artisanal and small-scale mining in Zimbabwe. The study puts forward the significant environmental degradation caused by ASM, including air pollution, land degradation, deforestation as well as loss of biodiversity. Maponga (2017) emphasized the need for effective regulations and sustainable practices to mitigate the environmental impacts of ASM. The study provided insights into the environmental challenges associated with ASM in Zimbabwe. The difference between the present study and the ongoing study lies in the scope. Whereas Maponga's (2015) research covers ASM in Zimbabwe more broadly, the ongoing study will focus on a specific geographic area, potentially highlighting unique environmental challenges and opportunities in that context.

Diaz-Silveira (2017) provided an overview of ASM in Africa, highlighting its economic, social and environmental dimensions. The study emphasized the complexities of ASM, including its potential to generate income and create jobs, but also its environmental and health risks. Diaz-Silveira's (2017) research points the need for a comprehensive understanding of ASM, considering both its benefits and challenges. The main difference between the two studies lies in their scope and focus. Diaz-Silveira's (2017) covers ASM in Africa more broadly, whereas the ongoing study focuses on a more detailed and context-specific examination of environmental impacts.

2.2 GAP ANALYSIS

Despite the existing research, there is limited focus on specific areas. Few areas have focused on the Rosa area in Chiweshe Communal Lands, Zimbabwe, leaving a knowledge gap on the specific environmental impacts of ASM in this region. Majority of researches conducted tend to generalize or looked at big mines where ASM is practiced such as Mazowe, Shamva and many more.

In addition, there is insufficient analysis of policy and regulatory frameworks within the knowledge arena. There is need for a more detailed analysis of the policy and regulatory frameworks governing ASM in Zimbabwe and their effectiveness in mitigating environmental impacts. Studies that have been conducted merely identify the policies and regulatory frameworks such as the EMA Act, Mines and Minerals Act but without a thorough analysis of the implementation, effectiveness of the policies in regulating ASM.

Moreover, there is a lack of comprehensive assessment of environmental impacts particular to a specific geographic context. A comprehensive assessment of the environmental impacts of ASM in Rosa area, including the effects on biodiversity, soil structure and water resources, is necessary to inform sustainable mining practices. This will aid environmental planners to identify new challenges and opportunities that are unique to a certain geographic area, thereby developing sustainable and eco-friendly ways of mitigating the effects of ASM.

2.3 THEORETICAL FRAMEWORK

This study has made use of two theories:

2.3.1 ENVIRONMENTAL KUZNETS CURVE (EKC) THEORY

The Environmental Kuznets Curve (EKC) hypothesis has been brought forward by Grossman and Krueger (1990). The scholars suggested that there is an inverted U-shaped relationship between environmental degradation and economic growth. According to Stern (2004), the EKC suggests that economic development initially harms the environment, but eventually leads to environmental

improvement as the economy grows further. Critics however argue that this is not guaranteed and that targeted policies are needed to ensure economic growth aligns with environmental protection.

The EKC framework provides lens through which to analyse the environmental implications of small-scale artisanal mining in Rosa area, Chiweshe Communal Lands, Zimbabwe. Artisanal mining, while contributing significantly to the livelihoods of rural communities, often creates substantial environmental challenges. This includes deforestation, soil erosion, contamination of water bodies and loss of biodiversity (Panayotou, 1993). According to Stern (2004), such activities, driven by economic necessity, align with the initial phase of the EKC, where environmental degradation intensifies alongside economic growth in the early stages of development.

Small-scale miners in rural Zimbabwe typically operate with limited access to technology and resources, focusing on short term economic gains without adequate consideration of long-term environmental impacts (Dinda, 2004). This dynamic exacerbates environmental degradation, as immediate survival often outweighs broader sustainability concerns. Stern (2004) asserts that the EKC suggests as incomes rise and economies progress, societies begin to prioritize environmental conservation. Therefore, in the context of Chiweshe Communal Lands, reaching this turning point requires targeted interventions that promote sustainable practices and technological improvements in mining process. Below is figure that shows the EKC, the horizontal axis (x-axis) represents economic growth in terms of gross domestic product (GDP) per capita. The vertical axis (y-axis) represents the level of environmental degradation or pollution (environmental damage).

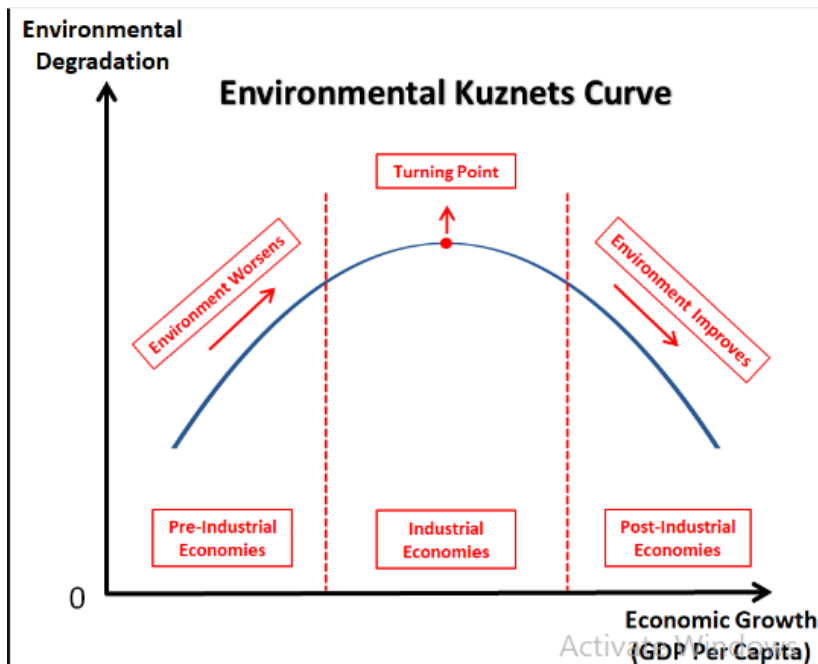


Figure 2 Image extracted from sciencedirect.com

From the above figure, one can note that the EKC theory suggests that environmental degradation increases with economic growth (early stages, pre-industrial economies); and later decreases with further economic growth. This relationship has been represented by a U-shaped curve, where environmental damage initially rises and then falls as income levels increase.

2.3.2 HUMAN-ENVIRONMENT INTERACTION (HEI) THEORY

The human-environment interaction (HEI) theory explores the dynamic relationship between human activities and the natural environment, emphasizing how societies shape and are shaped by their surroundings (Moran, 2010). This framework is particularly relevant when assessing the environmental impacts of ASM in Rosa area, because it is an example of human-environment interaction. However, Redman (1999) posits that this activity often leads to significant environmental consequences, including deforestation, soil erosion, water contamination, and biodiversity loss. The HEI theory therefore helps analyse how miners modify the landscape, exploit resources, and respond to environmental changes (Redman, 1999). The research also holds

that the theory considers how environmental degradation, in turn, affects human well-being, economic stability, and social structures.

The theory also highlights the role of governance and policy in shaping human-environment interactions as stated by Ostrom (2009). Effective environmental regulations, technological advancements and community engagement can mitigate the negative effects of artisanal mining. Moran (2010) further points out that sustainable mining practice, such as improved waste management and land rehabilitation can help balance economic benefits with ecological preservation.

Another key aspect of HEI theory is the feedback loop between human actions and environmental responses as highlighted by Ostrom, (2009). In Chiweshe Communal Lands, miners rely on local ecosystems for water and land, but their activities degrade these resources leading to reduced agricultural productivity and water scarcity. According to Redman (1999), these degradation forces communities to adapt, either by implementing conservation measures, seeking alternative livelihoods, or continuing unsustainable practices due to economic necessity. Below is a figure that demonstrates how the HEI theory works.

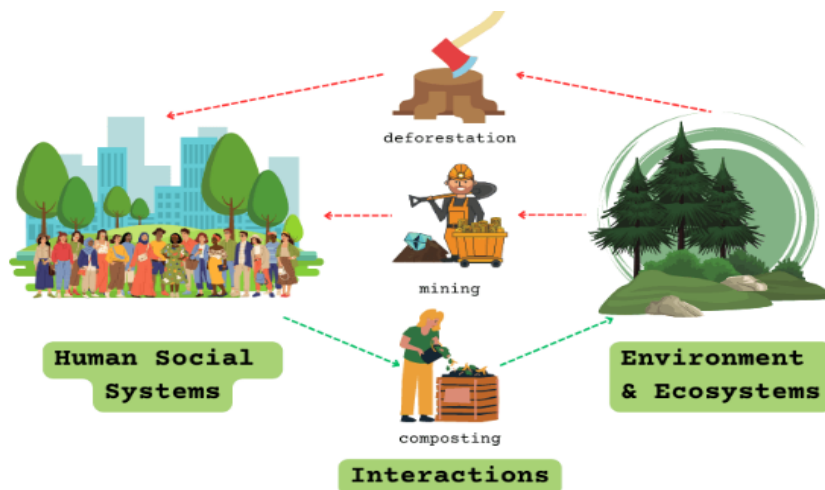


Figure 3 Image extracted from greencitizen.com

The figure above shows that while interactions can have negative impacts, there are also positive ways to benefit the natural environment. Thus, human interact differently with the natural environment.

2.3.2.1 DEPENDENCE ON THE ENVIRONMENT

According to Lambin & Geist (2006), every living creature on Earth relies on its natural environment for survival. This however has increased, taking into consideration residents from the Rosa area. Their daily lives depend on minerals extracted from the earth. This dependence has a potential to harm the environment as it has become an over dependency syndrome.

2.3.2.2 MODIFICATION OF THE ENVIRONMENT

Lambin & Geist (2006) point out that human activity inevitably leads to changes in environment bringing both adverse and beneficial effects. In the case of Rosa area, ASM though it has improved people's living standards, has destroyed the soil structure, affected air quality, and contributed to siltation of rivers.

2.3.2.3 ADAPTATION TO THE ENVIRONMENT

This refers to how human beings have thrived under certain circumstances, changing their way of life to suit the surroundings. Thus, the research seeks to proffer sustainable adaptation measures to the inhabitants of Rosa area.

2.4 CONCLUSION

The chapter has analysed related literature pertaining to ASM. The chapter further discussed the EKC and HEI theory, which are its intellectual pedestals. The following chapter looks at the research methodology and design that the study has adopted.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

This segment of the enquiry seeks to provide an outline of the research plot or design, the sampling and sampling procedures to be adopted for the selection of research participants and the data analysis approach to be used in the study.

3.1 RESEARCH DESIGN

In trying to paint a purer portrait of the environmental impacts of small-scale artisanal miners in rural Zimbabwe focusing principally on Rosa artisanal mining area in Chiweshe Communal Lands of Mashonaland Central, the researcher in this enquiry espoused the mixed-methods research design.

3.1.1 THE MIXED-METHOD RESEARCH DESIGN

According to Chikoko and Mhloyi (2005) The Mixed-method research design is a consolidation of two research slants or strategies namely the quantitative and qualitative research approaches. The two cited sages above claim that this research design comprises of collecting qualitative data through the use of interviewing principal participants in an enquiry who include residents of the Rosa Mining area and Ward Natural Resource Monitors (WNRMs) and quantitative data through statistical analysis of responses provided by respondents through questionnaires. Cohen (2006) opines that Mixed-methods research encompasses an amalgamation the qualitative and quantitative data collection and analysis systems which in turn generates a new comprehensive depiction of the academic marvels under the scholarship.

