

**IMPACT OF STONE QUARRYING ON THE SOCIOECONOMIC DEVELOPMENT OF
EASTERN DIVISION, TORORO DISTRICT.**

BY

OWOR MARK PHILIP

BU/UP/2021/1747

**A RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY
FACULTY OF SCIENCE AND EDUCATION IN THE PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE AWARD OF BACHELORS
DEGREE IN SCIENCE AND EDUCATION OF
BUSITEMA UNIVERSITY**

AUGUST, 2024

DECLARATION

I, OWOR MARK PHILIP do declare that this is my own research work and has never been presented to any other institution of learning.

Signature..........Date.....19/08/2024.....

APPROVAL

This to certify that this research work is for Owor Mark Philip entitled “Impact of quarrying on the socioeconomic development of Eastern Division “has been under my supervision and is now ready for submission to the department with my approval

Supervisors' signature  Date 22nd / 10 / 2024

MR WAMONO EMMA

DEDICATION

I dedicate this report to my beloved mother Akongo Martha for her guidance, motivation and support throughout my academic journey.

Signature..........Date.....19/08/2024.....

OWOR MARK PHILIP

(STUDENT)

ACKNOWLEDGEMENT

My sincere appreciation goes to the almighty God for health, wealth and granted to me to enable finish this report.

My appreciation goes to my supervisor Mr. Wamono Emmanuel for the great work done, I can't forget to thank Dr Turyahabwe Remigio and the entire staff of the department of Geography, Busitema University for the good mentorship.

I am humbled by the contribution of my family that has been by side morally, spirituality and financially through my academic journey. May God reward the effort of my mummy, Akong Martha, grand mama Ongwena Mercy who took the mantle to support my academic journey?

Lastly to all my friends and class mates especially the geography class of 2022-2024, Mafabi Nathan, Lemanda Michael, Atida, Doreen, Martha, Dausi, Collins and Mechak. The memories we shall forever be a part of me.

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List of acronyms

EIA	Environment Impact Assessment
EPA	Environment Protection Agency
ARM	Athi River Mining
ZCTU	Zimbabwe Congress of Trade unions
3Es	Environment, Economics and Equity

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ABSTRACT

The study aimed at establishing the impact of quarrying on the socioeconomic development of Eastern Division in Tororo district. 40 respondents participated in the study; the respondents were selected using simple random sampling and purposive sampling techniques from different parishes of Amagoro A and B, Nyangole parish. The study objectives were to find out the dominant method of stone quarrying in Eastern Division, identify the positive socioeconomic impacts of stone quarrying, examine the negative socio economic impacts of stone quarrying. The data collected was analyzed using structured questionnaires, interview, observation, camera tools were employed and recording. The collected data was analyzed using description and statistically using tables, bar graph column graphs and pie chart. The study found out that the dominant methods of quarrying were heating and wedging. The study also found out that the positive impacts of stone quarrying were source of income, provision of employment opportunities, economic diversification, provision of building materials, source of water, and development of infrastructures and utilization of idle resources. The negative impacts of quarrying includes accidents, deforestation, accelerated school dropout, moral decay, poor drainage destruction of the land scape, dangers of unfilled pits. The negative impacts of stone quarrying has been mitigated by tree planting, wedging, use of local authorities, use of police, clan courts, digging channels, use of mosquito nets, spraying of houses.

The researcher recommended that the methods of stone quarrying were rudimentary therefore there is need to adopt modern quarrying methods to increase output and reduce labor costs.

CHAPTER ONE

1.0 Introduction

This chapter gives an introduction to the study. It highlighted the back ground of the study problem statement, location of the study area and the background of the study area, the purpose of the study research objectives and questions, scope of the study, significance of the study, limitations that were faced and mitigations measures for the limitations (delimitations).

1.1 Background to the study.

A stone is defined as building material consisting of a piece of rock hewn in a definite shape for special purpose, materials consisting of aggregate of minerals like those making up the earth crust, a crystalline rock that can be cut and polished for jewelry Jennifer et al, (2005).

A harden earthen material consisting of large rocks and boulders, a piece of small rock, a playing piece made of any hard materials, used for various board game such as backgammon and go, precisely shaped piece of granite with handle attached which is bowled down the ice, a lump of mass of unconsolidated mineral matter (Jennifer et al, 2005)

Quarrying on the other hand originates from the Latin word “Quadraria” which means a place where stones are extracted. It is therefore the extraction of stones or slate from an open surface quarry. (Jennifer et al, 2005).

