

IMPACTS OF BLACK GRANITE QUARRYING ON HOUSEHOLD INCOME AND FOOD SECURITY: A CASE STUDY OF MUTOKO DISTRICT IN ZIMBABWE.

BY

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(FINAL DRAFT)

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The undersigned people certify that they read and recommend to Midlands State University to accept a dissertation entitled “Impacts of black granite quarrying on household income and food security: A case study of Mutoko district in Zimbabwe” submitted by r151159t in partial fulfilment of the Bachelor of Science in Geography and Environmental Studies.

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Dedication

I dedicate this research project to the Sibanda Family and Miss M Rangai.

Acknowledgement

Firstly, I thank God for guiding me throughout this research study. Heartfelt gratitude goes to my supervisor Dr C. Madebwe. Thank you for your professional guidance and tireless effort throughout the development of this research. Special thanks to Miss M Rangai for your infinite support from the commencement of this research.

Abstract

The purpose of this study was to assess the impacts of black granite quarrying on household income and food security in Mutoko district. The researcher adopted a case study research design and used two methods of sampling that is purposive sampling and census sampling. Research instruments used were questionnaires, interview guides and an observation check list. Research findings were that black granite quarrying was contributing to household income only to the employed households. Main beneficiaries of increased household income from black granite quarrying were male headed families which were employed in greater numbers compared to female headed families. Quarry salaries had managed to raise the food security status for employed households as households had managed to buy extra food stuff from Harare while other households had purchased farm inputs like fertilisers and maize seeds. However the situation was very different for the non employed households. These are the households who rely on agriculture for accessing food and household income. Quarrying activities like forest clearing was affecting their access to non agricultural sources of food, blasting processes during the excavation stage affected underlying granite rock which had a bearing on availability of underground water necessary for agricultural purposes. In conclusion quarrying is negatively impacting household income and food security in Mutoko district. Some of the recommendations included employment of all the locals who were affected by the land eviction process and raising salaries for locals.

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List of acronyms

AIDS	Acquire immune deficiency syndrome
AGRITEX	Agricultural Extension Services
BECT	Budya environment conservation trust
EMA	Environmental Management Agency
FAO	Food Agricultural Organization
GDP	Gross domestic product
HIV	Human immune-deficiency virus
MMCZ	Mineral Marketing Corporation of Zimbabwe
NGO	Non-Governmental Organisation
SPSS	Statistical Products and Services Solutions
STI	Sexually transmitted illness
UN	United Nations
WFP	World food program
ZELA	Zimbabwe environmental law association
ZIMASSET	Zimbabwe Agenda For Sustainable Socio-Economic Transformation

Chapter One: Introduction

1.1 BACKGROUND OF THE STUDY

The Universal Declaration on human rights (1948) article 25 recognises the right of every individual to have a standard of life adequate for a healthy life. This is facilitated by the ability of every individual to have physical, social and economic access to adequate food (Food Agricultural Organisation (FAO 2001).

FAO (2001) states that food security at individual, household, national, regional and global level is achieved when all people at all times have physical, social and economic access to adequate, safe and nutritious food in order to meet their dietary needs and food preferences, for an active and healthy life. At household level food security is achieved when the household has the ability to secure food either from its own produce or purchase, to meet the dietary needs of every family member (FAO 2010). In order for food security to be achieved at any level, food has to be available, accessible and capable of being utilized, either from fields, water bodies, forests, wetlands, animals and soils.

Zimbabwe is experiencing food insecurity both at national and household levels (World Food Programme 2017). The World Food Programme (2017) noted that 4.1 million people in Zimbabwe were estimated to be food insecure due to the El Nino induced drought. A number of reasons are contributing to the food insecurity situation of the nation. Some of them are climate variability and climate change, poverty and unemployment and chiefly unsustainable land use (Global Hunger Index 2016).

Zimbabwe has 4.3 million hectares of arable land with only 2.8 million hectares under cultivation (United Nations 2015). Agriculture has remained the only major source of household income for many Zimbabweans since 1980. Food insecurity in Zimbabwe is high in rural communities largely due to unsustainable land uses. With the rise in the mining sector over the past decade, most rural communities are still experiencing land transformation with agricultural lands being turned into mines and quarries (Chigonda 2010). The agriculture sector contributes 16 % to the economy (United Nations 2015), while the mining sector contributes more than half to the economy. The latter's contribution to the economy was expected to rise by 5.1 % in

2017 (Majaka 2017).

In Africa major producers of black granite are Botswana, Malawi, Tanzania, Mozambique and Namibia. In other parts of the world China, India, Canada, Brazil, Italy and United States of America also produce and supply vast amounts of black granite to the international market (Demarco, Pedro, Karl and Siegfried 2011).

Black granite from Zimbabwe fetches very high prices and has a broad international market, for example Germany, Italy and Spain (News day 2015). Nero Assoluto a Zimbabwean black dimensional stone was used in the construction of a Footbridge in Bad Homburg Germany (Demarco et al 2011). According to Saunyama (2015), Zimbabwe Mines and Mineral act (21:05), transformed black granite from being a resource into a mineral in 1990. This was due to the high prices the rock was fetching on the international market. Black granite is a major source of revenue and foreign currency earner for the nation. Mutoko rural district receives US\$18 400 per year from quarrying companies for development levies (Saunyama 2015).

According to The Herald (2011), the Mineral Marketing Corporation of Zimbabwe (MMCZ) reported that Mutoko district produces 75 percent of black granite in Zimbabwe. Zimbabwe Environmental Law Association (ZELA) (2015), state that 98 percent of the total black granite quarried in Mutoko is exported to European countries, and in 2009, 121 000 metric tonnes of black granite worth US\$12.1 million were extracted in Mutoko district alone. Chigonda (2010) also mentions that some of the quarries in Mutoko are involved in road construction and drilling of boreholes as part of corporate social responsibility. However, most of the locals in Mutoko have been evicted from their land to make way for quarrying. Land lost is not paid for but payment is given for land development (Chigonda 2010). This is because of the land tenure system which does not give the right of ownership to land, meaning the land belongs to the state. Hence one is not paid for the land lost but for the developments one would have made on the land (Chigonda 2010). Therefore, this study seeks to investigate the impacts of black granite quarrying on household income and food security in Mutoko district and determine how this activity has impacted on household income and food security.

1.2 STATEMENT OF THE PROBLEM

Poverty and food insecurity are major crises affecting many rural communities in developing countries. In Zimbabwe food security has been at the centre of development goals since 1980. In 2016, 46 % of the population was declared to be undernourished and major factors contributing to food insecurity and poverty in most developing communities according to the 2016 Global Hunger Index are due to high prevalence of HIV/Aids, unemployment, recurrent climate induced shocks and poor policies. However, in Mutoko district, a new contributing factor has emerged whose activities are detrimental to household income and food security.

Black granite quarrying in Mutoko district has proved to be more of a curse than a blessing to the locals in terms of household income and food security (Newsday 2012). Communities like Nyamakope and Mbudzi who are located near and around quarry sites are experiencing land invasions and farmland transformation (Chigonda 2010). Farmlands located near quarry sites have been taken over for granite quarrying (Chigonda 2010). In addition, prime lands located close to quarry sites are being used as dumpsites for granite waste (Rubbles). After blasting all granite rocks are cut into right sizes before transportation to Harare for second stage processing. Waste generated from cutting the rocks such as boulders and rubble are discarded on surrounding fields. Granite rocks which sustain cracks during the blasting process are also discarded as misfits. For a community which heavily relies on agriculture (subsistence farming and horticulture) for household income and access to food and with only 30 % of fertile farmland (Chigonda 2010), this is a serious problem which makes some families in the community vulnerable to hunger and food insecurity.

According to Chigonda (2010) blasting of the granite rocks has resulted in the lowering of water tables. This is because granite rocks stretch extensively underground and act as aquifers, but during the blasting process they are blasted away. This disturbs and hinders horticultural activities, which are the main source of income for 63 % of the local populace in Mutoko (Chigonda 2010). Some locals in Mutoko have lost their land through road construction for quarrying purposes. With agriculture being the main economic activity, black granite quarrying activities are subjecting the Mutoko people to poverty and hunger. In addition, black granite quarrying is compromising labour supply on the fields. This is because most of the

local employees are between ages of 25 years and 34 years. This leaves a population aged 0 to 15 years and 64 years and above to take charge of the fields and food production. Most of those left to work the fields are women and children (Chigonda 2010). The consequences are food insecurity for the affected families. Biophysical problems relating to contamination of soils from improperly disposed oils is also a major issue undermining food production and underground water quality. Mountain forests, grazing land and mountain farmlands are also destroyed by blasting and clearing of work sites. This results in habitat loss and reduction in forestry produce which comprises of non- agricultural sources of food such as wild berries, honey and mushrooms. The Herald (2011) stated that Global traders sell a square metre of black granite from quarries in Mutoko at prices between US\$500 and US\$600 while the local rural district council is getting a mere US\$1 for a tonne of black granite. Chigonda (2010) propounds that local employees are paid US\$70 per month since the majority of labour force is unskilled.

1.3 OBJECTIVES

1.3.1 General Objective

- To assess the impacts of black granite quarrying on household income and food security in Mutoko District in Zimbabwe.

1.3.2 Specific Objectives

- To examine how black granite quarrying impacts on household income in Mutoko district.
- To evaluate the extent to which black granite quarrying impacts on household food security.
- To assess effectiveness of strategies that are being implemented by mining companies to reduce the impacts of black granite quarrying activities on household income and food security in Mutoko district.

1.4 JUSTIFICATION OF THE STUDY

In Mutoko mining and quarrying activities are increasing every year as evidenced by

their contribution to the national Gross Domestic Product (GDP). However, mining and quarrying share the same space with agriculture. Most Zimbabweans are dependent upon agriculture for household income and food security. Zimbabwe is an agricultural nation and prior to 1980 it was the bread basket of Africa (FAO 2001). The majority of rural communities are involved in subsistence agriculture. A decrease in arable land is also being witnessed across the nation with poverty and food insecurity as major issues affecting the nation. This is evidenced by the nation signing agreements such as the Sustainable development goal number 2, to end hunger, achieve food security and improve nutrition and promote sustainable agriculture. In Mutoko agricultural production is decreasing. Quarrying of granite is subjecting locals to poverty (Chigonda 2010) hence, an investigation on the impacts of black granite quarrying on household income and food security warrants attention.