Rukuni-Makore (2010) posits that all social science researches the adoption and use of the Mixed-method research design is more expedient than other same systems of enquiry. According to the researcher, the primary pluses of using this approach include:

- Provision of the researcher with a more complete appreciation of portents under the microscope through providing both qualitative and quantitative understandings.

- The research design also increases the validity of studies through allowing ease triangulation of the gotten qualitative and quantitative data.
- Further, the research design helps in addressing polygonal research issues through using of both qualitative and quantitative methods.
- Finally, the research design offers ironic data though providing text, figures and even images where possible.

Rukuni-Makore (2010) however, says that the use of this research design also has certain drawbacks to social research when researchers opt to use it. According to the scholar the most notable of these demerits include those listed below:

- According to the scholar the use of this research design embraces the use of convoluted and sophisticated data analysis approaches which if not scrupulously checked could lead to errors in data interpretation.
- The research design is also demanding in matters of resources which could affect the execution of studies leading to provision of incomplete and inconclusive findings.
- There is also a prospect of incompatible data collected from the qualitative and quantitative studies that could further confound the analysis of findings of the study.

However, while complications could arise in using the said research design in this enquiry, the researcher in this study was of the opinion that this research slant has more to offer in this enquiry than can the demerits shade off. It was the researcher's grounded view that through the adoption and use of this research design, the researcher would be able to with ease triangulate the collected data and come up with a clear picture of the results. The researcher also was of the of the opinion through the through the use of the research design the researcher would be able to adjust to nascent research drifts that would arise in the course of the enquiry and the approach itself will be able to offer a richer depiction of issues under study in this enquiry.

3.2 RESEARCH INSTRUMENTS

In trying to unpack the environmental impacts of artisanal mining in Rosa Mining area, this researcher opted for interviews, questionnaires and focus group discussions as data collection instruments in the enquiry.

3.2.1 QUESTIONNAIRES

Cohen (2006) holds that questionnaires are data gathering instruments used in quantitative research to collect data from participants in any study that comprise of well fashioned questions on papers called questionnaires. In the same spirit, Creswell (2012) says questionnaires are structured questions that are distributed to research respondents in order for them to fill them in and return to researchers for the final treatment and analysis of findings.

Cohen (2006) further says there are different systems of questionnaire designing which are of on-line questionnaires, paper-based questionnaires and telephone-based questionnaires. In this study the researcher adopted the paper-based questionnaires for easier analysis of data and storage of responses for future needs.

According to Creswell (2012) the use of questionnaires in social research has advantages for the any research. Creswell (2012) says that some of the positive returns in adopting and using this data collection method are:

- Questionnaires are low cost instruments.
- Questionnaires can be standardized which makes it easier to compare the collected data.
- Questionnaires are not time consuming both distribution and analysis.

In this enquiry, the researcher opted for using to use questionnaires based on the views raised by Creswell (2012) above.

While questionnaire have merits, Cohen (2006) says the use of questionnaires in social research may have demerits. According to the scholar one of the major hitches of this method to research is that respondent may choose not to return the instruments or answer certain questions in the questionnaire which could lead to misleading findings. To counter this researcher in this study used interviews to ensure that where there were shortfalls with questionnaires, interviews were used to complement data collected through questionnaires. In this enquiry, both open-ended and closed-ended questionnaires were used make sure that the participants in the study could elucidate well in their responses where it was necessary.

3.2.2 INTERVIEWS

Interviews are research data collection approaches that include dialog or direct questions and answer sessions between the researcher (interviewer) and individuals or groups of participants in

the study whose sole intention is to gather comprehensive rejoinders on a topic of study (Rukuni-Makore, 2010). Saunders (2015) on the other hand also says that there are five different of interviews types in research which are structured, semi-structured, unstructured and group discussions. According to the Saunders (2015) the usage of dialogs (interviews) for data collection in research has a number of advantages some of which include among others:

- These provide a chance for interviewers to seek for precision where interviewees' responses appear obscure and indistinct.
- They provide thorough appreciation of perceptions into researched phenomena because the interviewee has the chance to explicate on concepts discussed.
- Give the researcher a chance to get personal perspectives of respondents on the research narrative understudy.
- Interviews are a more flexible means of research which can be undertaken in a relaxed atmosphere where the respondent can unwind totally to give the researcher all the necessary details.

However, while Kvale (2007) says interviews also have disadvantages and some of the major one being these listed below:

- Interviewing research participants is time consuming.
- Interviews are necessary when dealing with small samples.
- They are also subjective in nature which then makes them an over compromised form of enquiry.

However, this researcher in this enquiry complemented interviews with questionnaires to make the findings of this study more comprehensive.

3.2.3 FOCUS GROUP DISCUSSIONS

According to Lewis (2000), a focus group is a type of interview that is planned in a manner that allows viewpoint to be yielded in the topic of interest in a permissive, non-threatening environment. Focus group discussions were very important as they assisted in obtaining general background information pertaining to artisanal mining activities happening in Rosa area in Chiweshe Communal area and their socio-economic effects. According to Stewart and Shamdasani

(1990), focus group interviews can also be used to stimulate new ideas and creative concepts. The scholars further put forward ideally a focus group should consist of 5-12 relatively homogenous participants, this allows perceptions to develop through participants' interaction. The researcher conducted 2 focus group discussions A and B in which both groups had 5 participants which is a manageable sample and would not allow one or two members to dominate over the others. Focus group discussions were conducted first via WhatsApp so as to capture unanswered questions for face to face interviews, and also the social media platform was very cheap considering the fact that it eliminates geo-physical boundaries.

3.3 STUDY POPULATION

Rosa Mining area lies in Mazowe District and has two Ward Natural Resource Monitors (WNRMs) whose responsibility is to monitor issues of environmental management and has 300 households with a total population of 1500 people and these in the study constituted the research population in this enquiry. It was from these people (the population) that the research sample was drawn.

3.4 SAMPLE AND SAMPLING PROCEDURES

The matter of what creates an opposite research sample for any enquiry is somewhat contentious. Countless dons have dissimilar instructions. Makore-Rukuni (2010) says 2/3 (two thirds) of the population creates a sample while Creswell (2014) opines that 33.33% of the population is a valid sample for any study. Kvale say between 10 and 20% of the population is good enough sample. In this study however, the researcher chose to go by Kvale say between 10%'s recommendation which means a sample for this enquiry will comprise of 150 people from the households in the mining area.

In the sampling procedure the researcher used the purposive sampling where the two WNRMs in the were selected on the basis of their responsibilities that entail monitoring environmental issues which is relevant to the thrust of this enquiry and then the other 148 respondents were chosen using the random sampling technique where cards inscribe **Yes** and **No** were put into a box and the WNRMs were asked to pick from the box. Those who **Yes** were chosen to participate in the study and those who picked **No** were left out.

3.5 DATA PRESENTATION AND ANALYSIS

Data in this study was presented in form of table, charts and graphs for the quantitative data. Statistical information pertaining to response rate was also presented in tables and analysed by SPSS basing on the gender that took part in the answering of the questionnaire.

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3.6 SUMMARY

In this section of the study, the researcher gave the research design, an outline of how this study will obtain. The researcher in the enquiry opted for the mixed methods approach from a population 1500 Rosa residents. A sample of 150 participants was chosen using both purposive sampling and random sampling method. Data was collected through interviews and questions. The collected data was collected both qualitatively and quantitatively. The next chapter (four) provides the findings found from the analysed data.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 INTRODUCTION

In this segment of the study, the researcher provides the analysis and interpretation of data collected through questionnaires and interviews to establish the environmental impacts of artisanal mining in communal areas focusing squarely at the experiences drawn from Rosa Mining Area in Chiweshe communal lands of Mashonaland Central province. Charts, table and graphs were used to provide a reflection of the views of the respondents.

4.1 RESPONSE RATE

Table 1: Response rate

		Instruments	
Respondent category	Questionnaires	Interviews	Average
WNRMs	100%	100%	100%
Residents	95%	94%	94.50%
Overall Response rate			97.25%

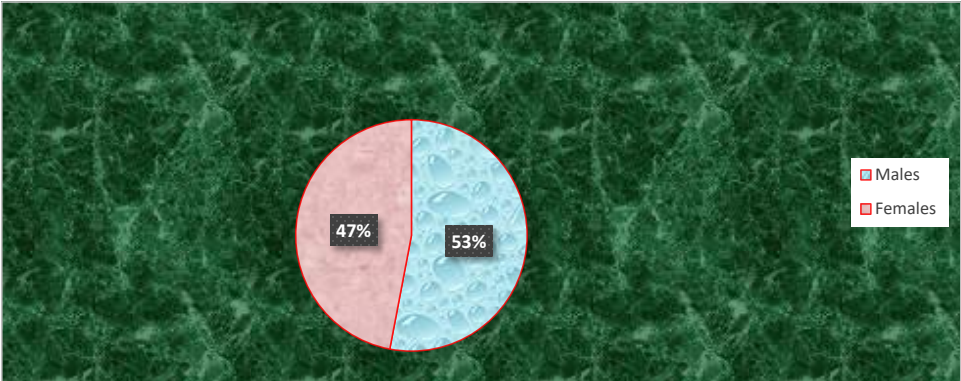
As is provided in the table above 100% of the Ward Natural Resource Monitors (WNRMs) returned the questionnaires and an equally corresponding figure of 100% of this class of these respondents were also available for the interviews making it that 100% of the WNRMs were available for the study. On the residents of the Rosa community 95% of the respondents returned the questionnaires while 94% were available for interviews. The averaged response rate for both the WNRMs and residents was 97.25% which is a high portion of same to render the findings of this enquiry both credible and representative of the views of the sample selected for the enquiry. However, the other 5% did not return the questionnaires and the other 6% did not appear for the

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interviews. Rosa community residents who did not return questionnaires may indicate certain underlying factors affecting participation. Possible reasons for non-response include lack of time, unwillingness to disclose information, literacy barriers, or scepticism about the study’s objectives.

4.2 DISTRIBUTION OF RESPONDENTS BY GENDER

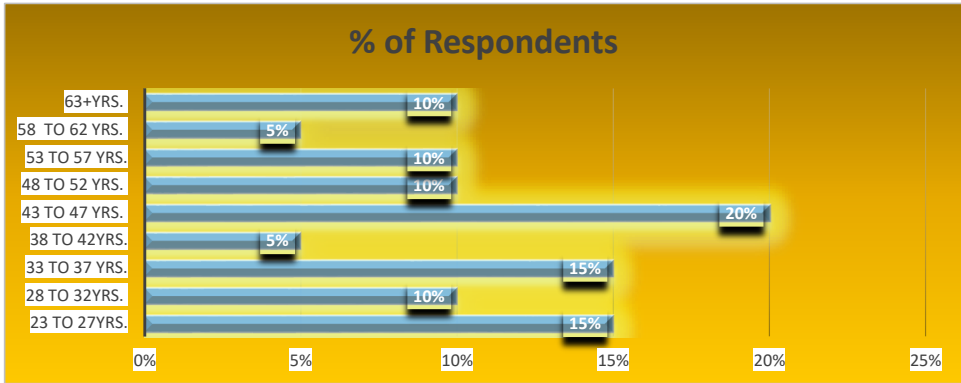
Pie chart 1: Gender distribution of sample



As the pie chart above provides, 47% of the respondents were females while 53% were males. The fact that more males participated in the enquiry could be out of the patriarchal nature of the rural communities in Zimbabwe where more men than women appear concerned with the world outside homes and the environment than women. The fact however that both males and females participated in the enquiry show that the views expressed in the study are gender balanced because both females and males were participants in the enquiry. The variations in their rations is not of much material worthy.