Quarrying is commonly divided into two categories that are large scale and small scale. However, such classification commonly obscures the unity or diversity of scales or across scales, giving rise to false dichotomy. For example, small quarries situated in close proximity to one another can cover extensive area. A more accurate classification therefore is the level of formality that is formal and informal which takes place in consideration the economy of the mining operations as well as the economic context in which it is placed.

Following such classification, a formal quarry is defined as low capital labor intensive extraction activities in developing countries which is local community participate in significant proportions. Within such operations, the community interface cannot be explained using exclusive assessment of geological scales. There is a wide range of workers involved in informal quarrying including local artisans, male wage workers and women who participate either on their own or alongside their family including their children. Although there are clearly many different types of labor performed at an informal mine, the work typically undertaken by women frequently goes unnoticed and little appreciated (Carina, 2002, Burke, 1993) as cited in Kuntala (2003).

Quarrying contributes to economic growth as it involves both genders (Elizabeth 2005). And yet rapid changes in building and infrastructure development has increased demand or construction materials according to Waringo et al (2018). Quarrying thus leads to increased tax base for the government, better standards of living due to increased income, employment opportunities for the local population and availability of construction materials inform of stones aggregates, stone dust, cement and building materials lime (Riihimaki et al 2012).

Quarrying can be traced back to world wars one because in 1915, stone quarrying became very important for the German soldiers especially in the regions of A base. German army perfected the art and produced geological maps showing sites for stones. The stones were used for fortification for instance the West Wall (Riihimaki et al 2005).

The German army in world war one also used stones for the construction of hard standing ammunition and stone depots. This is in addition to the importance of stones and marbles as building and construction materials (Riihimaki et al 2005)

Some of the most famous quarry works in the world include the Tuscany Quarry in Italy, Paros and Pentellic quarries in Greece and Rutland quarry in Vermont in the United states of America (USA) Francini Inc. Blog 2014)

The world's largest granite quarry found at Mount Airy, North Carolina USA is about the size of 66 football fields and is visible by the National Air space satellites. The USA state of Oregon is also operating a number of stone quarries. Pakistan is famous for Omex quarry, Poland famous for sandstone blocks while the quarry industry in Brazil is famous for Ubatuba quarry stone.

India is the world's largest producer of dimensional stones (27% of the world's production) and is the major exporter of stones. The breakdown of stones export in India in 1998 was as follow, marble 3.6 million tones, granite 5 million tones sand stone 5.5 million tones, flaggy line stones 2.1 million tones and slate 3000 tons. However, the informal nature of quarrying activities around the world leaves some of these data questionable particularly the low level profit stones such as basalt are taken into account which results in many quarrying operations going on unrecorded. Indian quarries are typically small operations that proliferate next to bone another in sizable geological locations and they have large number of female worker (Chakraverty, 2001, Nandi, 1996 and Aich 1996 as sited in Kuntala (2003) and are also renowned for having and child labor (Pria 2001 and Alfa 1991) as sited in kuntala.

In Kuwait quarrying dominates the northern part which is mainly desert and comprises about 2.29% of the country's total land area of 17, 818 square km the population dynamic and the socioeconomic transformation increased the demand for gravel which is deposited in layers (1m- 10m depth) The annually expected demand for gravel is about 3.3million cubed meters. Housing projects, road construction and commercial industrial projects consumes about 33%, 24.5% and 3.5% of the total demand for gravel respectively (Jasem 2001).

Asia as a continent, the dominant granite producers are India, about 85% and China is the second with about 9%, Saudi Arabia is the third with about 6%, Sri Lanka, Iran and Turkey are small exporters of granite. Most of India's granite come from South India, Dharwar craton with close pet granite. Dharwar granite in South India is made up of classical triplet of Achaean terrains.

In South America, Brazil produces almost all the content's granite from Riberia belt in Esperanto Santo, Rio de Janeiro and Bahia sates and Sao Francisco craton in Minans Gerias and Bahia state. The small amount of commercial granite come from Argentina and Uruguay (Banez et al, 2010).