The results of this study will assist in the achievement of the Zimbabwe Agenda for Sustainable Social Economic Transformation (ZIMASSET) clusters, which focuses on social service and eradication of poverty, food security and nutrition. Results from this investigation can also aid the Agricultural Rural Service Extension (AGRITEX) workers in coming up with measures to assist farmers in Mutoko to increase both agro-based and non- agro-based food stuffs. Organisations such as FAO are also going to benefit from this research on knowing what specific areas to look at in order to promote food security in Mutoko. The research will also increase the research output of Midlands State University.

1.5 STUDY AREA

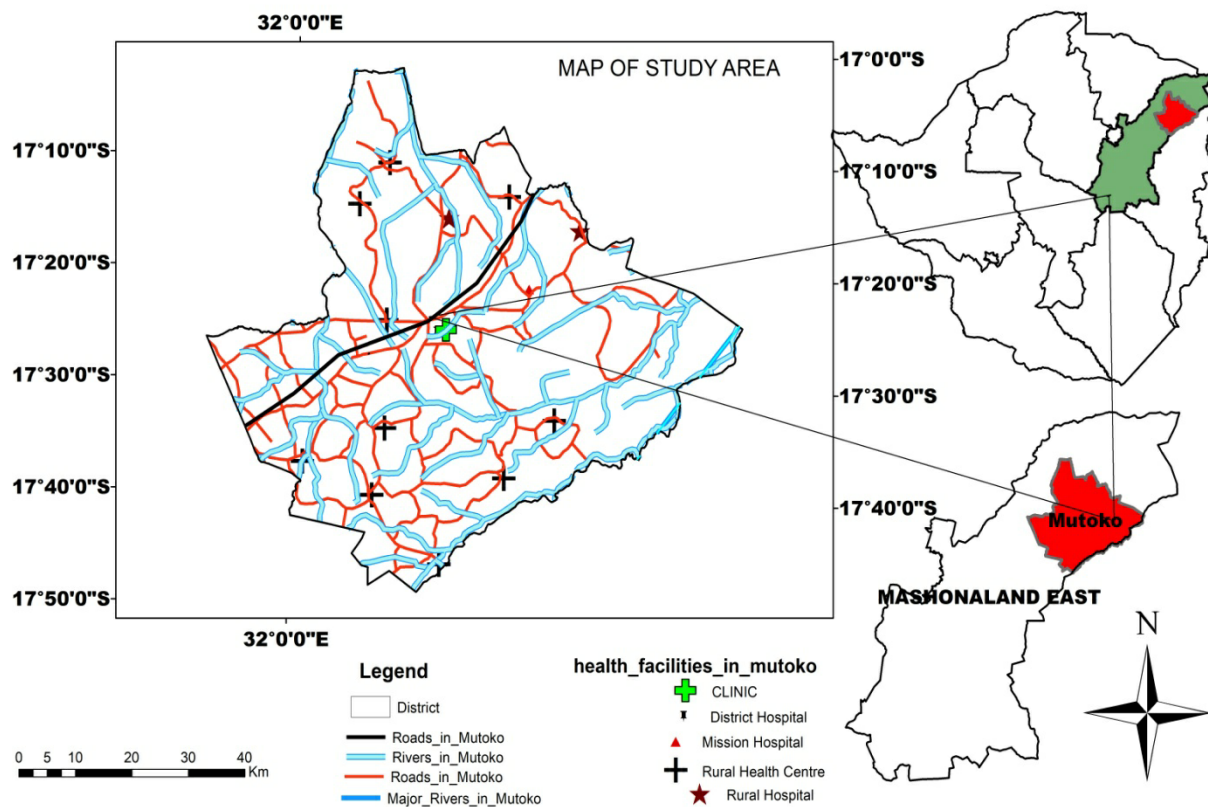


Figure 1.1: Map of study area

1.6 PHYSICAL CHARACTERISTICS

Mutoko is a district located in Mashonaland East Province in Zimbabwe and shares boundaries with the Murewa, Mudzi, and Nyanga Districts. It is located within geographic coordinates of -17240 S and 32.130 E. It lies 143 kilometres East from Harare the capital city of Zimbabwe, and found within natural farming regions 3 and 4. These areas are characterised by unpredictable rainfall, mid-season dry spells and high temperatures. Precipitation occurs mainly over five months November to March followed by a seven month dry season (Mika 2010). Big yearly differences in rainfall or rainfall variability have occurred in the district for example, during the 1982–1984 period Mutoko was seriously hit by drought, while in 1985 rainfall exceeded the yearly average (total average for 1985 was 900 mm) as noted by (Mika 2010). The area falls under the granite and gneiss hydro-geological grouping, with 53 % of the land, granite and peraferrallitic soils which do not retain nutrients due to low levels of clay and organic matter (Chigonda 2010). However, the soils are suitable for subsistence farming activities. land classification is as follows as according to

Bhatasara (2013) 34.000hectares are arable land, 58,000hectares are summer grazing land and 37.000 hectares of land are waste land. Unclassified land has been reserved for newcomers in the district. Mutoko district is drained by Mudzi River and its tributaries. The dominant vegetation type is miombo woodlands characterised by *Mutondo* and *Musasa* among others (Environmental Management Agency (EMA 2018). According to Chigonda (2010) quarrying is practised by 13 foreign companies in different parts of Mutoko district.

1.7 SOCIO-ECONOMIC CHARACTERISTICS

Mutoko has a population of 146 127 people (Zimbabwe National Statistics Agency, 2012). The main primary economic occupation is agriculture with horticulture being the major agricultural activity. Women dominate in horticulture with main crops grown as vegetables, tomatoes, bananas, onions and maize. 15.5% of the population is under 4 years, 33.7% are between the ages of 5 and 14 years and 50.8% are above 15 years (Bhatasara 2013). Females account for 53% of the total population in the district and age groups for most females who dominate in horticulture are 35-44 years and 45 years and above (Bhatasara 2013). Males are mostly employed by quarrying companies and each company can employ an average of 50 to 100 local employees (Chigonda 2010). Main age groups employed are between the ages of 25-34 years and 35-44 years. According to Bhatasara (2013) population distribution is as follows 69% are in communal areas, 23.3% in resettlement areas, 4.3% are at the service centre or growth point and 3.4 % in the small scale commercial farms (Bhatasara 2013). Single parent headed homes are increasing due to the incidence of the HIV/AIDS pandemic (Mika 2010). Apart from the heavy reliance on agriculture the district now relies on black granite quarrying employment (Bhatasara 2013). Black granite quarrying has managed to transform the district into an important quarrying area. Salaries and wages from such quarrying activities provide families with a stable source of household income. Most of the salaries is spent on school fees and buying farming inputs. Crops grown in the region are mainly for selling and the main market is Harare. Males being the main bread winners are more employed as compared to females. Most of the males employed have reached secondary level.

CHAPTER TWO: LITERATURE REVIEW

2.1 What is Black Granite Quarrying?

Various authors have suggested different definitions for black granite rocks worldwide. Black granite rocks are also known as black dimensional rocks (Demarco, Oyhançabal, Stein and Siegesmund 2011). According to King (2010) black granite rocks are dark coloured intrusive igneous rocks composed mainly of two minerals namely plagioclase and augite. Black granite rocks unlike other granite rocks contain no quartz (Demarco et al 2011) and because of this other scholars suggest that these rocks are not true granite rocks (Demarco et al 2011). However, black granite rocks resemble physical properties unique to granite rocks such as rock strength and hardness, extremely high compressive strength and low porosity (Demarco et al 2011).

Black granite rocks have been mined since the 1960s in countries such as Uruguay (Demarco et al 2011) and in Zimbabwe black dimensional stones have been mined since the 1970s (Chigonda 2010). In Egypt quarrying of black granite rocks dates back to ancient Egypt where they were used in the construction of sacred monuments for example, tombs and temples (Newman 2014). Prices of these stones vary globally and are mainly influenced by the areas from which they are mined. Uses of black granite also vary from country to country depending on the engineering capacity of the country (Demarco 2011). For instance, flooring tiles for Düsseldorf Airport in Germany and wall tiling for the offices of the Federal President in Berlin were constructed with the Impala dark, a type of black granite from South Africa (Demarco 2011). The Nero Assoluto (from Zimbabwe) was used in the construction of footbridge masts in Bad Homburg Germany (Demarco 2011) and in the United States of America black granite rocks from Sweden were used in the construction of the Empire State Building (Demarco et al 2011).

It is of paramount importance to note that before black granite is used for tiling and flooring it must first be extracted from the earth (Ming'ate and Mohamed 2016 and Motloun 2008). Stone quarrying is a form of land use method concerned with the extraction of non-fuel and non-metal minerals from rocks (Ming'ate and Mohamed 2016). It is usually done by open-cast method using rock drills, explosion of dynamite and consists of removing layers or large slabs of stone from an identified

geologic deposit, creating minimal breaks in the stone, removing the stone using heavy machinery, securing the stone on a vehicle for transportation and moving the material to storage (Ming'ate and Mohamed 2016 and Motloun 2008). This process is illustrated in Figure 2.1.