4.3 RESPONDENTS AGE DISTRIBUTION

Graph 1: Distribution of respondent by age

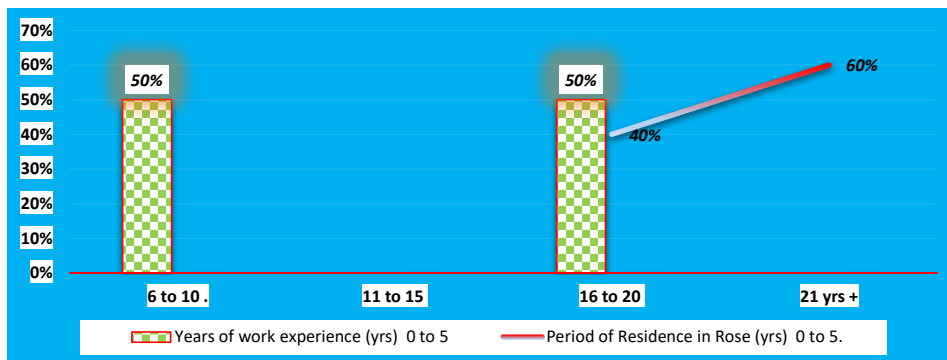


The figure above provides a clear depiction on the distribution of participants by age. From the figure 15% of the respondents were between 23 and 27 years of age while 10% were between 28 and 32 years of age. The other 15% were within the 33 to 37-year age bracket. 5% of the respondents were between 38 and 42 years of age. The larger hunk of the of the groups constituting 20% were between 43 and 47 years of age while 10% were between 48 and 52 years of age and other 10% were between 53 and 57 years of age. 5% of the respondents were between 58 and 62 years old and the last 10% were 63 years old or above that age.

The age distribution of the respondents as is given in the figure above shows that the participants in the study were drawn from different generations as reflected by their aged where the young population was represented by those in the early twenties to the early thirties and the middle ages were represented by those in the forties while the old generations where represented by those above sixty years of age. Such a distribution shows that ideas and responses raised in this study capture the views of all generations of people in Rosa Mining area and hence based on this the findings of the enquiry could be said to be inter-generationally sound, credible and reliable as they drew perceptions of all generations in the society.

4.4 YEARS OF EXPERIENCE OF WNRMS AND RESIDENCE OF RESPONDENTS IN ROSA MINING AREA

Graph 2: Years of experience of WNRMS and residence of respondents in Rosa Mining area



From the graph above, 50% of the Ward Natural Resource Monitors have been at work for between six to 10 years while the other 50% have need working in their position of monitoring the environment in the area for between 16 to 20 years. The periods of experiences possessed by these respondents is too long a period to enable them to understand issues of environmental degradation and the impact of artisanal mining which is the thrust or pith of this enquiry. Their protracted years of industrial experience renders their contribution to this enquiry both trusty and credible which therefore renders the findings of this enquiry sound and encyclopaedic.

On the issue of residents of respondent is Rosa Mining area, 40% of the respondent say they have been resident in the area for a period ranging between 16 and 20 years while the other 60% claim to have been resident in the area for a period ranging from 21 years and beyond. The fact that these respondents have been resident in the area under study implies that they have seen over years the deprivation of the environment that the area has seen over years due to artisanal mining activities in the area their lingering habitation in the area has enabled them to see the environmental transformation of the area brought by the rise of artisanal mining in the area. Their stay in the area under the microscope has therefore given them the ability to provide responses to both questionnaires and interviews that informed by experience which by no means can fail the test of reliability.

4.5 ENVIRONMENTAL DEGRADATION IN ROSA MINING AREA AND ITS FORMS

Table 2: Prevalence of environment degradation and it forms

Yes	No	Forms of environmental degradation	% of respondents
100%	0%	Gullyying	30%

River bank panning and river siltation	20%
Land pollution	10%
Water pollution	6%
Noise pollution	10%
Air pollution	4%
Poisoning of water bodies through cyanide & other chemicals	7%
Deforestation	13%

The 100% of the respondent all claim that there are serious issues of environmental degradation in Rosa Mining area and according to these respondents these forms of environmental degradation are grossly linked to activities of artisanal mining in the area. The fact that 100% of the respondents agree to the incidences of environmental vandalism in the area which they claim is or could be linked to the mining activities in the area provides a justification why this study was necessary in the area it was undertaken. The fact that all respondents find a link between the environmental shattering and artisanal mining in the area provides a sound explanation as to why this study can be read for a credible enquiry as it sought to address a genuine issue that is prevalent in the area of Rosa which is violation of the environment owing to artisanal mining activities in the area.

On the forms of environmental degradation ubiquitous in the area, 30% of the respondents claim that gullyng or digging and leaving open gullies in search of gold is the most dominant form of environmental wrecking in the area while the other 20% say river bank panning which then gives way to river siltation is another issue of environmental violation common in the area. According to these respondents when going after the alluvial form of gold artisanal miners go to the banks of *Mutoradundu* and *Ruya* Rivers in the area where they dig for soil which they then pan in the rivers resulting in a lot of siltation of the rivers.

The other 13% of the respondents believe that artisanal mining in the area has resulted in heightened deforestation when the artisanal miners have to cut down tree for either timbering their mines or general uses as firewood in the gold purification processes.

The 10% of the respondents say that the other for of environmental degradation experienced in Rosa Mining area owing to artisanal excavation in the area is the issue of land pollution. According

to these respondents a lot of rubble from the mines is deposited anywhere and everywhere as the mines have no designated dumping sites in the area. According to the respondent a movement through the places provides an eye soring kind of scenery of dumbs of rubble and uncovered pits that have become not only risks to the people but even to animals in the locality. The other 10% of the respondents hold that the other form of environmental degradation in the area is the issue of noise pollution which emanates from the diesel -powered machines that are used by the miners in their quest to get the yellow stone from deep under.

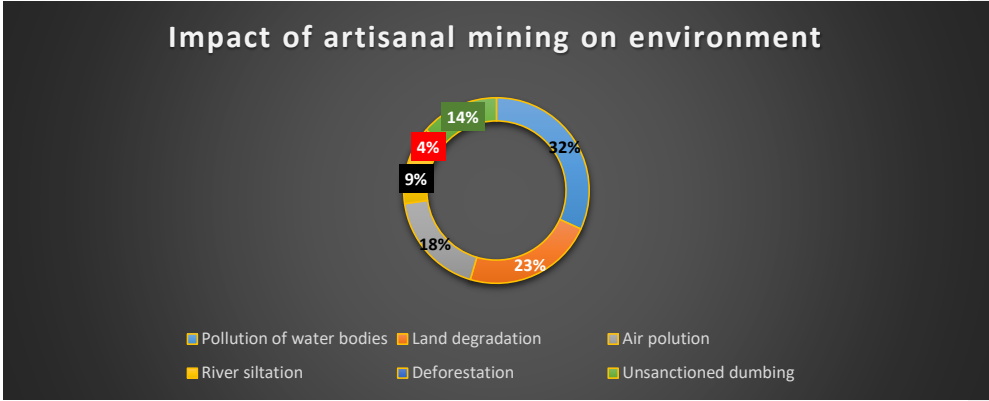
According to 7% of the respondent the other environmental hazard that occurs in Rosa mining area owing to artisanal mining in the area is pollution and poisoning of the water bodies in the area from cyanide used in the cyanidation of gold and other minerals like mercury that they use in the treatment and purification of gold. The use of these environmentally toxic chemicals does to a large extent destroys the environment as well as possess health dangers to both people and animals in the area.

The 6% of the respondents are of the opinion that the other challenge or environmental menace that artisanal mining in Rosa has levied on the environment is water pollution. According to the respondents' water bodies in the area have become cleaning basins for miners who are either into alluvial gold search or those with bigger mining facility who want to clean their ore. In addition to these forms abuse of water bodies in the area, rivers and other water sources in the area have also become dumbing sites of chemical laden mining residue.

The last 4% of the respondents said that air pollution is another issue of environmental concern common in Rosa Mining are emanating from artisanal mining activities in the area. According to these respondents a lot of miners in the area use diesel powered machines which emit a lot of smoke in the process which causes air pollution. Of the 4% some respondents also say that during the mining process there is a lot of dust that is raised from the mines which also results in the pollution of the air.

The fact that the all respondents in the study acknowledged the prevalence of environmental violation in Rosa mining area which they all attribute or claim is closely linked to artisanal mining in the area justifies the validity of this study in that it is an enquiry that took place in an area affected by artisanal mining which makes it findings credible and lucid to the core.

4.6 HOW ARTISANAL MINING CAUSES ENVIRONMENTAL DEGRADATION
Doughnut Chart 1: Impact of artisanal mining on the environment



The 32% of the respondents were of the opinion that artisanal mining in Rosa Mining community in Chiweshe communal area is responsible for major environmental violation which include pollution of water bodies. According to these respondents, the use of river for panning and, cleaning the ore as well as dumping mining residue are form of water pollution which are rampant in the area. The views given by the respondents here are in sync with the views raised by Hajer (2009) who opined that the first fatality in any area where artisanal form of mining takes place area the water sources that miners adopt as mineral purifying centres. The view is also supported by Adams (2015) who holds that in every artisanal mining community water sources are the first victims of abuse by artisanal miners who target them and use them for mineral processing in their exertion to eke a living out of the environment. The fact that respondents in the enquiry raised the issue of water bodies that were also raised by Hajer (2009) and Adams (2015) implies that indeed to a greater extent the environment in Rosa mining area is under siege from artisanal miners and it is clear that the first aspect of the environment are water bodies in the area used for the purification and treatment of gold by the miners themselves.

The other 23% of the respondent are of the view that land degradation is the other way artisanal mining in Rosa is impacting on the environment. According to these respondents through gullying the area by digging everywhere and anywhere the mines destroy the land and equally so through dumping their residue everywhere artisanal miners are destroying the environment. According to

these respondents despite massive land degradation in Rosa there have not been even the barest efforts from the miners to reclaim the violated land. The view of land degradation being a challenge in artisanal mining zones has also been said by Chuma (2017) who opined that in South Africa Artisanal mining has resulted in massive land degradation and this is the same experience of residents and WNRMs in Rosa mining area.

Also 18% of the respondents said that air pollution is another way through which the environment has been impacted on by artisanal mining in Rosa. According to the respondents through the use of either diesel or gasoline powered engines to power machinery used by artisanal miners in Rosa area heavily pollutes the air to the point that a lot of the people in area now fear for their health. Other than fumes from diesel and petrol the dust raised from the mining activities is another area of concern for the residents and WNRMs in the area. This response from participants in the study proves that through the use of machinery that emits petrol or diesel billows artisanal miner in Rosa affect the environmental equilibrium.