In Europe granite comes from Finland (27%) and Norway 23%. They are followed by Italy, 22% Spain 19%, and Sweden 5%. Other quarrying countries include France, Switzerland, Portugal, Germany, Poland. The most dominant stones are Proterozoic, rapakivi, granite of Finland, Ukraine and Sweden

Paleozoic Herynian granite (Italy and Spain). Others are Rapakivi granite and anorhosites from Ukraine, granite of Herynian mountain from Spain and Italy, alkali syenites of Oslo rift from Southern Norway. (Norma et al 200)

In North America, United states of America sells about 72% and 28% for Canada. American commercial granite come from Archean (Ontario, South Dakota), preterozoit (Ontario, Quebec, Minnesota and Texas) Paleozoic (core of North American continent) migmatite from Minnesota. They are quarried in Ontario (vermmicillion pink, crystal gold, red deer brown, pine green) and Manitoba. In the Appalachians there are solar white, Salisbury, pink mount, air white granites from South Carolina, granodiorite from Vermont, isle granite from Georgia grey granite from Georgia, Silver para gneiss from Georgia, miffed pink granite from Massacheutess, stony Greek migmatite from Connecticut. Sierra Nevada batholith produces academy black gabbro and sierra white granite from batholith and younger granite of Tercieryare quarried in British Columbia and western Canada. (Townsend 2009)

The continental quarry industry in dictated by rapid change in building and infrastructure development which have taken a positive trend and increased the demand for construction materials inform of cement, aggregates, hard core and so on hence increase on the size of quarries and quarry works (Stephen et al 2018).

Quarrying in Africa is not a new activity. This is evident in the Egyptian crafts like Obelisk and other ancient Egyptian monuments. A rock temple stands at Sessile quarry site in Egypt and 80% of Egyptian temple monuments were constructed out of quarry stone (Cohen et al 2004).

Mining in Zimbabwe dates back to 15th century when people practiced traditional small scale mining of iron and gold. Increasing demand for black granite especially for construction has led to the development of quarrying industry operations in Mutoko district. This has transformed the district into an important mining area in the country. This district falls within the granite gneiss rock which covers approximately 53% of the country's surface area (Pivko 2004)

Some of the Africa's most famous quarries include South Africa's blue sodality (blue semi-precious stone) gold Africa marble quarry famous for brown marble, impala black granite famous for South African sand stone, Africa stateroom vention Namibia famous for white marble sunny marble in Egypt specializing in beige marble, Africa multicolor granite in Nigeria, Nero impala famous for black granite in South Africa, Rosa stone slate south Africa known for black granite, fantastic marble quarry in Egypt mostly producing gold marble and ivory coast famous for yellow granite (Dantron et al 2006).

The most commercial granite from Africa are found in South Africa 73% less from Zimbabwe, 22. The rest is from Angola, Zambia, Egypt, Nigeria. The gabbro and granite of Bushveld complex from South Africa are of commercial value (Pivko 2004)

In East Africa, the aggregate market is looking very promising a market boom is expected and East Africa has a lot of unexploited aggregate potential both in the urban and deep in the rural areas according to Sheem (2005)

The East Africa quarry industry is dominated by Kenya's giants Athi River mining company (ARM). The group is investing heavily in limestone quarrying for example, they plan to invest in Kitui county about 25million USA Dollars (\$). The Dangote group is facing persistent land acquisition obstacle and legal

battles but has made a significant progress in the regional quarrying industry with estimated capitalization of about 20 billion \$ and is planning a 400 million US \$ cement plant in Kitui. Other large quarrying companies are those mining limestone for cement for example Hima cement, Masekeru and Dura all owned by the French cement giants, Lafarge. The Dangote group also plans further investment in partnership with the East Africa Portland cement worth \$ 285 million. Indian conglomerate Sang his group has a 99 years lease for 106,000 acres to prospect for limestone in West Pokot in Kayondo county in Artisanal stone quarrying industry has grown rapidly in Kenya in recent years employing many but also having adverse effect upon the environment inform of low recovery of usable stones, hence large amount of waste (Jill 2000)