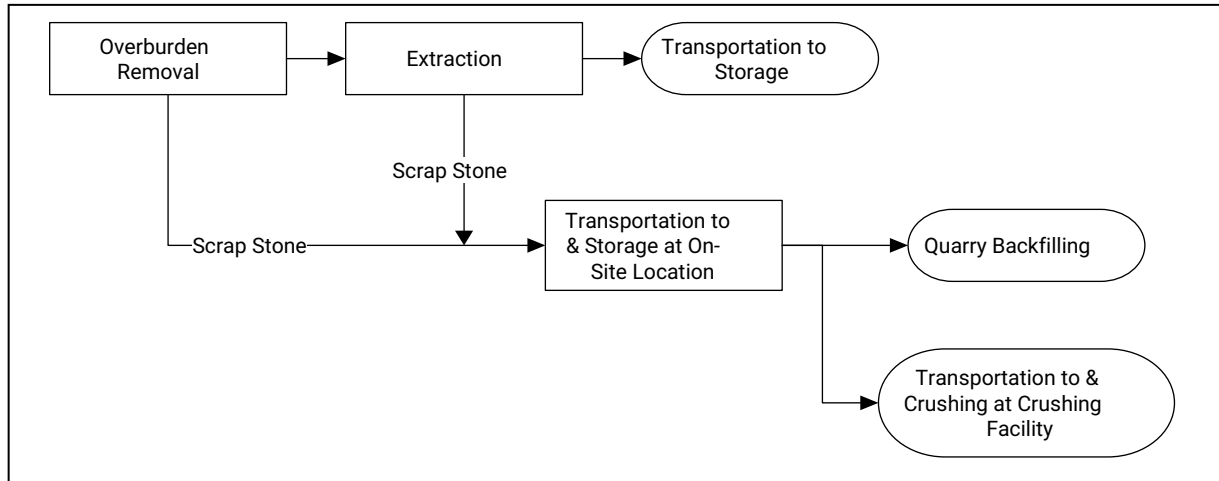


Figure 2.1: Flow diagram to show stages in black granite quarrying

Source: University of Tennessee Centre for Clean Products (2009).

2.2 Definition of household food security

Food security has been an issue of paramount importance globally as evidenced by the revising of food security definitions since the late 1940s to date. According to the FAO (2010) in order for any nation or region in the world to fully assess its food security status, it should measure food security at household level. In 1948 the World Bank defined food security as access by all people at all times to enough food for an active and healthy life. However, due to further research into food security and the growing number of the undernourished population, FAO (2001) came up with a new definition with new parameters to effectively measure food security. Food security at individual, household, national, regional and global level is achieved when all people, at all times have physical, economic and social access to sufficient, safe and nutritious food, capable of meeting their dietary need and food preference in order to have an active and healthy life (FAO 2001).

FAO (2010) indicated that households are food secure when they have year round access to the amount and variety of safe food their families need to live an active and healthy life. Food security is mainly influenced by household income, which is a

measure of the combined incomes of all people sharing a particular household or place of residence (FAO 2010). Food security is based on three pillars which are availability, access and utilization (FAO 2001). Baro (2002) argues that although all pillars are important, the predominant problem is a situation where households do not have access to the kind of food they need for nutrition and sustainable living. When food is available within an environment, households should have the purchasing power in order to access the food and utilize it (FAO 2010).

In 2015 a report by FAO stated that over 900 million people were estimated to be food insecure and undernourished world wide. In Zimbabwe the vulnerability assessment committee estimated that 42 percent of the rural population were food insecure in 2017 due to drought induced factors. Food security is a major global concern as one billion people are suffering from starvation and malnutrition (FAO 2012). This resulted in world leaders signing the millennium development goal number one to reduce extreme poverty and hunger by 2015. Due to different factors, African countries in the 21st century are said to be food insecure, which is lack of physical, economic and social access to food in order to have an active and healthy life (FAO 2001). Different factors contribute to food insecurity vulnerability in African nations, chief being high population growth rates, unplanned and unsustainable land use patterns and economic crisis among other factors.

From the above it is evident that food security is a growing global concern and household income cannot be separated from it. This is because it is the major factor controlling food security status of families. A food secure nation can be food insecure at household level hence it is necessary to study food security at household level.

2.3 Trends in black granite quarrying in the world

2.3.1 Black Granite Quarrying in Southern Africa

Black granite in developing countries has been quarried for decades in countries like Zimbabwe and South Africa. According to Motloun (2008) the dimension stone industry has grown at an average rate of 7% per annum since 1986 in Southern Africa and the rate is expected to continue growing. According to Moeletsi and Tesfamichael (2006) black granite quarrying in South Africa started in the Bon-

Accord area near Pretoria in the late 1930s. This was followed by the first black dimension stone quarry in Rustenburg in a farm in 1947 (Moeletsi and Tesfamichael 2006). Black granite quarrying in Rustenburg has contributed immensely to economic development in South Africa with most people residing near and around quarry sites benefiting through employment (Moeletsi and Tesfamichael 2006). Improved mining techniques and increase in numbers of quarries has led to increased production which contributes significantly to the economy of South Africa (Moeletsi and Tesfamichael 2006). In Zimbabwe, black granite quarrying is mined in Mashonaland East province (Chigonda 2010 and Bhatasara 2013). According to an article by the Herald (2011) a square meter of black granite rock from quarries across Mutoko is priced between US\$500 and US\$600. A minimum of 95 % of an estimated 150 000 tonnes' is mined and exported annually in Zimbabwe (The Herald 2011). In 2009, Mutoko produced 121 000 metric tons of black granite worth US\$12.1 million (The Herald 2011). The State receives 2 % of royalties every year from black granite quarrying companies and in 2010 the Government received US\$322 540 in cash from quarrying companies (The Herald 2011 and Chigonda 2010).

According to Levantina (2017) black granite quarried in Zimbabwe contains little quartz and gives it unique tiny glowing glints and an animated brilliant surface. However, an article by the Marble store (2015) states that Zimbabwean black granite texture varies from slab to slab, hence black granite quarried in Zimbabwe have no uniform quality and colour. An average of 13 foreign companies mine granite in Mutoko district (Chigonda 2010). Quarrying technologies employed by some of the quarrying companies include blasting, cutting and drilling (Chigonda 2010 and Environmental Management Agency (EMA) 2012).

2.3.2 Black Granite Quarrying in Egypt

According to Newman (2014) black granite quarrying in Egypt dates back to the time of the construction of Egyptian pyramids. Black granite quarrying was first mined in the Aswan quarries in Egypt around 1170 BC (Newman 2014). Egyptian Marble and Granite Exporter Factories & Warehouses (2017) states that ancient Egyptians built their pyramids using granite from the Aswan quarries and a modern company called Creative Interior Design Group produces its granite products from Aswan quarries.

Quarries from Aswan were used by ancient Egyptians to construct obelisks which where more than 500 tonnes in weight and used in the pyramids and Valley Temple on the Giza plateau (Newman 2014).

2.3.3 Black Granite Quarrying in the United States of America

In other parts of the world, for example in the United States of America black dimensional stones have been quarried for many years. According to Bourque (1999), black granite quarrying is estimated to have started in the Upper Peninsula of Michigan around 1870 to 1915. Remnants of this great industry are present in buildings of communities such as Lake Superior region. In 1997 annual production of dimensional stones in the United States of America had an estimated 1.18 million tonnes and valued at US\$225 million (Bourque 1999). Some other regions and names of quarry sites in the United States include Cold Springs Granite Company in California, Minnesota in South Dakota, Texas and Indiana Rock of Ages Corp located in Georgia among others (Bourque 1999). According to Bourque (1999) in 1997, 38 quarrying companies were operational in America and these were located in 70 different locations. Cold Spring Granite Company in California, Minnesota in South Dakota Texas and Indiana Rock of Ages Cop in Georgia were top producers of dimensional stones in 1997, and accounted for 50% of domestic production in value and tonnage (Bourque 1999). Methods of extraction used included, drilling, blasting, cutting using wire saws and the type of equipment used were pneumatic block-cutters for vertical and horizontal cutting, pneumatic rock drills, diamond wire sawing machine and pneumatic perforator to execute holes (Bourque 1999).



Plate 2.1 a granite quarry operation, using wire saws, drills, and other support equipment for extraction. Source: Bourque and Associates (1991).

2.4 Role of black granite quarrying on household income in developing countries

In order for any household to live a comfortable life, a reliable and stable source of income is required to facilitate daily operations of the household (Liu 2004). Black granite quarrying has been contributing significantly to the economic development of many households in Zimbabwe with particular reference to Mutoko (Chigonda 2010). The granite industry in Mutoko has resulted in the employment of 80% of the local youth, providing them with a stable source of household income (Chigonda 2010). According to Chigonda (2010) and Bhatasara (2013) major activities involved in black granite quarrying are drilling, blasting, washing, transportation and excavation. Most of these activities absorb unskilled labour, thereby creating employment opportunities for less educated local populace (Chigonda 2010).

Black granite in Zimbabwe has resulted in women contributing significantly to household income (Mubvumbi 2009). This is because some women from Mutoko have abandoned their gender role of being confined in the kitchen to taking up employment in the black granite quarrying industry (Mubvumbi 2009).

However, according to Budya Environment Conservation Trust (BECT) (2009) black granite operations in Zimbabwe have resulted in occupational injuries and deaths

due to poor and lack of safety regulations by mining companies. BECT has taken up a mandate to train mine workers in work safety since most mining companies do not prioritize it. This has created a direct source of occupation and income to members who are employed by BECT to address safety issues in unsustainable quarrying operations.

Communities in the Lower Manya Krobo District of Ghana, experience granite quarrying and this has resulted in more than half of the male population being employed at various quarrying sites and a substantial number of females becoming food vendors at the quarry sites (Nene 2011). Dimensional rock quarrying in Ghana has been a source of livelihood both to employees at the various quarry sites and to people who sell different food stuff and other basic goods to quarry employees' thereby increasing household income.

In South Africa black granite quarrying has been contributing immensely to household income in Rustenburg (Moeletsi and Tesfamichael 2006). This is evidenced by the increased standard of living in Rustenburg city with people being able to build more houses and improvement in nutritional diet of households as cases related to undernourishment have decreased since 1994 (Moeletsi and Tesfamichael 2006). Employment levels in Rustenburg quarries are increasing every year and the industry is also growing annually in terms of production (7% annually since 1986). Hence a clear indication of favourable household income to employed individual households (Motlounq 2008).

2.5 Role of black granite quarrying on food security in developing countries.

With the majority of the world's poor living in rural areas and engaging in agriculture, governments and Non-Governmental Organisations (NGOs) have taken measures to promote agricultural activities so as to alleviate poverty (Birabwa 2006). According to the World Food Program (WFP) (2018) in Zimbabwe more than 1.1 million people were facing food insecurity at the peak of the 2018 lean season, as poor rains and

erratic weather patterns have a negative impact on crop harvests and livelihood prospects. The government of Zimbabwe has made various initiatives to capacitate its people especially those in rural areas with strategies to cope with food insecurity resulting from dependability on agricultural products (Zimbabwe Country Strategic Plan 2017 to 2021). Agriculture has been a major source of household food security for most rural and urban dwellers in Zimbabwe. However, in communities such as Nyamakope and Mbudzi located in Mutoko district, an alternative source of non-agricultural activity has emerged through black granite quarrying (Chigonda 2010).