From the 18% of the respondents the other 14% of the respondents are of the view that unsanctioned and uncontrolled dumping of disused ore or other mining solid mining residue is another means through which environmental degradation takes place in artisanal mining area. According to these respondents the deposition of unwanted and useless mining dregs everywhere is a form of environmental violation experienced in the area. This view is in line with the view raised by Kumar (2015) who says in Ghana mounts of unwanted mining debris has become an eye sore in some of the country's artisanal mining communities. This same experience has become a common sight in Rosa where such actions are rampant proving therefore that uncontrolled dumping of has resulted in creation of serious mountains of useless mining debris in the area.

Through river bank and stream bank panning 9% of the respondents claim that stream and river siltation is another way by which the environment in Rosa Mining area is affected by artisanal mining activities in the area. According to these respondents when artisanal miners in the area ply their trade close to the rivers and on the banks, this leads to erosion that consequently leads to rivers filling up with soils.

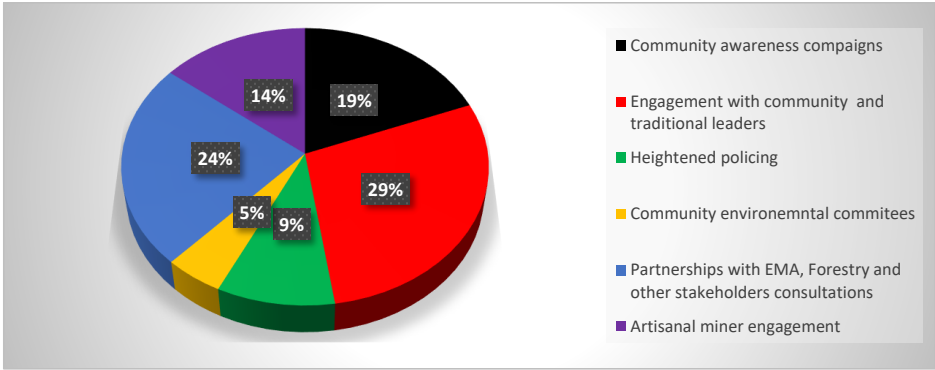
The other 4% of the respondents opined that the other way mining in Rosa has impacted on the environment in the area is through deforestation where miners and their families wantonly cut down trees for firewood either for mineral purification or cooking or timbering their mines for

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safety. According to these respondents owing to the rise of mining in the area in the early 1990s there has been serious deforestation in the area to the point that the area now stands on the peripheries of desertification.

4.7 MEASURES PUT IN PLACE TO CURB ENVIRONMENTAL DEGRADATION IN ROSA

Pie chart 2: Measures put in place to curb environmental degradation in Rosa



In a bid to control the challenges of environmental degradation in the Rosa mining area a lot of has been done in the area by the community and other stakeholders. 29% of the respondents say that they have been efforts to engage with traditional and community leaders engage the miners and community members on matters of environmental issues while 19% of the respondents say that WNRMs and other governments have engaged communities through community awareness campaigns.

The 24% of the of the respondents say partnerships with government parastals like the Environmental Management Agency (EMA), Forestry Commission and other stakeholders to effectively police environmental issues in the area while the other 14% of the respondents say that direct engagement of the miners by EMA, Forestry Commission and Mazowe Rural District Council (Natural Resources Unit) have also been used as potential ways out of the environment mining quagmire Rosa mining area has found itself in owing artisanal mining activities in the area.

The other 9% of the respondents say increased police visibility and heightened community policing is the other way that has been adopted by Rosa community and the try and arrest environmental violators in the area while the last 5% of the respondents say that establishments of community environment committees that work with community leaders, police and WNRMs in monitoring and reporting environmental issues has also been adopted as a measure in the area.

4.7 EFFECTIVENESS OF STRATEGIES EMPLOYED TO CURB ENVIRONMENTAL DEGRADATION IN ROSA

Graph 3: Effectiveness of measures to curb environmental degradation in Rosa

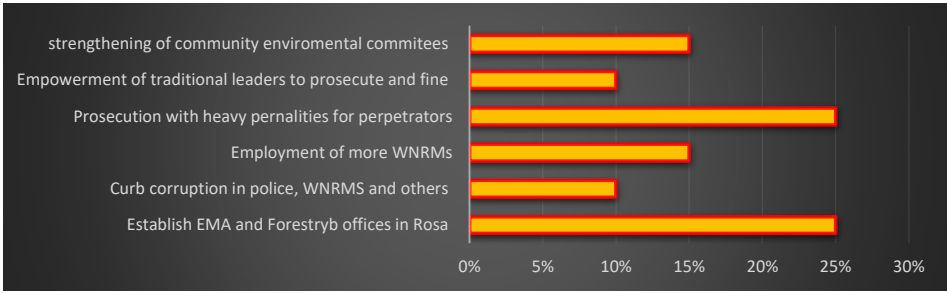


The graph above provides a feel of the respondents on the effectiveness of the adopted strategies to control environmental degradation in Rosa Artisanal mining area. According to 5% of the respondents the strategies employed in the area are effective in that some of the miners in the area like the Rosa Mining Syndicate and Rosa 10 syndicate have started have responsible litter and disposal mechanisms where they two are engaged in gully filling and land reclamations. The other

25% of the respondents hold that there is no significant shift in matters environment in the area despite the implementation of new strategies. According to these respondents despite these new strategies, issues of water bodies pollution, land degradation and deforestation still persist in the area. The majority of the respondents (70%) say that there have been some partial or fractional improvements in the area where certain mining syndicates have taken it upon themselves to promote responsible and sustainable mining activities in the area like land reclamation and rehabilitation which were not there previously. However, these respondents say that there still certain grey areas in environmental protection from the artisanal mining like water bodies pollution still continues and air pollution is still a challenge. But based on the views of respondents, it is apparent that the migration towards conservational mining in the area is still too minimal to write home about.

4.8 POSSIBLE SOLUTION TO ENVIRONMENTAL CHALLENGES IN ROSA MINING AREA.

Graph 4: possible solution to environmental challenges in Rosa Mining area



As is given in the graph above 25% of the respondents say to effectively claim that to effectively curtail environmental degradation in the Rosa artisanal mining area there is need to establish resident offices of EMA, Forestry Commission in the area to arrest and process the prosecution of environmental violator unlike the current establishment when these visit the area intermittently. According to these respondents their permanent residence in the area provides for them to monitor issues of environmental use and abuse by artisanal miners in the area.

The other 25% of the respondents were of the view that the legal systems in the country are rather on the indulgent side that they should be. According to these respondents there is need for arrest by either the police or environmental agency like EMA and Forestry Commission of violators of the environment that should be followed by prosecution of these people. According to these participants in the study the current arrangement where environmental violators are either arrested and released without custodial or heavy penalties serves only to exacerbate the issue of environmental degradation in the area.

The 15% of the respondents believe that there is also need to strengthen environmental monitoring committees in Rosa to ensure these are given arresting powers as members of the neighbourhood watch committees to ensure they can work to deter environmental degradation in the area while the other 15% believe there is need to employ more WNRMs as the current number of two per ward cannot exhaustively manage the ward which is too big for only two people.

The 10% of respondents say that traditional leaders in the area like village heads, the headmen and chiefs should be empowered legally to try environmental issues and move away from the current schema where their exclusive province appears to be only domestic and family squabbles. According to these if traditional leaders are empowered to do this then these cases can surely be reduced in the area. The other 10% of the people were of the opinion that there is need to curb corruption in the police force, WNRMs and other environmental agency through continually rotating officers as these have to an extent become agency of environmental degradation rather than protecting it. According to respondents oiling the palms of a police officer or WNRMs with a few coins of silver can earn you a passport to environmental rape.

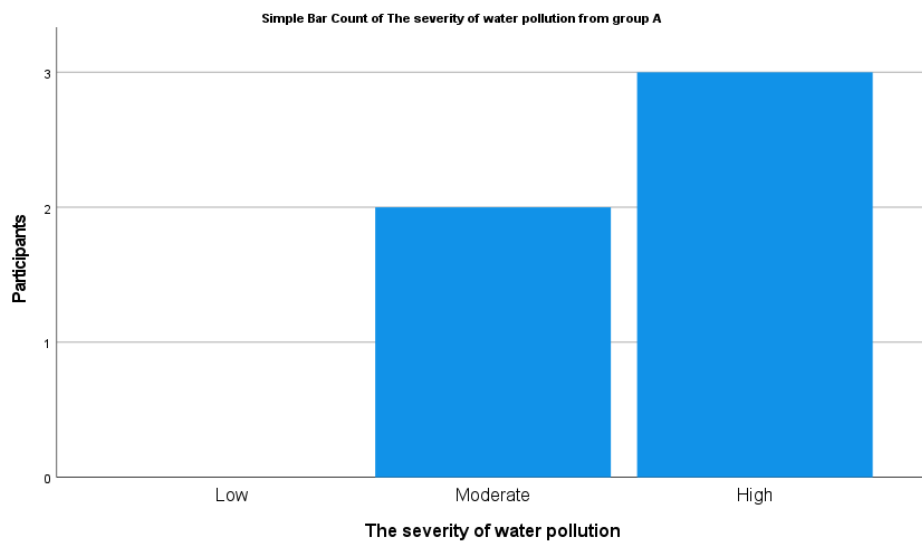
4.9 ANALYSIS OF DATA GATHERED FROM FOCUS GROUP DISCUSSIONS

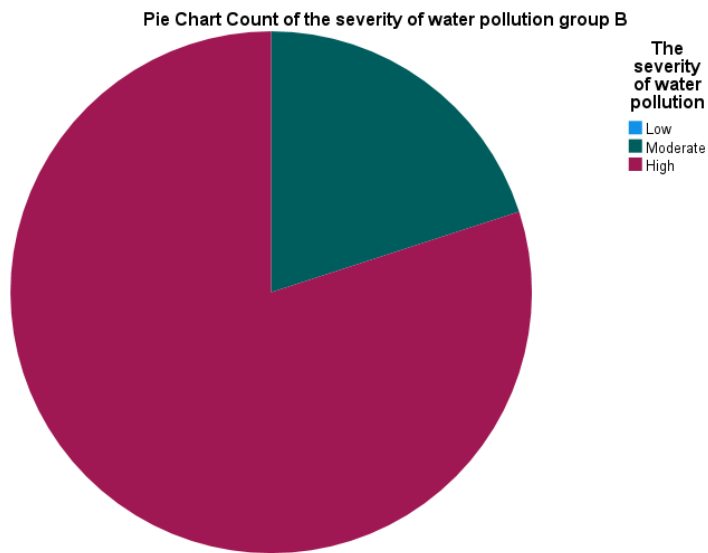
Responses in both focus groups seem to marry because Rosa residents identified signs of land degradation which include deforestation, air and water pollution, as well as disruption of water flows. This according to WNRMs, are the chief environmental impacts of artisanal mining, which has led to soil erosion, water contamination in the local water bodies.