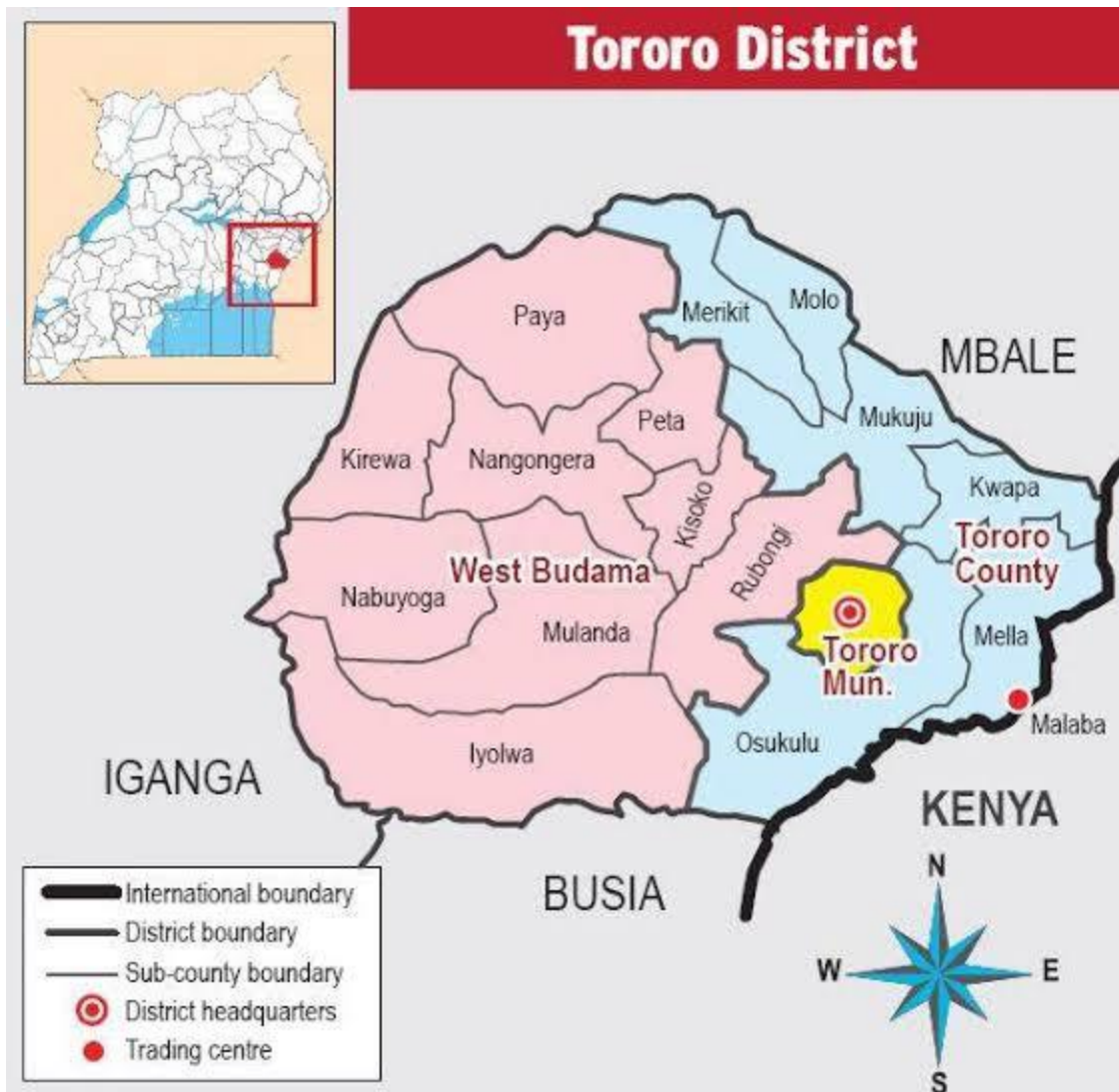
Many developing countries Kenya inclusive have aligned themselves towards alleviating of over exploitation of minerals. Through the help of Kenyan government there has been promotion and creation of agent quarry legislation that has changed the picture of the rural stone quarrying dramatically. It has enabled community in Nyambara to create a wide network of agent who carry out various services such as stone agent, brokers and so many other services there by addressing the problem of physical access on stone quarrying. The commercial stone quarrying has not been left behind in this goal making it a reality (Anunda 2009).

By 2012, there were 116 registered companies in Uganda carrying out less than 15 of which were Uganda owned. The purpose of starting up a quarry company in Uganda starts with the identification of sufficient quantity of rock suitable for the Ugandan construction market, acquisition of the rock deposit by negotiating fair price with land owners, conducting Environmental impact Assessment (EIA) authorization by the general security officers who sits at the ministry of internal affairs who visit's the sites on fact finding mission then you can enlist the service of a blaster (explosive expert) who assess the quantity of explosive required and then the district security should be informed of the blast (Ogwang 2019)

Uganda's largest building stone quarry, Namubiru stone is located in Mukono 6km from mukono town council and it occupied 30 acres' land with a production capacity of 80 tones per hour and also produces product like asphalt for construction in addition to ordinary building stones (Ogwang 2019)

1.2 Problem statement.

Stone quarrying in Eastern Division is not a new activity and is not the only economic activity in the area other activities include agriculture, trade and commerce, transport and so many others in the sub county. Comparing the quarrying dominated community and other economic activity dominated communities within the sub county, it evident that the quarrying community enjoy better infrastructure inform of roads, health services in Tororo main hospital, education services with in schools like Amagoro primary school, Elgon view primary school, Rock high school, Tororo girls school Majansi High school among others, all allocated within the vicinity of the quarry. Even in terms of trade the busiest areas include Nuluwere trading center, corner UCI market along Malaba- Jinja road and the main Tororo town are all with in the proximity to the quarry. It is puzzling and not clear whether quarrying is the only activity that has led to the above socioeconomic change pattern or otherwise. Understanding this can only be ascertained by evaluating each activity to start with in this case stone quarrying. Therefore, this study will seek to find out the influence of quarrying on the above pattern of socioeconomic development in Eastern Division.