According to Chigonda (2010) black dimensional stone quarrying in Mutoko has proved to be an alternative source of household food security. This is because salaries from black granite quarrying enable locals in Mutoko to outsource food and other basic necessities from areas like Harare. Moreover, households with family members employed at quarrying sites are able to purchase agricultural inputs on time in preparation for the rainy season (Chigonda 2010).

According to the Environmental Management Agency (2012) black granite quarrying companies in Mutoko have been buying, transporting and storing ammonium fertilizer for local households in Mutoko. This is an attempt by the various companies to equip different households with basic necessities required for agriculture, since the majority of households depend on self-produced agricultural products to be food secure. In addition, Chigonda (2010) states that as the rural economies of Zimbabwe and many other developing countries of the world are largely dependent on peasant agriculture, black granite quarrying in Mutoko has created an opportunity for off-farm employment and guarantee of food security through diversification of sources of livelihood assets. Some households have increased their livestock herds through financial capital from black granite quarrying (Chigonda 2010).

Black granite operations in Mutoko reduced food insecurity in different communities. Firstly, the construction of gravel roads improved household food security through improvement of communication networks (Chigonda 2010). According to FAO (2009) one of the pillars of food security is access and households in different locations should have the capacity to access food at any time and from any place and this is facilitated by the availability of transport and roads. Moreover, construction of road

networks enables farmers to acquire agricultural inputs from Harare and also sell their outputs to markets in the Capital city. In addition, Chigonda (2010) stated that black granite quarrying companies provide locals with access to roads and transport to and from Mutoko for their private household needs.

According to Motloung (2008) households in Rustenburg are experiencing vulnerability to food insecurity due to soil contamination from quarrying machinery. Soil is an integral part of agriculture and soil quality determines agricultural yields. Moeletsi and Tesfamichael (2006) stated that quarrying in South Africa has resulted in vegetation loss which greatly affects none agricultural sources of food, for example fruits, honey, wild animals, mopane warms and mushrooms. According to Nene (2011) quarrying in Egypt had resulted in biodiversity loss and destruction of farm lands due to primitive methods of quarrying involving blasting. This has greatly affected the food security status of the communities in Aswan. However, due to improved methods of payments affected members have been able to outsource food from other regions and cities (Nene 2011).

2.6 Challenges on household income and food security due to black granite quarrying

It is important to note that even though black granite quarrying is associated with many benefits in various communities around the world, it is also attached to some problems which are making the practice unsustainable to other people (Chigonda 2010 and Bhatasara 2013). Most of these problems are evident through household income and household food security in Mutoko. Chigonda (2010) as cited by The Standard (2012) stated that much of the earned money from black granite quarrying is pumped out of the district through payment of revenue fees and lack of value addition to granite processing in Mutoko district affecting household income and food security.

Chigonda (2010) states that black granite companies in Mutoko employ 80% of the locals with majority of them being unskilled labour force. This greatly affects wage payment as unskilled labour is paid the lowest salaries but perform most of the hard work involved in black granite quarrying (Chigonda 2010). Chigonda (2010) and (Chakadaya 2016) stated that unskilled labour is paid US\$ 70 per month which falls far below the poverty datum line of US\$430 and US\$574 per month. According to

Chigonda (2010) after extraction most of the black dimensional stones are cut into portable sizes for transportation to Harare and South Africa for processing. This has resulted in most of the paying jobs being lost to other cities and countries through lack of value addition thus affecting household income as the unskilled employees are left to do simple and low paying jobs (Chigonda 2010 and The Herald 2011).

Black granite quarrying has resulted in creation of agriculture bottlenecks as most of the middle aged male population are engaged in quarrying (Chigonda 2010). Mutoko is an area whose main economic activity and source of household income is agriculture with particular reference to horticulture (Chigonda 2010 and Njaya 2014). Black granite has resulted in most of the males abandoning farming and focusing on black granite quarrying with hope for better income leaving women and children to attend to the fields (Chigonda 2010). This has resulted in both a decrease in crop yield and household income from horticultural crops (Chigonda 2010).

Granite quarrying and extraction involve blasting and this leads to destruction of vegetation (Nene 2011, Bhatasara 2013 and Newsday 2012). In Mutoko black granite quarrying has resulted in forest destruction and habitat loss for many wild animals and reduction in numbers of wild animals like the hyena, leopard and Impala (Chigonda 2010). Forests and wild animals are forms of non-agricultural sources of food and any activity which threatens them affects food security of any location at a large scale.

According to Chigonda (2010) blasting of granite rocks in Mutoko has altered water table levels in the study area. This is because granite rocks are impervious and acts as aquifers. Blasting processes weaken the underlying rock leading to formation of cracks and fissures. Hence aquifers will not be able to hold much water for longer periods and in some cases water is lost through underground seepage since the rock will be pervious. This has resulted in the reduction of water table levels and wells drying up (Chigonda 2010). With the majority of households in Mutoko depending on agriculture for food security (Chikadaya 2016), this is a major threat as water shortages are experienced through inadequate water being available for human consumption, crops and livestock due to lowering of the water table (Chigonda 2010).

Soil contamination and underground water pollution caused by oil spillages from heavy machinery used for excavation, loading and transporting granite rocks and disposal of improperly recycled oils are major drivers of poor agricultural yields (Nene 2011). Good quality soils and readily available water sources are major input for agriculture and any compromising of the soil structure and quality of water results in reduced agricultural yields and increased production costs of purifying and treating the soil and water. This therefore results in the channelling of funds for rehabilitation of contaminated soils and polluted water bodies instead of utilizing them for the purchase of agricultural inputs such as seeds and fertilizers.

Dust from quarrying activities reduces the production of agricultural plants as it closes the stomata which is used for water uptake by plants and disrupts photosynthesis. Road constructions and transformation of fields into quarry sites and waste dumpsites are also major factors affecting the food security (Chigonda 2010). This is because roads are constructed in between prime farm lands in order to access quarry sites and easy transportation of black granite from Mutoko (Chigonda 2010 and Mukudu 2015). Chigonda (2010) also states that black granite waste like fractured granite rocks, rubbles and pebbles are being dumped into nearby farm lands. Other families have been removed from their lands to make way for granite quarrying thereby leaving their agricultural lands behind and exposing them to food insecurity (Chigonda 2010).

2.7 Strategies to reduce challenges of black granite quarrying on household income and food security in developing countries

In order to reduce and manage challenges of black granite quarrying on household income and food security, countries like South Africa have introduced mine closure plans in order to plan for the future (Motloun 2008). Quarrying companies in South Africa Rustenburg have introduced soil management systems where topsoil from every quarry is stockpiled for future use in reclamation and properly sited dumpsite introduced to absorb all waste from quarrying (Motloun 2008). Mountains like the Magaliesberg Mountain have been identified as crucial to human and animal life and are protected from quarrying activities through the use of diamond wire saw instead of blasting (Motloun 2008).

Wash bays have been constructed so that oil and grease is retained by means of a

three stage filter, which is cleaned frequently (Motloung 2008). All runoff water from within workshops passes through this filter. Oil spillages within workshops is soaked up by means of saw dust, which together with used oil filters and soiled rags are collected by a waste disposal company for disposal at a licensed hazardous material waste disposal site (Motloung 2008).

Revegetation and creation of tree nurseries is another activity which quarries in Rustenburg are doing to return the natural state of the environment (Motloung 2008). Trees which have been planted include Marula (*Sclerocarya birrea*), Rooi Ivooi (*Berchemia zeyheri*), the bushwillows (*Combretum erythrophyllum*, *C. apiculatum* and *C. molle*) and the wild fig species (*Ficus ingens*, *F. natalensis*, *F. glumosa* and *F. soldanella*).

In Zimbabwe quarrying companies claim to be involved in revegetation, soil treatment and use of the diamond wire saw to protect mountains and habit loss through blasting (Chigonda 2010 and The herald 2012).

2.8 Knowledge gap

In Zimbabwe, inadequate research has been undertaken pertaining to how quarrying contributes to household income and food security in the affected communities. Research attention has focused on the impact of black granite mining on the environment with particular reference to dust emissions, biodiversity loss and impact on soil structure, mountain and rock stability (An assessment of the benefits and costs of black granite quarrying in Mutoko district, Zimbabwe, Journal of sustainable development in Africa. Black granite mining and the implications for the development of sustainability in Zimbabwe: The case of Mutoko communities). Inadequate research has been done on the socio-economic and cultural impacts of black granite quarrying on affected communities. Data on the quantities of land and soil lost due to black granite quarrying is not available. Vegetation species which have become extinct due to such mining activities is not available in most developing countries. Data on agricultural performance prior to quarrying is missing. Water quantity levels in quarrying areas are not known. Data on the quality of life the affected community prior to quarrying, during and after quarrying is inadequate to explain questions on food security due to the impact of black granite quarrying activities. To this end, this research seeks to provide some of the answers to these

questions by investigating the impacts of black granite quarrying on household income and food security in order to fill this gap of knowledge.

Chapter 3: METHODOLOGY

3.1 RESEARCH DESIGN

In this research paper the researcher employed a case study research design. A case study research design allowed the researcher to come up with an in depth study of the impacts of black granite quarrying on household income and food security in Mutoko District. Case study research design assisted the researcher to narrow down a very broad field of environmental challenges faced by people in Mutoko due to black granite quarrying into direct identifiable challenges impacting household income and food security.

A mixed method approach was used in this study that is the use of both qualitative and quantitative methods. According to Wanjohi (2014) a mixed method approach is a technique for collecting and analysing data using the combination of both qualitative and quantitative research approaches in order to understand the research problem. Sources of data collection used by the researcher were questionnaires, interviews and field observations.

3.2 Targeted Population

Targeted population refers to a group of individuals in terms of interested parties or organisations from whom the researcher intends to collect data from (Tashakkori and Creswell 2007). These included four key informants, namely one environmental official from the Zimbabwe Environment law Association, one environmental officer from EMA, one environmental technician from Mutoko Rural District Council and one representative from the quarrying companies. Data was also collected from affected households whom some were employed by the quarrying companies and while some were only involved in agriculture.