Henceforth, the research holds that small-scale artisanal mining in Rosa poses significant environmental risks, with potential impacts on the local ecosystem and surrounding communities. One of the primary concerns is deforestation and land degradation, as mining activities lead to

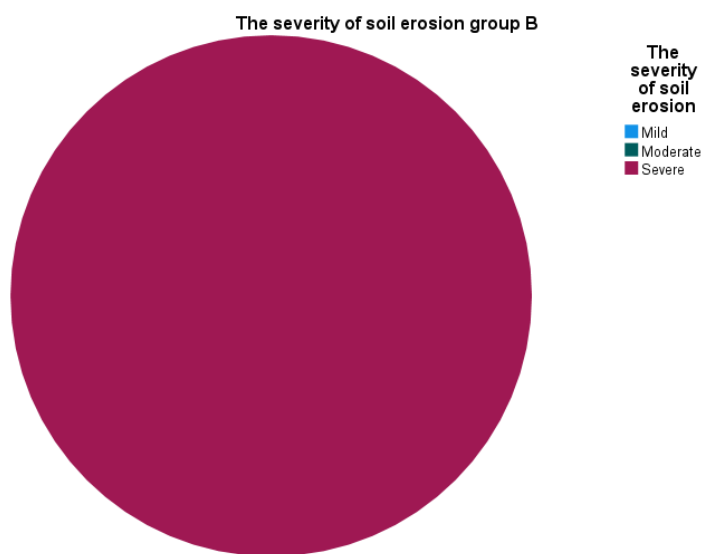
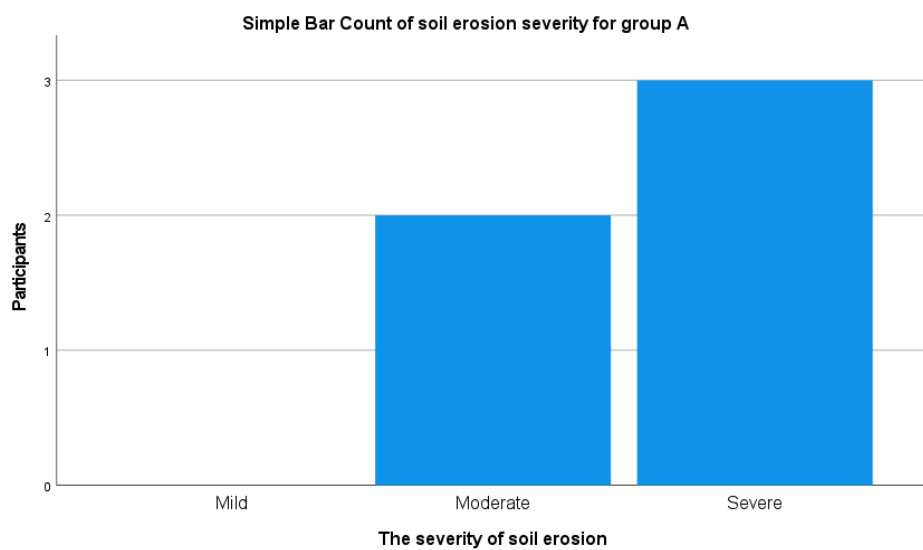
clearing of vegetation, soil erosion, and land degradation of land. This not only affects agricultural productivity, but also contributes to loss of biodiversity.

Water pollution is another major issue, as artisanal mining often involves the use of mercury and other chemicals. These toxic substances can contaminate nearby water sources, posing a significant risk to human health and aquatic life. Moreover, mining activities can lead to soil pollution, releasing heavy metals and other pollutants into the soil. This can have devastating effects on agricultural productivity and human health.

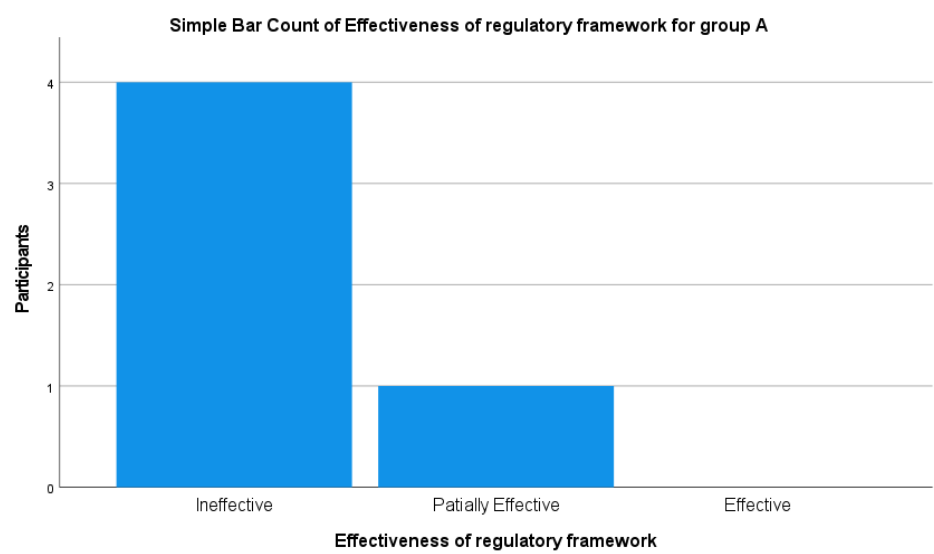


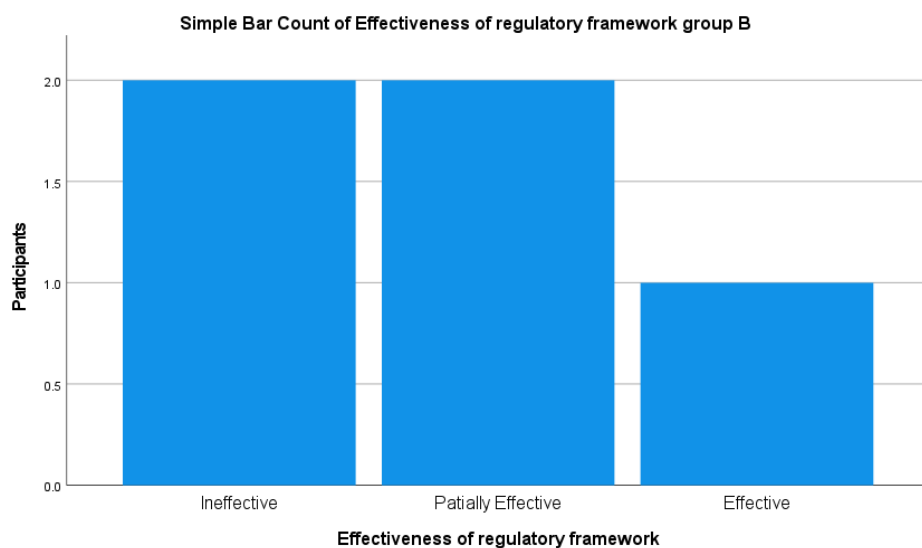


Pertaining to the environmental changes, focus group A, highlighted the degradation of soil structure which has become more prone to erosion. Focus B, though not clear pointed that many trees have been cleared to make way for mining operations. thus, small-scale artisanal mining in Rosa has led to significant environmental degradation. Soil structure has degraded, increasing erosion and sedimentation in local water bodies. Deforestation has altered the ecosystem, affecting local flora and fauna. Increased dust pollution has compromised air quality, while gully formation and soil erosion have exacerbated environmental change.

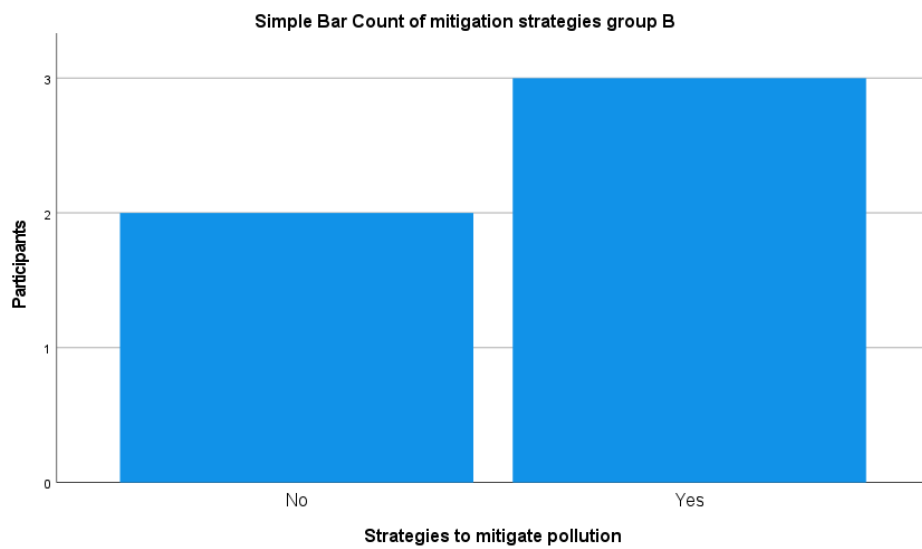
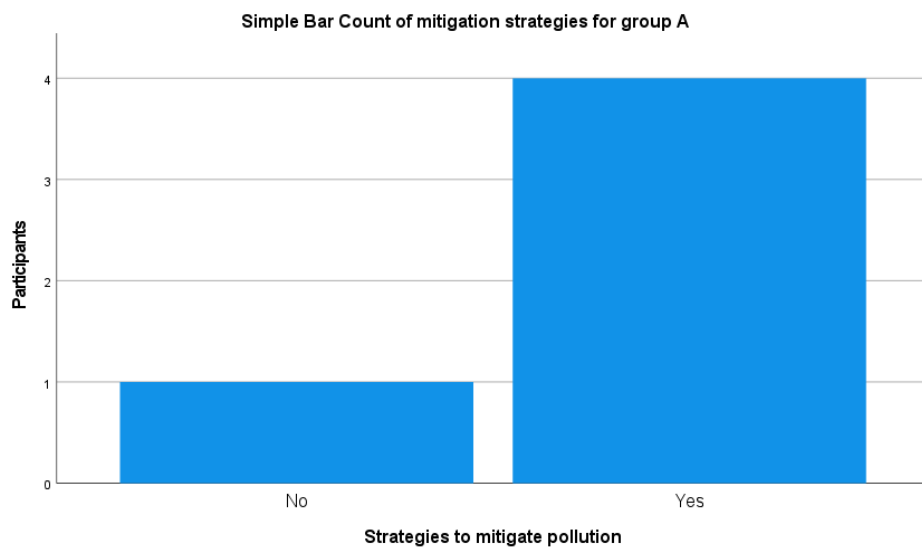


In regards to regulations, governing artisanal mining in Rosa, focus group discussion A pointed out that the Mines and Minerals Act, as a law that regulate mining activities. However, the effectiveness of this regulation in mitigating environmental impacts of artisanal mining is limited due to lack of proper enforcement. As a result, environmental impacts persist, and the regulations are not effectively mitigating the negative effects of small-scale artisanal mining in Rosa.





In relation to the mitigation of environmental impacts, both focus groups, comprising of Rosa residents and WNRM, converged on potential strategies and opportunities to mitigate the environmental impacts of small-scale artisanal mining. Strategies included providing alternative livelihoods, environmental education, regulatory enforcement, rehabilitation of degraded lands, and community-led management. Opportunities for sustainable mining practices, eco-tourism, agricultural development, collaboration with NGOs, and access to finance were also identified. Notably, both focus groups emphasized the importance of empowering local communities and promoting sustainable practices, highlighting a shared commitment to environmental conservation and community development.



4.10 SUMMARY

This section of the study provided a presentation and analysis of the data collected in the enquiry through questionnaires, interviews and focus group discussions. Charts, tables and graphs were used to present the data. The next chapter will now provide the summary, conclusions drawn from the study and recommendations.

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CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 INTRODUCTION

This chapter aims at interpreting and analysing the findings presented in the previous chapter, examining their importance within the context of the study's objectives. By synthesizing results with theoretical frameworks, such as the Environmental Kuznets Curve (EKC) and Human-Environment Interaction (HEI) theory, this discussion highlights key challenges, trends and opportunities relevant to small-scale artisanal mining in Rosa area, Chiweshe Communal Lands, Zimbabwe.

5.2 DISCUSSION OF INFORMATION GATHERED FROM QUESTIONNAIRES

Pertaining to the response rate, the respondents who did not return the questionnaires, though a minority represents a small gap in data collection that should be acknowledged. While the overall response rate of 97.25% is notably high and ensures that the findings are credible and representative, the 5% of Rosa community residents who did not return questionnaires may

indicate certain underlying factors affecting participation. Possible reasons for non-response include lack of time, unwillingness to disclose information, literacy barriers, or scepticism about the study's objectives. Although their absence does not significantly compromise the validity of the study, it is important to recognize that non-respondents may hold perspectives that differ from those who participated. If their views diverge considerably, their absence might create a slight bias in the findings.

In regards to gender responses, the data gathered shows that the participation ratio of males (53%) and females (43%) in the study is relatively close, ensuring that both genders were represented and their views were included in the findings. While the slight disparity may stem from cultural and social dynamics in rural Zimbabwe, where traditional patriarchal norms often shape participation in public and environmental matters, it is important to recognize the significance of both genders contributing to the research. The difference in participation rates though noticeable, does not diminish the credibility of the findings or create a significant bias, as both perspectives were adequately represented. This balanced representation contributes to the reliability of the study and ensures that the results reflect a diverse range of opinions and experiences.

In relation to age dynamics, the age distribution of respondents reflects a diverse representation of age groups ensuring a balanced perspective of different generations. The majority participation from individuals between 43 and 47 years of age (20%) suggests that middle-aged adults play a significant role in engaging with the study's themes, potentially due to their extensive experience in the community and environmental concerns. The notable presence of younger respondents, such as the 15% in the 23-27 age groups indicates a level of involvement among younger demographics, possibly influenced by educational awareness or direct economic ties to artisanal mining. Although participation declines slightly in older age brackets (with 5% between 58-62 years and 10% above 63 years), their involvement ensures that insights from long-standing community members are included. This mix of respondents from various age groups enriches the study by integrating perspectives from different stages of life, helping to provide a comprehensive understanding of the environmental and socio-economic impacts of small-scale artisanal mining in Rosa area, Chiweshe Communal Lands.

The data on the tenure of Ward Natural Resource Monitors (WNRMs) reflects a significant level of experience among respondents. The even split- 50% with 6-10 years of experience and 50% with 16-20 years of experience suggests a well-balanced workforce with both relatively newer and

highly seasoned monitors. The presence of experienced individuals is valuable for managing small-scale artisanal mining's environmental impacts, as they can draw on their historical observations to identify changes, enforce regulations, and educate local miners on sustainable practices. The residency data of communities indicates a long-term presence of respondents in Rosa mining area, with 40% having lived there for 16-20 years, while the majority (60%) has been residents for 21 years or more. This significant tenure suggests that most individuals in the community have developed deep-rooted connections with the environment and local mining activities. Such long-term residency is valuable in assessing the environmental impacts of artisanal mining, as these individuals possess first-hand knowledge of ecological changes, land use patterns, and socio-economic shifts over time. Their extended stay implies that they may have witnessed both the benefits and challenges associated with mining, contributing informed perspectives to the study.

5.3 DISCUSSION OF INFORMATION GATHERED FROM INTERVIEWS

5.3.1 FORMS OF ENVIRONMENTAL DEGRADATION IN ROSA MINING AREA

The data gathered presented various forms of environmental degradation prevalent in the Rosa area, highlighting key concerns such as gulling (30%), river bank panning and siltation (20%), deforestation (13%) and poisoning of water bodies through cyanide and other chemicals (7%). According to Grossman and Krueger (1990), the EKC suggests that environmental degradation initially increase with economic activities but eventually declines as economies mature and implement better environmental regulations and technologies. Therefore, in the case of Rosa mining area, the high prevalence of gullies, river siltation, and land pollution indicates that the mining community is in the early stage of the EKC, where environmental damage intensifies due to unregulated exploitation of resources. From an HEI perspective, the information highlights direct human intervention in the ecosystem through artisanal mining. These findings emphasize the urgent need for harmonized resource management in Rosa, because, Redman (1999) argues that unless adaptive strategies – such as land rehabilitation, water conservation measures and community-based regulations are implemented, the degradation will continue to impact livelihoods and ecosystems negatively. The picture below shows a gulley that developed as a result of the mining activities:



Picture 1: Shows a gully developed as a result of unchecked mining activities

5.3.2 ARTISANAL MINING AS A CAUSE OF ENVIRONMENTAL DEGRADATION

The findings highlight that artisanal mining is a chief cause of environmental degradation in the Rosa mining area. Among the most prevalent issues is the pollution of water bodies, accounting for 32% of the recorded environmental damage. This underscores the substantial role that mining activities play in contaminating local water sources, posing risks to both aquatic ecosystems and human health (Heller, 2015). Land degradation, making up 23% of the impact, further reflects how unregulated resource extraction leads to soil erosion and loss of arable land, ultimately affecting agricultural productivity and biodiversity. HEI theory contextualizes these findings by emphasizing the reciprocal relationship between human activities and the environment. Mining is deeply embedded in the livelihood of Rosa residents, yet its consequences such as river siltation (9%), unsanctioned dumping (14%), and deforestation (4%), illustrate how unchecked exploitation disrupts ecological balance. Hilson (2010) asserts that human actions directly shape the landscape, affecting water availability, soil stability air quality. In return, these environmental changes impact

the sustainability of mining itself, forcing communities to adapt increasingly fragile ecosystems. Henceforth, Lambin and Geist (2006) assert that if mitigation strategies are not implemented, ongoing environmental degradation will reduce resource availability and threaten long-term economic viability. The picture below shows a degraded land as a result of mining activities:



Figure 5: shows a gully erosion

5.3.3 MEASURES TO CURB ENVIRONMENTAL DEGRADATION IN ROSA

The largest segment (29%) reflects efforts to engage community and traditional leaders, emphasizing the importance of leveraging local authority and influence to drive environmental conservation initiatives. This measure, according to Moran (2010), aligns well with the principles of HEI theory, which highlights the significance of social structures in shaping sustainable practices. Community awareness campaigns, accounting for 19%, suggest a focus on educating residents about the environmental impacts of artisanal mining and promoting environmentally friendly behaviours. Such campaigns are crucial for fostering a sense of responsibility and encouraging collective action, which is in-line with the EKC framework. Thus, by increasing

environmental awareness, the community can potentially make a transition toward reduced degradation as socio-economic conditions improve. The heightened policy 9% reflects efforts to enforce environmental regulations and deter illegal or harmful practices. While enforcement is a critical component, its relatively low emphasis suggests the policing alone maybe insufficient without broader community engagement and education. Similarly, the small allocation to community environmental committees (5%) could be expanded to strengthen participatory governance and ensure that local voices are actively involved in decision-making processes. The distribution of measures demonstrates a multifaceted approach to addressing environmental degradation in Rosa.

5.3.4 EFFECTIVENESS OF STRATEGIES CURBING ENVIRONMENTAL DEGRADATION IN ROSA

The data presented signals that while certain strategies show promise, their effectiveness is yet to reach a level where they can be considered transformative (Ostrom, 2009). 25% of respondents expressed dissatisfaction, indicating that the implemented strategies have not resulted in substantial changes. Issues like water body pollution, land degradation, and deforestation remain pervasive, highlighting ongoing challenges in curbing environmental harm. This perspective underscores a gap between strategy implementation and its tangible impact on the environment, suggesting that more comprehensive approaches may be needed. The small scale of success points to the need for stronger interventions, such as stricter enforcement, broader community engagement, and targeted support for sustainable mining practices. While 5% of respondents see the strategies as successful, pointing to specific improvements like responsible litter disposal, gully filling, and land reclamation initiatives by groups such as Rosa Mining Syndicate and Rosa 10 Syndicate, this sentiment represents a minority. However, the efforts are notable as they show a growing awareness of sustainable practices among some stakeholders. To make meaningful progress, stakeholders must address these grey areas comprehensively, ensuring that environmental protections are robust and effectively applied across all mining activities in the area (Smith et al 2016). Heller (2015) holds that this gradual process, though minimal, could lay the foundation for larger-scale improvements in the future.

5.3.5 POSSIBLE SOLUTION TO THE ENVIRONMENTAL CHALLENGES IN ROSA AREA

The most strongly supported measures, each with approximately 30% backing, are the prosecution with heavy penalties for perpetrators and the establishment of Environmental Management

Authority (EMA) and Forestry offices in Rosa. This suggests that residents emphasize both strict enforcement and the establishment of local institutions as critical to addressing environmental challenges effectively. These preferences highlight a demand for enhanced accountability and localized regulatory presence, both of which align with addressing systemic issues in managing artisanal mining impacts. The strengthening of community environmental committees, with 15% support, also reflects the importance of empowering local actors to take a centre stage in conservation and environmental governance. This measure aligns closely with HEI theory, emphasizing community-based engagement to foster sustainable practices. The presence of the Ward Natural Resource Monitors (WNRMs), underscores the need for additional on-the-ground personnel to monitor and enforce environmental protections. The emphasis on empowering traditional leaders to prosecute offenders (15%) reflects the community's recognition of the cultural and traditional structures in enhancing compliance and sustainable practices. The long and short, the graph suggests that community members value both top-down regulatory measures and bottom-up participatory approaches (Heller, 2015), which when effectively implemented could facilitate a sustainable balance between mining activities in Rosa area and environmental conservation.

5.4 DISCUSSION OF INFORMATION GATHERED FROM FOCUS GROUP DISCUSSIONS

5.4.1 ENVIRONMENTAL KUZNETS CURVE (EKC) PERSPECTIVE

The EKC framework suggests that environmental degradation typically increases during the early stages of economic activity but eventually declines as societies reach higher levels of income and environmental awareness (Stern, 2004). However, the research in Rosa reflects that the area is still in the early phase of this curve, where exploitation of resources is prioritized over environmental concerns. Issues like soil erosion, deforestation and toxic water pollution demonstrate the heavy toll of unregulated mining. The limited enforcement of the Mines and Minerals Act further hinders progress toward the EKC's turning point where sustainable practices could be adopted. As the findings show partial efforts toward land reclamation and rehabilitation, they hint at a gradual movement toward sustainable mining, though the progress remains insufficient to reverse the environmental damage.