3.3 Sampling and sampling procedures

In this study the researcher used two methods of sampling, namely purposive sampling which was used to obtain information from four key informants namely,

one environmental lawyer from ZELA, one EMA officer, one environmental technician from Mutoko Rural District council and a company representative from quarrying companies. This was done with the use of interview guides which the researcher used to interview each and every key informant. A census was also used to obtain data from affected households who were 100 in counting. According to Cochran 1953 when a population is not more than 100 a census must be employed in order to obtain accurate results.

Table 3.1: Sample size and sampling method

Type of respondent	Location	Sample size	Sampling method
EMA Officer	Mutoko	1	Purposive
ZELA Official	Harare	1	Purposive
Mutoko RDC Official	Mutoko	1	Purposive
Quarrying Company Official	Mutoko	1	Purposive
Local villagers	Mbudzi ward	50	Census
Local villagers	Nyamakope village	50	Census

3.4 Research Instruments

3.4.1 Questionnaires for affected households

The researcher administered 100 questionnaires to the affected households in Mutoko. The researcher self-administered all the one hundred questionnaires to the affected households, this he did through door to door visiting. Each questionnaire contained twenty nine questions in total, nine closed questions and twenty open questions. Closed questions were used to collect data mainly for demographic purposes while open ended questions gathered data from section B to D, which

focused on the impacts of black granite quarrying on household income, impacts of black granite quarrying on food security and lastly measures to reduce challenges faced.

3.4.2 Interview guide for key informants

The researcher held interviews with four key informants namely ZELA, EMA, Mutoko Rural District Council and Quarrying companies. The researcher booked appointments with each key informant a week before the interview and did appointment confirmations a day before the appointment date. Interviews for all key informants were completed in two days. Each interview lasted an average time of forty five minutes and conversations were recorded by a voice recorder and by means of making notes on a note pad. These key informants provided specialist information which assisted in addressing the research objectives. For example, Quarrying companies, EMA and Mutoko rural district council provided information concerning the effectiveness of strategies that are being implemented by mining companies to reduce impacts of black granite quarrying activities on household income and food security in Mutoko district. Table 3.2 below shows brief explanations for conducting interviews and selection of key informants.

Table 3.2 shows key informants and reason for interviewing them.

Name of key informant	Location for the interview and date and time	Reason for the interview
EMA Officer	EMA offices Harare	To get information mainly on the physical impacts of black granite quarrying.
Environmental lawyer	ZELA offices Harare	To collect information on what is being done to protect the rights of people in Mutoko especially on access to land.
Environmental technician	Mutoko rural district council offices in Mutoko	To collect data on the impacts of black granite quarrying on rural

		livelihood assets and how black granite quarrying is contributing to rural development.
Company representative	Quarrying company in Mutoko	To understand the operations of black granite quarrying and how companies are mitigating negative impacts to the surrounding community's especially addressing household income and food security.

3.4.3 Field observations

The researcher also utilized an observation check list to gather independent information. Observations were done in one operational quarry site and one non-operational quarry site namely in Nyamakope village and Mbudzi ward. Observations were also done in fields of the affected households and each observation would last ten minutes. The main reason for these observations was to identify impacts of quarrying on size of farmland, size of grazing land lost, location and quantities of waste dumps, vegetation densities and type of crops grown and size of land under cultivation.

3.5 Ethical considerations

The researcher observed various ethical considerations before, during and after completion of the data collection process. Permission to start field work and enter Mutoko District for purposes of data collection was sought from relevant authorities including Midlands State University, EMA and Mutoko Rural District Council. Information was only collected from those who were willing to provide information. Data collected was used for research purposes only.

3.6 Data analysis and presentation

The researcher utilised Microsoft Excel to analyse and present quantitative data in graphs and tables. Data was coded and labelled in Microsoft excel package and later manipulated into presenting quantitative data in graphs and tables.

Chapter 4: Data presentation and Analysis

4.1 Employment in black granite quarrying companies and its contribution to livelihoods

Table 4.1 shows the number of respondents employed in black granite quarrying companies and how this has impacted their way of living.

Gender of respondents	Period of employment	Job category	Monthly salary	Main uses of salaries
1. Male	< 5 years	general worker	< \$ 250.00 but >\$ 300.00	Bought a wheelbarrow and three goats.
2. Male	< 5 years	general worker	< \$ 250.00 but > \$ 300.00	Paid school fees and bought two cows.
3. Male	< 3 years	general worker	< \$ 250.00 but > \$ 300.00	Paid medical bills and school fees
4. Male	< 4 years	general	< \$ 250.00 but	Bought sugar,

		worker	> \$ 300.00	cooking oil, rice and flour from Harare
5. Male	< 5 years	general worker	< \$ 250.00 but >\$ 300.00	Bought agriculture inputs
6. Male	> 4 years	general worker	< \$ 250.00 but >\$ 300.00	Bought farm inputs like maize seeds and fertilizer
7. Male	4 years	general worker	< \$ 250.00 but > \$ 300.00	Bought fertilizers, seeds and food from Harare
8. Male	< 6 years	driver	< \$ 300.00	Built a house
9. Male	< 4 years	Driver	< \$ 300.00	Bought 3 cows and 5 goats
10. Male	< 5 years	Driver	< \$ 300.00	Bought maize seeds, fertilizers and 2 cows
11. Male	< 5 years	Driver	< \$ 300.00	Bought flour, rice and sugar
12. Male	> 3 years	hammer man	< \$ 250.00 but >\$ 300.00	Built a house and paid school fees
13. Male	> 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought a cow, 2 goats and a plough
14. Male	< 2 years	hammer man	< \$ 250.00 but >\$ 300.00	Paid medical bill and school fees
15. Male	< 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Built a house
16. Male	< 4 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought a wheelbarrow and married
17. Male	< 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Built a house and paid school fees

18. Male	< 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought family groceries
19. Male	< 2 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought food and paid bills
20. Male	< 5 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought basic commodities and paid fees
21. Male	> 1 years	hammer man	< \$ 250.00 but > \$ 300.00	Built a house and bought groceries
22. Male	< 2 years	hammer man	< \$ 250.00 but > \$ 300.00	Purchased farm inputs like fertilizers and seeds
23. Male	< 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought farm inputs like fertilizers and seeds
24. Male	< 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Purchased basic commodities and paid fees
25. Male	< 4 years	hammer man	< \$ 250.00 but > \$ 300.00	Built 3 houses
26. Male	< 1 years	hammer man	< \$ 250.00 but > \$ 300.00	Increased cattle herd by 4 cows
27. Male	> 2 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought 6 goats and a wheelbarrow
28. Male	> 3 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought 3 cows and built a house
29. Male	< 2 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought a plough and farm inputs
30. Male	< 4 years	hammer man	< \$ 250.00 but > \$ 300.00	Bought 4 cows
31. Male	< 4 years	general worker	< \$ 250.00 but > \$ 300.00	Paid school fees.

32. Male	< 4 years	general worker	< \$ 250.00 but > \$ 300.00	Paid medical bills and school fees
33. Male	< 4 years	general worker	< \$ 250.00 but > \$ 300.00	Bought 5 goats
34. Male	< 5 years	driver	< \$ 300.00	Built a house, bought 3 cows and purchased a plough
35. Male	< 3 years	driver	< \$ 300.00	Built 3 houses, bought 2 cows and 4 goats
36. Male	< 4 years	driver	< \$ 300.00	Purchased fertilizers, tomato seeds and maize seeds from Harare.
37. Male	< 5 years	driver	< \$ 300.00	Paid fees, bought farm inputs, built a house
38. Male	< 5 years	driver	< \$ 300.00	Increased cattle herd by 4 cows
39. Male	< 5 years	driver	< \$ 300.00	Bought 5 goats and 4 cows
40. Male	< 6 years	hammer man	< \$ 250.00 but > \$ 300.00	Paid school fees
41. Male	< 4 years	hammer man	< \$ 250.00 but > \$ 300.00	Increased cattle herd
42. Male	< 5 years	hammer man	< \$ 250.00 but > \$ 300.00	Built a house
43. Male	< 5 years	General worker	< \$ 250.00 but > \$ 300.00	Purchased Farm inputs like seeds.
44. Male	< 4 years	General worker	< \$ 250.00 but > \$ 300.00	Purchased fertilizers
45. Male	< 3 years	General	< \$ 250.00 but	Purchased

		worker	> \$ 300.00	farming inputs, bought 4 goats and a wheelbarrow
46. Male	< 5 year	general worker	< \$ 250.00 but > \$ 300.00	Bought 4 cattle
47. Male	< 3 year	general worker	< \$ 250.00 but > \$ 300.00	Bought a bicycle and a wheelbarrow
48. Male	< 2 years	general worker	< \$ 250.00 but > \$ 300.00	Built 2 houses
49. Female	> 10 months	Cook	≥ \$ 150.00	Built a kitchen, paid school fees
50. Female	< 7 months	Cook	≥ \$ 150.00	Paid school fees and bought 3 goats
51. Female	< 1 year	Cook	≥ \$ 150.00	Purchased farm inputs
52. Female	< 14 months	Cook	≥ \$ 150.00	Built a kitchen and paid school fees
53. Female	< 7 months	Cook	≥ \$ 150.00	Paid school fees
54. Female	> 2 years	Cleaner	≥ \$ 100.00	Paid school fees
55. Female	<1 year	Cleaner	≥ \$ 100.00	Bought 3 goats
56. Female	> 1 year	Cleaner	≥ \$ 100.00	Paid school fees and medical bills
57. Female	< 1 year	Cleaner	≥ \$ 100.00	Paid Medical bills.
58. Female	< 1 year	Cleaner	≥ \$ 100.00	Paid school fees
59. Female	> 11 months	Cleaner	≥ \$ 100.00	Purchased fertilizers and paid school fees
60. Female	> 10 months	Cleaner	≥ \$ 100.00	Paid school

				fees and bought farm inputs.
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Among those employed respondents 80% (n=48) were male while females accounted for 20% (n=12) of the employed respondents. Males are regarded as the main bread winners hence most of them are employed. Females on the other hand rely on agriculture for livelihood and job opportunities for women in quarry mines are limited. In South Africa Moeletsi and Tesfamichael (2006) stated that quarries in Rustenburg have had a trend of employing more males because of the manual jobs performed at quarry sites and this has contributed positively to household income for male headed families.