5.4.2 HUMAN-ENVIRONMENT INTERACTION (HEI) THEORY PERSPECTIVE

The findings from the focus group discussions align closely with the HEI theory, which emphasizes the interconnected relationship between human activities and the environment (Moran, 2010). According to Ostrom (2009), artisanal mining disrupts ecosystems through deforestation, gully formation, and sedimentation in local water bodies, showing how human intervention alters natural landscapes. The focus groups underscore the degradation of soil structure and biodiversity, indicating a feedback loop where environmental harm negatively affects agricultural productivity, water availability and community health. While some syndicates are adopting responsible practices, such efforts are sporadic, leaving critical areas like water pollution and air quality largely unaddressed. The picture below shows mining activity which is also causing stone quarrying:



Figure 6: shows a mining hole, which is still in its early phase

5.4.3 REGULATORY AND MITIGATION EFFORTS

The effectiveness of the Mines and Minerals Act emerges as a key point of concern. The lack of proper enforcement allows environmental impacts to persist, revealing a gap between policy intent

and execution. Both focus groups identified strategies for mitigation, including alternative livelihoods, environmental education, and rehabilitation of degraded lands, all of which emphasize the importance of empowering local communities to actively participate in conservation. These strategies align with HEI's emphasis on adaptive management and highlight a shared commitment to sustainable development.

5.4.4 OPPORTUNITIES FOR SUSTAINABILITY

The findings further identify opportunities for sustainability, such as ecotourism, agricultural development and collaboration with NGOs. These initiatives hold promise for transitioning artisanal mining toward environmentally responsible practices. However, the gradual pace of change signals the need for stronger enforcement, targeted funding and community-driven solutions to ensure these opportunities are realized effectively.

5.5 SUMMARY

The findings highlight the intersection of economic activities, environmental risks and community responses within the Rosa area. While partial improvements suggest progress, the persistence of critical challenges like water contamination and deforestation underscores the need for more coordinated, effective strategies informed by both EKC and HEI frameworks. The following chapter will conclude the research and proffer recommendations.

CHAPTER SIX

SUMMARY AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter will summarize the research as presented and discussed in the preceding chapters. The chapter will also draw the conclusion and recommendations basing on the research findings in regards to small-scale artisanal mining in Rosa area. Recommendations propose to change artisanal small-scale mining into sustainable mining.

6.2 SUMMARY

The research investigated the impacts of small-scale artisanal mining in Rosa, Chiweshe Communal Lands, Zimbabwe, identifying significant ecological challenges caused by unregulated mining practices. Artisanal mining, while economically vital for local communities, has resulted in deforestation, soil erosion, and air pollution, posing considerable risks to biodiversity, agricultural productivity and human health. The study aimed at assessing these impacts and evaluating the effectiveness of existing regulatory measures. The research mainly focused on bridging the gap between economic benefits and ecological preservation.

Grounded in the Environmental Kuznets Curve (EKC) and Human-Environment Interaction (HEI) theories, the research contextualizes the findings within broader environmental and developmental frameworks. The EKC theory suggests that environmental degradation increases during early economic growth stages but eventually declines with rising income levels and environmental awareness. Rosa's situation, however, reflects the early stages of this curve, where significant ecological harm occurs due to limited regulatory oversight and unsustainable resource exploitation. Meanwhile, the HEI theory highlights the reciprocal relationship between human activity and the environment, illustrating how artisanal mining has altered ecosystems, disrupted water flows, degraded soil quality and reduced forest cover. The feedback loop created by human-interactions is evident in the study's findings, as environmental degradation also negatively affects the socio-economic conditions of the Rosa community.

The study employed a mixed-methods approach combining quantitative and qualitative data to provide a well-rounded perspective. Data was gathered through questionnaires, interviews and focus group discussions with the Ward Natural Resource Monitors (WNRMs) and local residents. The WNRMs were purposively selected because of their paramount information in regards to ecological issues affecting Rosa area, while local residents were conveniently sampled. This comprehensive methodology allowed the research to capture detailed insights into the environmental impacts of mining in the region.

The findings revealed a range of environmental challenges attributed to artisanal mining. Deforestation and land degradation were identified as significant issues, with vegetation cleared for mining activities, leaving land prone to erosion and reducing biodiversity. Water pollution emerged as another critical concern, with the use of mercury and other chemicals contaminating local water sources, impacting both aquatic ecosystems and human health. Soil pollution and air quality deterioration were also highlighted, with heavy metals and dust contributing to further environmental decline. The findings revealed that despite the adoption of strategies like waste management and land reclamation by certain mining syndicates, challenges such as water body pollution and air pollution persist, and regulatory enforcement remains weak.

The study however emphasized the need for robust mitigation strategies, including alternative livelihoods for miners, environmental education, community-led management, and stricter enforcement of regulations. Both focus groups comprising of Rosa residents and WNRMs identified opportunities for sustainable practices such as eco-tourism, agricultural development,

collaboration with NGOs, and financing conservation projects. Empowering local communities to adopt sustainable practices and enforcing environmental laws more rigorously are vital steps toward mitigating mining-related degradation.

6.3 CONCLUSION

The study established that small-scale artisanal mining in Rosa has caused extensive environmental harm, including deforestation, land degradation, water and air pollution, and soil erosion. These impacts pose serious risks to agricultural productivity, biodiversity and community health. Despite partial improvements in land reclamation by certain mining syndicates, critical issues like water contamination and air pollution persist, emphasizing the need for more effective interventions.

The research highlighted that while the Mines and Minerals Act exists to regulate mining activities, its enforcement has proven inadequate in mitigating environmental impacts. Weak regulatory mechanisms have allowed ongoing degradation, highlighting the gap between policy formulation and implementation. Strengthening enforcement and empowering local institutions are crucial to achieving meaningful environmental protection.

The study attested that addressing mining-related environmental challenges requires a multifaceted approach that integrates policy enforcement, community engagement, sustainable livelihood alternatives and technological advancements. A singular focus on regulation or policing is insufficient, instead, comprehensive strategies involving rehabilitation programs, eco-friendly mining practices, and partnerships with non-governmental organizations can pave way for meaningful environmental improvements.

The research validated the importance of local engagement in promoting sustainable mining practices. While external regulations are necessary, grassroots involvement through traditional leadership, environmental committees, and awareness campaigns- plays a fundamental role in shaping conservation efforts. Strengthening community-led initiatives can ensure long-term ecological protection while balancing economic needs.

6.4 RECOMMENDATIONS

Basing on the findings of the research on small-scale artisanal mining in Rosa area, the researcher recommends the following:

6.4.1 TO THE WARD NATURAL RESOURCES MANAGERS

- Use advanced tools and technology, such as Geo-Positioning Systems (GPS) mapping and drones, to monitor changes in land use and environmental degradation more efficiently.
- Organize workshops and seminars for miners, focusing on eco-friendly techniques and safer chemical usage.
- Advocate for the adoption of greener mining methods, such as reduced chemical usage and mechanized equipment that minimizes land disturbance.
- Establish environmental committees within the Rosa community to enable grassroots participation in conservation efforts.

6.4.2 TO THE ENVIRONMENTAL MANAGEMENT AGENCY

- Ensure strict implementation of the Mines and Mining Act by increasing monitoring and inspection of mining activities.
- Set up EMA offices in Rosa to provide on-the-ground support, ensuring timely monitoring and enforcement of environmental regulations.
- Implement large-scale reforestation programs to restore deforested areas and improve biodiversity.
- Promote skill development initiatives to help miners diversify their sources of livelihood, reducing pressure on natural resources.

6.4.3 TO THE COMMUNITIES

- Participate actively in environmental campaigns and share knowledge on conservation within households and the wider community.
- Work closely with traditional leaders, WNRMs and other stakeholders to ensure adherence to environmental guidelines.
- Explore and adopt alternative income-generating activities such as agriculture, eco-tourism or small-scale businesses, to reduce reliance on artisanal mining.
- Report illegal mining activities and violations of environmental laws to authorities, ensuring accountability for harmful practices.

6.5 AREAS FOR FURTHER STUDY

The study interrogated the effects of artisanal mining using Rosa area as a case study. Therefore, further researches may focus on viable alternative livelihood options for communities reliant on

artisanal mining, as well as to problematize technological feasibility for small-scale operations in Rosa.

REFERENCES

- Adams, L.P.K (2015). *Ecosystem Services and their Role in African Biodiversity Conservation*. Ecological Economics.
- Brugger, E (1998). *Challenges for the new millennium in Latin America: Sustainable development, competitiveness and second-generation reforms*. Andean Development Corporation (CAF). Santafe de Bogota. Colombia
- Bryceson, E (2010) African minerals and Geopolitics. Routledge. Toronto.
- Bryceson, E (2010) African minerals and Geopolitics. Routledge. Toronto.
- Campbell, B. (2013). Introduction: Modes of governance and the restructuring of the African mining sector. In B. Campbell (Ed.), *Modes of governance and the restructuring of the African mining sector*. Palgrave Macmillan

Castro, A. (2017). *The exploitation of artisanal and small-scale miners in Mozambique. Extractive Industries and Society.*

Chuma, M (2017) "Environment impacts of artisanal in South Africa." Journal of Environmental Science and Health, Part C,

Chuma, M (2017) "*Environment impacts of artisanal in South Africa.*" Journal of Environmental Science and Health, Part C,

Chuma, T, Field, L and Mutemeri, N (2016)

Chuma, T, Field, L and Mutemeri, N (2016)

Conservation Biology Journal.

Creswell, B.L (2012). *Social Research Methods.* Longman. Sussex.

Creswell, J (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches,* Pearson Education. Toronto. Sage Publications. New York.

Diaz-Silveira, C. (2017). "Artisanal and small-scale mining in Africa: A review of the literature."

Dinda, S. (2004). Environmental Kuznets Curve Hypothesis: A Survey. *Ecological Economics*, 49 (4)

Dunn, W (2013). *Public Policy Analysis.* McGraw Hill. Toronto

Dzoro, M, Mashapa, C and Gandiwa, E. (2023) Impact of Artisanal gold mining on woody vegetation in Chiwore South Safari, Northern Zimbabwe on www.sciencedirect.com

Dzoro, M, Mashapa, C and Gandiwa, E. (2023) *Impact of Artisanal gold mining on woody vegetation in Chiwore South Safari, Northern Zimbabwe* on www.sciencedirect.com

Feyissa, J.T. (2017) "Environmental impacts of Artisanal mining in Tanzania" Journal of Environmental Science and Health, Part C, 35(1), 1-13

Feyissa, J.T. (2017) "*Environmental impacts of Artisanal mining in Tanzania*" Journal of Environmental Science and Health, Part C, 35(1), 1-13

Fisher, E. (2007). *Occupying the margins: Labour integration and social exclusion in artisanal mining in Tanzania.* Development and Change

- Grossman, G.M. & Krueger, A.B. (1995). Economic growth and the environment. *The Quarterly Journal of Economics*, 110 (2), pg. 353-377
- Hajer, M (2009). *The politics of environmental discourse*. Oxford. Claredon.
- Heller, K. (2015). Sustainable small-scale gold mining: Challenges and opportunities. *Journal of Cleaner Production*
- Hentschel, T., & Priester, M. (2004). Small-scale gold mining: An ambiguous industry. Focal
- Hilson, A. (2019). *Why is there a large-scale artisanal and small-scale mining policy vacuum in sub-Saharan Africa?* Resources Policy
- Hilson, G. (2002) “An overview of land use conflicts in mining communities.” *Land Use Policy*, 19(1), 65-73
- Hilson, G. (2002) “*An overview of land use conflicts in mining communities.*” *Land Use Policy*, 19(1), 65-73
- Hilson, G. (2010). *Once a miner, always a miner: Poverty and livelihoods in artisanal and small-scale mining*. Practical Action Publishing
- Hoadley, M. & Limpitlaw, D. (n.d.) *The artisanal and small-scale mining sector and sustainable livelihoods*. University of Witwatersrand, Johannesburg: South Africa
- IDB (1996). *Environmental Management in the Southern Cone*. IDB
- Kareiva, D. P (2023). *Conservation in the Anthropocene*. Trends in Ecology and Evolution.
- Kareiva, D.P (2017). *Conservation Strategies for the Anthropocene: A Global Perspective*. Frontiers in Ecology and the Environment.
- Keane, S. (2008). The impact of mercury on health in gold mining regions. *International Journal of Occupational and Environmental Health*
- Keeley, J and Scoones, I (1999). *Understanding environmental policy processes: a review*. IDS Working Paper 89
- Kumar, J.S (2015) “Assessing environmental of artisanal gold mining in Ghana.” *Journal of Environmental Science and Health, Part C*, 33(1), 1-13.