The research as evidenced in Table 4.1 above clearly shows that males have been dominant in the quarrying business for a very long time as they have a longer period of employment as compared to their female counterparts. The least number of years for male employment is 1 year while for females it is 10 months. Years of employment are crucial as individuals with more years of employment have been able to save money to acquire meaningful livelihood assets and improve their way of life through their savings from salaries. Chigonda (2010) in her cost-benefit analysis on the impacts of black granite quarrying, also stated that quarrying in Mutoko has managed to give the employed individuals a chance to better their way of living.

Granite companies like the Natural Stone Company employ males as hammer men, general workers and drivers while females are employed as cleaners and cooks. The type of work performed by locals is unskilled labour hence they are employed in greater numbers. Jobs done by males are physically demanding. Compared to females males receive higher salaries.

4.2 Monthly income and its contribution to employee’s standards of living

From Table 4.1 above it is clear that income from various unskilled jobs at quarry sites has enabled families to improve their way of life. The highest paid local employee was a driver who received \$ 300.00 and above while the least paid is the cleaner who received a maximum of \$ 100.00. Both male and female employees

have managed to acquire certain assets and have had access to certain social services through their incomes. For example, most males have managed to build huts or houses, increase their cattle herd by buying extra cows which are regarded as a symbol of wealth. Females built kitchens, paid school fees, medical bills and purchased farming inputs in time for the agricultural season. Ming'ate and Mohamed (2016) also stated that in Mandera County in Kenya quarrying had improved the financial base of the community. Those who benefited the most were the employed who had managed to acquire livelihood assets.

4.3 Impacts of Black granite quarrying activities on agricultural sources of income

Table 4.2 shows quarrying activities and how they impact other sources of income.

Black granite activity	Type of crops & expected yields	Type of crop and actual yields	Unit price and expected income	Actual income
Blasting	Banana < 500kg	Banana > 300kg	70c per kg = \$ 350.00	\$ 210.00
Land evictions/ transformation	Vegetables < 600 bundles	Vegetables >500 bundles	50c per bundle = \$ 300.00	\$ 250.00
Road construction	Tomatoes < 500 boxes	Tomatoes >300 boxes	\$ 10.00 per box = \$ 5000.00	\$ 3000.00

From the table above it is clear that in as much as quarrying contributes to household income through employment, its activities however have a strong bearing on other sources of income and this largely impacts the unemployed who rely on agriculture for household income. Key findings were that in order to extract granite, quarrying companies like the Zimbabwe International quarrying company, Red quarry, Shuwawini quarry and Natural stone quarry are involved in activities such as blasting,

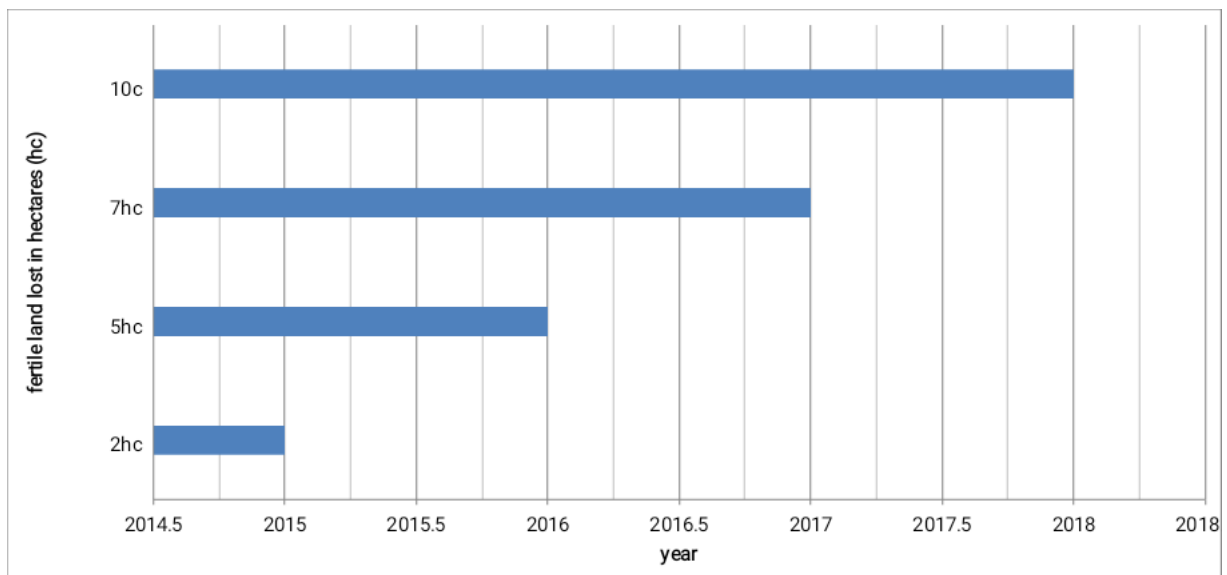
land evictions and transformation and road construction which heavily disrupt household income derived from horticulture.

These activities such as the blasting of hills have a strong effect on availability of underground water. Underground water availability is vital for economic activities like horticulture for the locals. This is supported by the interview with the local EMA technician who said most wells and ponds in the district are drying up quickly due to destruction of aquifers and this is heavily affecting horticultural activities. This has resulted in a decrease in yields as illustrated in Table 4.2 above which shows a decrease in household income from horticultural activities.

Other quarrying activities such as land transformation and road construction have seen most agricultural lands turned to dumpsites. A good example is that of banana gardens in Nyamakope village which are under threat of being taken over for quarrying. Such activities have resulted in less land available for farming and the consequences are reduced yields and reduced household income. This is supported by Bhatasara (2013) and Chigonda's (2010) cost-benefit analysis on the impacts of black granite quarrying in Zimbabwe.

4.4 Black granite quarrying impacts on agricultural land

Figure 4.1 Impacts of quarrying on agricultural land.



Results from Figure 4.1 above show that black granite quarrying is affecting agricultural land. Most of those negatively affected are those not employed by

quarrying companies. Year 2018 has so far seen 10 hectares of land lost to quarrying while year 2015 had the least amount of agricultural land lost to quarrying (2 hectares). Land is an asset that ensures food security especially in a country like Zimbabwe which relies on agriculture. Any alterations on the size and fertility of land available can have serious effects on food security. Quarrying activities have resulted in the displacement of people from their land and in some cases like in Nyamakope village and Mbudzi ward the agricultural land available has been turned into dumpsites for quarry waste. Most of the land affected is located close to mountain areas. This has had a serious effect on maize production since most maize farmlands are located near mountain farmlands. According to United Nations Economic Commission for Africa (2011), displacement and forced eviction or relocation are common features of mining and quarrying operations and quarrying activities include waste disposal. Mining and quarrying compete for space with other land uses such as farming, which can easily become a source of tension among the miners, farmers and local communities (Bhatasara 2013).

4.5 Impact of Black granite quarrying activities on availability and access to forest produce and grazing land.

Figure 4.2 Impact of quarrying activities on forest produce and grazing land.

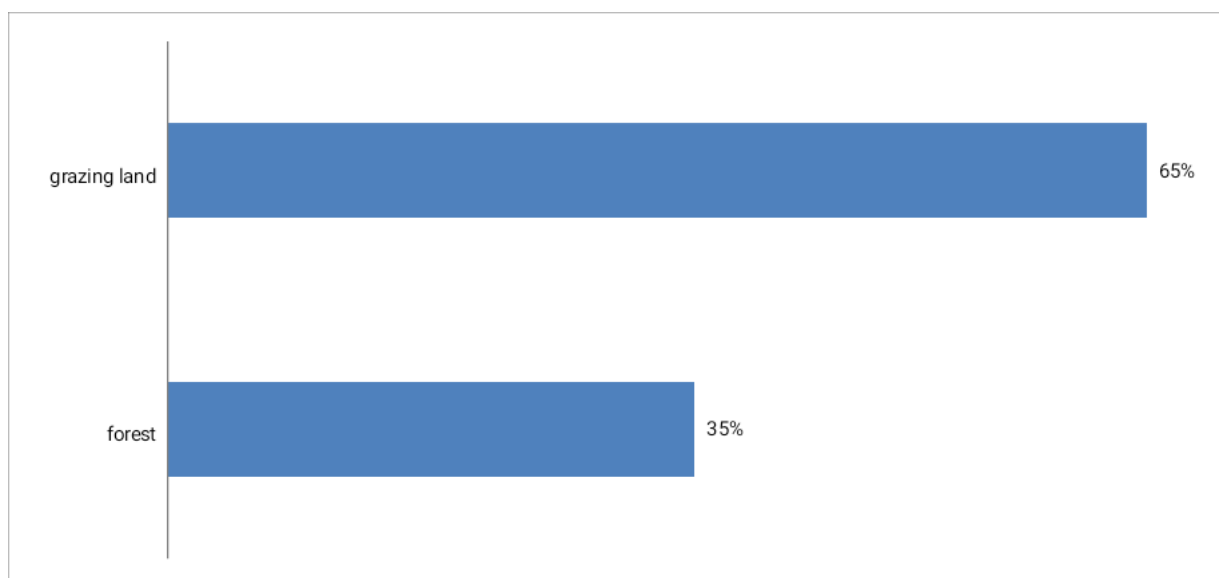


Figure 4.2 shows that 65% of the questionnaire respondents' access to grazing land is being affected by quarrying while 35% of the respondents stated that availability and access to forest resources is now difficult due to quarrying. With access to

grazing land having the highest percentage (65%). Food security is supplemented by access to livestock and non-agricultural sources of food. Quarrying activities like creation of dumpsites and land clearing have resulted in most grazing land being lost. This has negatively affected food security through affecting livestock rearing activities. Cattle and goats are a source of wealth and food and with the reduction of available space for grazing land food security is being undermined.

Forest produce plays a vital role in ensuring food security through access to non-agricultural sources of food. Forests provide access to wild berries, mushrooms, honey and wild animals. These contribute to food security in times of drought and famine. Most rural communities in Mutoko district rely on these forest produce for their household food security. However, with the rise and growth of quarrying activities most of these forest produces are decreasing in quantity and yields. Deforestation and blasting have scared away many wild animals which used to be found in the district. Access to wild meat had always been a way of supplementing dietary needs of households and food security (Chigonda 2010). With reduction in agricultural yields and loss of forest produce households in Mutoko are facing challenges in accessing food thus becoming vulnerable to hunger and poverty. This view is supported by Bhatasara (2013) who stated that unsustainable land clearing in Gurure ward in Mutoko is being done to pave way for quarrying and to construct roads resulting in massive deforestation.

4.6 Impact of quarrying on Water resources

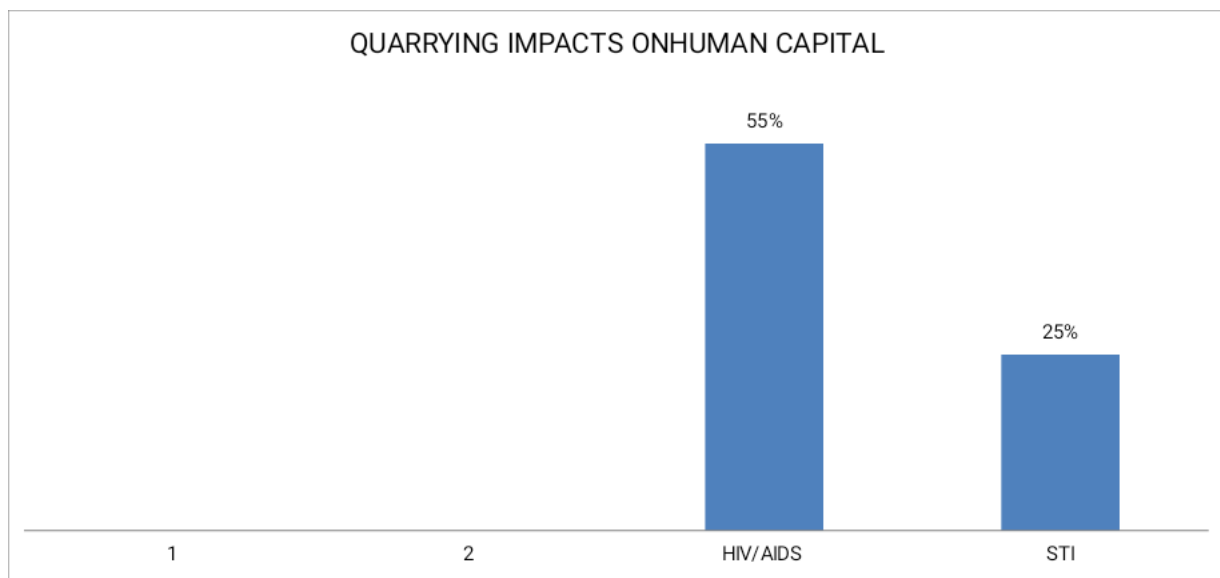
The main economic activity in Mutoko district is agriculture which utilizes underground water such as wells and ponds. Quarrying activities like blasting have a negative effect on the underlying granite rocks which act as aquifers for water tables. Blasting has resulted in the cracking and creation of fissures in most granite rocks and water tables are now unable to hold water for a long period of time. According to an interview with the Local Authority engineer and local EMA technician water tables levels in Mutoko district are now very low. Questionnaire respondents stated that wells and ponds now dry up quickly affecting agricultural yields especially in community garden crops.

Questionnaire respondents also stated that rainfall patterns and amounts have since

decreased due to quarrying activities. Blasting processes have resulted in the demolition of most hills in the district. Hills and mountains have an effect on the occurrence of water and rainfall as some mountains act as sources of water Ming'ate and Mohamed (2016). Hills also act as water catchment areas and most agricultural fields in Mutoko are located closer to them. In addition, some hills are regarded as sacred places for African traditional purposes and quarries have since blasted away most of these hills. The results have been loss of agricultural land near hills, low agricultural yields due to low rainfall and shortages of rainfall when it is expected. This has had a serious bearing on the food security status on different communities in Mutoko. Ming'ate and Mohamed (2016) are of the same view with regards to quarrying in Mandera in Kenya where quarrying has led to the destruction of hills which are regarded as water catchment areas.

4.7 Impacts of Black granite quarrying on human capital

Figure 4.3 Impacts of quarrying on human capital.



According to the data collected through interviews and questionnaires. Black granite quarrying has had many impacts on human capital. Some of the effects are illustrated in Figure 4.3. Quarry employees are vulnerable to various occupational injuries which have resulted in 10 workers being unable to work in agricultural fields or to continue working at quarry sites. This has had a strong bearing on food security. An injury on a bread winner affects the availability of food in a household. Five workers suffered from back ache due to the jobs they do like carrying and off-loading

heavy material. From the questionnaires 15% of the injured employees stated that injuries are affecting food availability.

According to Bhatasara (2013) quarrying or mining activities undermine the quality and availability of human capital. This is due to the fact that mining weakens men such that their virility and sexual prowess is undermined thereby making men unable to satisfy their women, who can then seek other sexual outlets (Bhatasara 2013). This has led to an increase in cases of HIV and STIs. From the administered questionnaires 55% of the respondents stated that quarrying has led to an increased number of HIV infected individuals while 25% stated that quarrying had led to increased illnesses related to STIs and this was through prostitution near and around quarry sites. Quarrying has also led to occupational fatalities (5%) through occupational injuries and poor working conditions. All these impacts on human capital lead to illness or death of bread winners and an increased number of orphans. Vulnerability to poverty and food insecurity rises due to lack of man power availability to work and provide for their households.

4.8 Black granite quarrying impacts on effective consumption of food.

Figure 4.4 Impacts of black granite quarrying on effective consumption of food.

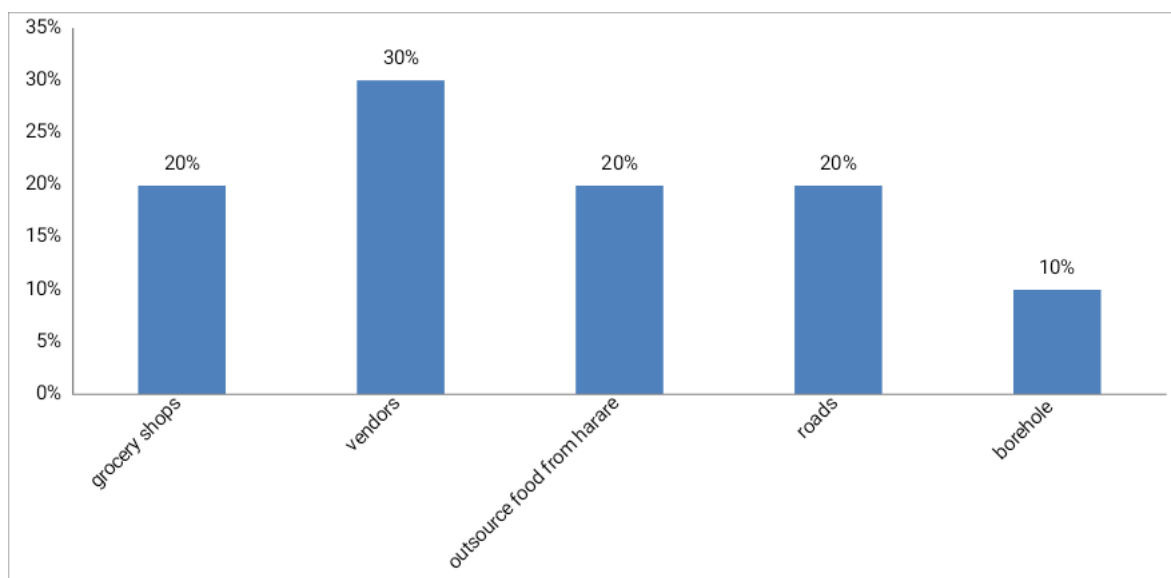


Figure 4.4 above summarizes answers from questionnaire respondents on how black granite quarrying is contributing to effective consumption of food. It is

however, important to realise as will be discussed in this section that most of those who are benefiting from effective consumption of food through black granite quarrying are only those who are employed by quarrying companies and the case is different for non-employed respondents.

From the administered questionnaires 20% of the employed respondents stated that quarrying is contributing to food access and consumption in their households. Quarry employees through access to salaries are able to save money and purchase food stuff from various stores to supplement their dietary needs. Local people in Mutoko used to mainly survive on self-produced food only. With the rise in quarrying activities in the district many grocery dealership stores and vendors have opened and this has managed to give access to locals to quality and healthy food to supplement their diets.

Employed respondents through their salaries are now able to buy safe and nutritious food from cities like Harare. According to FAO (2018) every household must have access to nutritious food and poor access to food with particular reference to healthy food can lead to health risks especially to women and children. 20% of the questionnaire respondents stated that black granite quarrying through construction of roads has managed to give different individuals a chance to access different types of safe and nutritious food located outside their communities and district.

Effective utilization of food is also facilitated by access to clean water. According to 10% of the questionnaire respondents quarrying companies have managed to do this through drilling of boreholes at different schools which they built as part of their corporate social responsibility. Communities who have benefited from such school development projects are able to access clean and safe water.

However, the situation is very different for non-employed households. Due to reduced horticultural yields and horticultural income, these households' access to safe and nutritious food from grocery shops is difficult. With the depletion of underground water through the blasting of granite rocks access to clean water is now becoming a problem.

4.9 Main crops grown by non-employed respondents and purpose for cropping.

Table 4.3 Main crops grown by non-employed respondents and their purpose.

Crops grown	Purpose for cropping
tomatoes	mainly for selling
Banana	mainly for selling
vegetables	mainly for selling
onions	mainly for selling
maize	mainly for household consumption

Above is a general description of the main crops grown by the unemployed respondents and the main purpose for cropping. Most of the crops are grown so as to supplement household food security through surviving on self produced food while other crops are sold to obtain money to access other types of food through outsourcing. Black granite quarrying activities like blasting, land evictions and land transformations are affecting the availability and access to such food crops.