- Kumar, J.S (2015) "*Assessing environmental of artisanal gold mining in Ghana.*" Journal of Environmental Science and Health, Part C, 33(1), 1-13.
- Kvale, S (2007). *Doing Interviews*. Sage Publications. London
- Lahiri-Dutt, S (2015) Women's lived experiences in the small-scale mining sector. ANU Press. New Delhi.
- Lahiri-Dutt, S (2015) Women's lived experiences in the small-scale mining sector. ANU Press. New Delhi.
- Lazier, T. (2020) "Cultural significance of artisanal mining in Tanzania." Journal of Cultural Heritage, 41, 102-113
- Laizer, T. (2020) "*Cultural significance of artisanal mining in Tanzania.*" Journal of Cultural Heritage, 41, 102-113
- Lambin, E.F. & Geist, H.J. (2006). *Land-Use and Land-Cover Change: Local Processes and Global Impacts*. Springer
- Maponga, O. (2017). "Environmental impacts of artisanal and small-scale mining in Zimbabwe."
- Mkodzongi, G. (2018). "Artisanal gold mining in Zimbabwe: A review of the environmental and social impacts."
- Moran, E.F. (2010). *Human-Environment Interactions: Current and Future Directions*. Springer
- Msingo, M.M (2019) "The role of artisanal mining in rural development in South Africa." Journal of Rural Studies.
- Msingo, M.M (2019) "*The role of artisanal mining in rural development in South Africa.*" Journal of Rural Studies.
- Munoz, Y (2016). *Free trade and environmental policies in Latin America Environmental policies*.UK
- Mwaipopo, R.M (2018) 'The economic benefits of artisanal mining in Tanzania.' Journal of sustainable mining, 18 (2), 53 -64

- Mwaipopo, R.M (2018) '*The economic benefits of artisanal mining in Tanzania.*' Journal of sustainable mining, 18 (2), 53 -64
- Naeem, S. (2013) Encyclopaedia of Biodiversity. Longman. London.
- Naeem, S. (2013) Encyclopaedia of Biodiversity. Longman. London.
- Nhlengetwo, S. S. (2020) "The Impact of artisanal mining on local communities in South Africa." Journal of Community Development.
- Nhlengetwo, S. S. (2020) "*The Impact of artisanal mining on local communities in South Africa.*" Journal of Community Development.
- Nyavaya, K. (2021). *Zimbabwe's rugged artisanal and small-scale mining sector*. Rosa Luxemburg Stiftung
- OECD (2000). *Donor support for institutional capacity development in Environment*. Evaluation and Effectiveness. OECD. Paris
- Ostrom, E. (2009). A General Framework for Analysing Sustainability of Social-Ecological Systems. *Science*, 325 (5939), pg. 419-422
- Panayotou, T. (1993). *Empirical tests and policy analysis of environmental degradation at different stages of economic development*. Geneva: international Labour Organization
- Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press
- Russell, C.S and Powell, T (2017). *Choosing Environmental Policy Tools: Theoretical cautions and practical considerations*. IADB. Washington
- Saunders, M. Lewis, P and Thornhill, A (2016). *Research Methods for Business Students*. New York.
- Schowalter, T.D (2022) Species Diversity on www.sciencedirect.com
- Schowalter, T.D (2022) Species Diversity on www.sciencedirect.com
- Smith H.A.J.R.K (2022). *Biodiversity Conservation in Africa: Challenges and Strategies*. Conservation Biology Journal.

Smith, N.M., Ali, S., Bofinger, C. & Collins, N. (2016). Human health and safety in artisanal and small-scale mining: an integrated approach to risk mitigation. *Journal of Cleaner Production*, 129 (2016), pg. 43-52

Stern, D.I. (2004). The rise and fall of the Environmental Kuznets Curve. *World Development*, 32 (8), pg. 1419-1439

Teschner, B.A (2017) “Cultural heritage and artisanal gold mining in Ghana.” *Journal of Cultural Heritage*, 26, 102-113

Teschner, B.A (2017) “*Cultural heritage and artisanal gold mining in Ghana.*” *Journal of Cultural Heritage*, 26, 102-113

Thompson, P.K (2016). *Restoration Ecology: Principles and Practices in Africa*. Trends in Ecology and Evolution.

Tuomisto, H (2017) *Module in Life Sciences*. McGraw-Hill. Toronto.

Tuomisto, H (2017) *Module in Life Sciences*. McGraw-Hill. Toronto.

Williams, J.F (2023). *Climate Change Impact on African Ecosystems*. Global Change Biology.

Wilson, J. W and Primack, R.B (2019). *Conservation Biology in Sub Saharan Africa*.

Zerner, J (1999). *Justice and Conservation*. The Rainforest Alliance. New York Zimstats

APPENDICES

APPENDIX 1:

QUESTIONNAIRE FOR WARD NATURAL RESOURCES MONITORS

Dear Respondent,

My name is Tinotenda Brown and am doing my final year in B. Sc SHEM with the Bindura University of Science Education. As part of my studies I am carrying out a project entitled “An

assessment on the environmental impacts of small-scale artisanal miners in rural Zimbabwe: A case of Rosa area in Chiweshe Communal Lands.” Please assist me make this study a success by answering provided in this questionnaire.

Please note that you do not have to identify yourself by either name or any identity. Your responses in this study will be treated with utter most confidentiality and will be used only for this enquiry and nothing more.

Yours Sincerely

.....

TINOTENDA BROWN

Section A: Personal Details

Please tick in the correct box or fill in your information in the spaces provided.

- 1. **Gender:** Male ☐ Female ☐
- 2. **Age:** (state) years
- 3. **Experience in as WNRM:** years

Section B

- 4. Do you have challenges of environmental degradation in your area?
Yes ☐ No ☐
- 5. What are the most common forms environmental degradation in the area you operate in?

6. Are the issues you have raised above linked to artisanal mining taking place in your area?

Strongly Agree	Agree	Disagree	Strongly Disagree

7. If your answer above is **Agree** or **Strongly Agree** explain how artisanal mining in your area is causing environmental degradation?

8. What measures have you put in place to try and stop the environmental degradation taking place in your area?

9. Have the measures you have put into place effective?

Yes, No Partially

10. If your answer above is not **yes** explain WHY?

11. What do you think should be done to effectively ensure that the negative impacts of artisanal mining are reduced on the environment in your area?

APPENDIX 2:

QUESTIONNAIRE FOR ROSA RESIDENTS

Dear Respondent,

My name is Tinotenda Brown and am doing my final year in B. Sc SHEM. With the Bindura University of Science Education. As part of my studies I am carrying out a project entitled “*An assessment on the environmental impacts of small-scale artisanal miners in rural Zimbabwe: A case of Rosa area in Chiweshe Communal Lands.*” Please assist me make this study a success by answering provided in this questionnaire.

Please note that you do not have to identify yourself by either name or any identity. Your responses in this study will be treated with uttermost confidentiality and will be used only for this enquiry and nothing more.

Yours Sincerely

.....

TINOTENDA BROWN

Section A: Personal Details

Please tick in the correct box or fill in your information in the spaces provided.

1. **Gender:** Male ☐ Female ☐
2. **Age:** (state) - years
3. **Period of staying in Rosa:** years

Section B

4. Do you have challenges of environmental degradation in your area?

Yes ☐

No ☐

5. What are the most common forms of environmental degradation in the area you operate in?

6. Are the issues you have raised above linked to artisanal mining taking place in your area?

Strongly Agree	Agree	Disagree	Strongly Disagree
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7. If your answer above is **Agree** or **Strongly Agree** explain how artisanal mining in your area is causing environmental degradation?

8. What measures have been put in place to try and stop the environmental degradation taking place in your area?

9. Have the measures have put into place effective?

you

Yes,

No

Partially

10. If you answer above is not **yes** explain WHY?

11. What do you think should be done to effectively ensure that the negative impacts of artisanal mining are reduced on the environment in your area?

Appendix 3:

INTERVIEW QUESTIONS FOR BOTH WNRMS AND ROSA RESIDENTS

1. Do you have challenges of environmental degradation in your area?
2. What are the most common forms environmental degradation in the area you operate in?

3. Are the issues you have raised above linked to artisanal mining taking place in your area?
4. If your answer above is **Yes** explain how artisanal mining in your area is causing environmental degradation?
5. What measures have been put in place to try and stop the environmental degradation taking place in your area?
6. Have the measures put place been effective in curbing environmental degradation in your area?
7. If you answer above is **no** explain WHY?
8. What do you think should be done to effectively ensure that the negative impacts of artisanal mining are reduced on the environment in your area?

Appendix 4:

Focus Group Discussion Questions for WNRM

1. How do you think small-scale artisanal mining has impacted the environment in Rosa?
2. Are there any specific environmental concerns or hazards associated with mining in Rosa?

3. What environmental changes have you observed in Rosa since the onset of small-scale artisanal mining, be it in soil structure, local water body sources and vegetation?
4. How have mining activities impacted local livelihoods, such as farming, livestock, or other economic activities?
5. Are there any existing regulations or laws governing small-scale artisanal mining in Rosa? If **yes**, how effective are these regulations in mitigating environmental impacts?
6. What strategies or solutions do you propose to mitigate the environmental impacts of small-scale artisanal mining in Rosa?

Appendix 5:

Focus Group Discussion Questions for Rosa Residents

1. Have you noticed any changes in the land or environment in Rosa over the past few years?
2. Have you heard any ways in which human activities can harm the land?
3. Have you seen any signs of land degradation in Rosa, such as soil erosion, deforestation, or water pollution?
4. Have you seen any mining activities taking place in Rosa area?
5. Do you think that small-scale artisanal mining could be harming the environment in Rosa?
6. Are there any alternative livelihoods or economic opportunities that could reduce dependence on mining?
7. Is there anything that you would like to share or discuss further about land degradation and small-scale artisanal mining in Rosa?