4.10 Measures in place to reduce the effects of black granite quarrying on household income and food security

According to an interview with one of the quarrying representatives, the companies are planning on increasing the number of local employees. This is an effort to correct the wrong deeds created due to the land eviction process. They will try to make sure most of the land eviction victims get employed. Black granite quarrying companies are also involved in community engagements with local leaders to try and deliberate on some of the problems which local communities are experiencing and methods to solve them.

4.10.1 Measures put in place by the government

Through the Indigenisation and Economic Empowerment Act (14:33) in 2008 the Government of Zimbabwe tried to make sure that local people benefit from their own indigenous resources. The government through the Mines and Minerals Act (Chapter 21:05) regulates how granite is quarried and sold in Zimbabwe. The Environmental Management Act (Chapter 20:27) of 2003 is also a tool used by the government to control the operations of black granite quarrying and promote sustainable quarrying.

4.10.2 Measures and efforts put in place by ZELA

ZELA has the responsibility to ensure that local people are aware of their rights and know what actions to take in order to protect them. ZELA has been active in Mutoko since 2006. Some of the measures and projects that ZELA has left in Mutoko district are as follows. It managed to collaborate with the Women Rights Commission to educate the communities in Mutoko about their rights especially young women. This is why Mutoko has been seeing a steady increase in the number of the employed females.

- ❖ ZELA has also managed to open and facilitate a dialogue in which quarrying companies and community leaders can meet and discuss some of the challenges affecting communities and workers.
- ❖ ZELA has also put in place schemes such as the Alternative Revenue Income Generating scheme for women to run their own projects and increase their household income. This has managed to make beneficiaries of such schemes independent from being dependent on their husbands for money and also supplement their husband's salaries.
- ❖ ZELA has been acting as advisers to local chiefs on how to manage their natural resources and how best their communities can benefit from exploitations of natural resources by outsiders.
- ❖ ZELA also put in place community monitors who act as observers at and around quarry sites. Their duty is to identify any injustices and report them to ZELA. There is a case study of four local workers who were wrongfully dismissed from work. The case was reported by the community monitors and ZELA took it to court and the workers managed to go back to work.

4.10.3 Proposed measures by the affected communities to enhance household income and food security.

The researcher was able to identify some of the solutions which the questionnaire respondents regarded as important in addressing their problems on household

income and food security. Employment of the victims who lost their farmland due to quarrying was on the top of their list. They regarded the victims as the main beneficiaries who are supposed to gain more from quarrying.

- ❖ Questionnaire respondents also stated that for those who lost small portions of their land to quarrying and managed to keep some parts of the land they encouraged the quarrying companies to provide such victims with cropping inputs so that they manage to start practising intensive agriculture.
- ❖ Another solution was that the government should consider starting feeding schemes at schools. This will promote the alleviation of hunger and poverty.
- ❖ Some locals suggested that in as much as quarrying is taking place the companies should avoid quarrying on prime fertile farmlands. In cases where the damage has already been done, quarrying companies should start considering rehabilitation of such lands by removing the rubbles left as waste material and filling of gullies left behind during the excavation stage of quarrying.
- ❖ Affected communities are also encouraging quarrying companies to develop forest nurseries to be used for land reclamation on lost forest areas.
- ❖ Most of the efforts being done by quarrying companies are not addressing food security and household income, for example building of schools and clinics. Hence locals are lobbying the quarrying companies to put more attention on addressing issues such as income and compensation of lost land.

Chapter five: Conclusion and recommendations

5.1 Conclusion

The aim of this research was to assess the impacts of black granite quarrying on household income and food security in Mutoko district. It was evident that quarrying had been able to improve household income for some individual households through employment and access to salaries. Black granite quarrying improved the household food security for employed individuals since they were able to buy food to supplement their diet and purchase agricultural inputs on time in preparation for the farming season. However, quarrying benefits are limited only to those employed at the quarry sites, while those who are not employed are suffering from lack of access

to agricultural fields, reduced crops yields and reduced quantities of horticultural crops for selling. This is due to creation of dumpsites in agricultural fields, creation of cracks and fissures on granite rocks through blasting which affects availability underground water. Most of the efforts being done by quarrying companies such as building of schools and clinics do not address the injustices created by quarrying on household income and food security. This has been attributed to the fact that quarrying companies are profit driven and they try as much as they can to avoid costs associated with land reclamation, salary increments and compensation for lost land to locals. Also the mines and mineral act does not mandate them to compensate victims of lost land.

5.2 Recommendations

- To government institutions like Mutoko rural district council and EMA, the researcher recommends that they fully implement government legislation for example the indigenization and empowerment act (14:33) of 2008 and the EMA act (20:27) of 2007. The indigenisation and empowerment act will make sure that more than 50% of the each quarry's skilled and unskilled employees are from Mutoko while the EMA act will help in conservation of natural forest areas which are sources of non agricultural sources of food.
- Quarrying companies should prioritise employment of local people who were forcefully evicted from their land as a way to cushion them from their grievances. As part of their Corporate Social Responsibility, quarrying companies should give farming inputs to local famers. This will go a long way in ensuring food security in the district.
- Local people whose livelihoods depend on agriculture should hold quarrying companies to account and seek commensurate compensation for land and livelihood losses.
- To the affected communities the researcher recommends that they form local partnerships or syndicates so that they start quarrying and benefit fully from black granite quarrying, this will go a long way in enhancing their household income.

- The researcher also recommends that females should engage in all types of job category. This will lead to more females being employed and the enhancing of household income and food security for female headed families.



Faculty of Social Sciences

Department of geography and environmental studies

My name is Abel Sibanda. I am a student at Midlands State University. I am doing research on impacts of blacks granite quarrying on household income and food security. Information that you give will be treated confidential and used only for this research.

Questionnaire no.....

Date.....

Village.....

Time.....

Please tick or fill in the space provided.

Section A: Demographic data.

1. Sex: Male Female

2. Age: 15-24 25-34 35-44 45-54 55-64 65+

3. Marital Status: Single Married Divorced Widow

4. Size of household:

4. Educational Level: Primary Secondary Tertiary

Section B: Impacts of black granite quarrying on household income.

5. Are you employed? Yes No

If yes, please state the type of employment.....

6. How many months/years have you been employed.....

7. What type of work do you do? Skilled Unskilled

8. How many people are employed in your household.....

9. How regularly do you receive your salary?

10. Do you have other sources of income? Yes No

If yes, please state your other source of income.....

11. What is your average monthly/weekly income.....

12. How has black granite quarrying contributed to your livelihood.....

13. Which contributes more to household income black granite or farm income.....

14. Have black granite quarrying improved your household income?

15. If yes state in what ways---

16. If no explain----

Section C: Impacts of black granite quarrying on household food security.

17. Is black granite quarrying enhancing your household food security status? Yes No

If yes, please explain.....

18. What type of challenges are you experiencing due to black granite quarrying?

On fields	
On soils	
On water	
On forests and forest produce	
On wild animals	
On wetlands	
Any other	

19. Are you involved in agriculture? Yes No

If yes, please state the crops grown, yields produced and purpose of the crops:

Crop and yield	purpose

20. How have quarrying activities affected farming activities?

21. Have quarrying activities affected size of your farm?

22. Have quarrying activities affected crop yields and crop diversity, food availability/access?

If yes explain.....

23. Have quarrying activities affected grazing areas?

24. Have quarrying activities affected household labour supply

25. Access to forest produce:

List.....

26. Are you experiencing any social challenges due to black granite quarrying (HIV, marital problems).....

If any are present, how is it affecting your household food security.....???

Section D: Measures to reduce impacts of black granite quarrying on household income and food security.

27. What do you think must be done by black granite quarrying companies to enhance food security in the district.....

28. What other measures are already put in place by black granite quarrying companies to address the challenges above.....
.....

29. What do you think are the limitations being faced by quarrying companies in implementation of measures to improve food security and household income in the district.....
.....

Thank you

Appendix 2 interview guide

INTERVIEW GUIDE FOR MUTOKO RURAL DISTRICT COUNCIL

Section A: Impacts of black granite quarrying on household income.

1. When did black granite quarrying start in the district?
2. How many quarrying sites are operational in the district?
3. How much black granite is produced annually from the district?
4. In what ways has black granite quarrying affected household incomes for local people?
5. What area is covered by each operational quarry?
6. How much land has not yet been utilised for quarrying?
7. How much granite is produce monthly/annually?
8. How many locals are employed at quarry site(s) annually since day of first operating? (Get information per year to determine growth in employment opportunities for local people.)
9. What type of work is undertaken by most of the locals employed?
10. What are the gender patterns for local employment?
11. What is the average salary paid to locals by job category?

Section B: Impacts of black granite quarrying on household food security.

12. How is black granite quarrying affecting soil composition?
13. How is black granite quarrying impacting on water quality in the district?
14. How much farmland has been lost due to quarrying activities annually?
15. In what ways has black granite quarrying affected forests and forest produce?
16. How much fertile land is lost annually and in what ways?
17. How has black granite quarrying affected the occurrence and distribution of wild animals in the district?
18. Are they any other ecosystems under threat from black granite quarrying?
19. Are quarrying operations taking place in a green area?
20. If not, did any work occur on villagers farm lands/ grazing areas/ forests?
21. Where operations have affected farm land have villagers been compensated?

22. If yes how have they been compensated?

23. Did quarrying operations result in displacement of villages or individual households?

Section C: Measures to reduce impacts of black granite quarrying on household income and food security.

24. What measures are in place in to protect the biotic and abiotic ecosystems in the district from black granite quarrying?

25. What measure have been implemented by the quarrying companies to address impact of black granite quarrying on farmland forests, soil and water resources?

26. What strategies can the government and quarrying companies implement to enhance food security in the affected communities?

27. How regularly do you visit the quarrying sites for inspections?

28. Are there any regulations which govern the quarrying of granite?

29. How do you make quarrying companies adhere to such regulations?

THANK YOU

**Appendix 3 observation check list
OBSERVATION CHECK LIST**

WHAT TO OBSERVE	WHAT WAS OBSERVED
Number of children per household	
Physical assets per household (tractors and other farming inputs)	
Type of houses and material used for building.	
Number of vendors per quarry	
Type of crops grown	
Number of operational quarries	
Available water sources and distance from quarry sites	
Distance of farms from nearest dumpsite	
Distance of roads from farmlands	
Type of work done by locals	
Mining methods in place	
Land development projects and programmes in place.	

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