1.3.2 Relief and drainage,

Generally, the relief of Eastern division is a plateau slightly slanting toward East that is in the areas of Amagoro A parish. The landscape is however punctuated by exposed rocks in Amagoro B parish

The upland areas of Amagoro are well drained and the streams of water flowing these area towards the lowland of Nyangole parish in the North.

1.3.3 Vegetation

Eastern division is a savannah area with shrubs, grassland and scattered trees with in the parishes of Amagoro A and B. The swamps are covered with swampy vegetation. Most of the swampy vegetation around Nyangole parish have been cleared to provide land for agriculture and settlement.

Plate 1.3.3 show vegetation type.



Source: Field photo as on 24/07.2024

1.3.4 Climate

The climate of Eastern division is a tropical wet and dry. It is characterized by high temperatures throughout the year and moderate rain totals. The rains are bi modal following the apparent overhead sun. The duration of the sun (length of the day) also varies with the apparent movement of the sun. The humidity alternates and it is high in the wet season and low in the dry season.

1.3.5 Geology and soils.

Eastern division is dominated by sedimentary rocks especially at the lowlands of Amagoro B parish has series of exposed sedimentary rocks giving an evidence of sedimentary actions in the area. The soils are varying in type and characteristics, the vertisols which are soils rich in heavy clay and sticky when wet, this supports a vibrant pottery industry in Kasoli, Nyangole. Hydromorphic soils which are not vertisols or saline but they are water logged characterized by seasonal or permanent logging in small depressions common in the low land of Amagoro A village.

Plate 1.3.4 show soils type



Source: Field photo as on 24/07/2024

1.4 Purpose of the study

The purpose of study will seek to establish the impact of stone quarrying on the socioeconomic development of Eastern Division in Tororo district.

1.5 Research objectives

1.5.1 General objectives

To find out the impact of quarrying on the socio-economic development of Eastern Division.

1.5.2 Specific objectives

To find out the dominant methods of stone quarrying used in Eastern Division.

To identify the positive socio- economic impacts of stone quarrying on the development of Eastern Division.

To examine the negative socio- economic impacts of stone quarrying on the development of Eastern Division.

To identify strategies of mitigating the negative impacts of stone quarrying.

1.6 Research question

What is the dominant method of stone quarrying in Eastern Division?

What are the positive socio-economic impacts of stone quarrying on the development of Eastern Division?

What are the negative socio- economic impacts of stone quarrying on the development of Eastern Division?

How can the impacts of stone quarrying on the socio-economic development of Eastern Division be mitigated?

1.7 Scope of the study

This study covers the parishes of Amagoro A ward, Amagoro B ward, Central ward, Nyangole, Akiisim ward, Kengere ward.

1.8 Significance of the study.

This study will enable the researcher to gain field experience in addition to fulfilling partial requirement for the award of Bachelors of Science with education of Busitema University.

The study will raise awareness to the community on the potentials that rests in quarrying and shed lights on the negative impacts of quarrying on socio-economic development and hence provides suggestions for mitigation measures to negative impacts. The finding of the study will guide policy makers in decision making in relations to promotion and development of quarrying in the sub county and enhances sustainability of quarrying.

The study will also provide platform and back ground knowledge for further research in the topic of quarrying and hence it will suggest areas for further research

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter aims at appreciating the scholars who have done some scholarly work in the field of quarrying hence bring together the different views of different schools of thought to aid the study by widening the perspective of study

2.1 Methods of stone quarrying

The method of stone quarrying depends on the number of factors for example the structure of the rock to be quarried in line to its characteristics' of jointed and hardness, intended use, geological history of the rock, quantity of stone to be quarried, level of technology, value of the stone to be quarried, distance of the quarry from settlements and other economic activities. The method of quarrying is therefore broadly grouped into two that is methods involving blasting stones and methods involving mechanical breakdown of rocks. According to this criterion of classifying methods of quarrying those that mechanical breakdown rocks involve heating or mechanical use of human physique to shatter the rocks apart for example channeling, wedging, heating and quarrying using hand tools. Methods involving blasting on the other hand involve use of explosives like cordite, dynamite and so on. (Sanadandam 2016)

Channeling involves the use of big machines called channelisers (channeling machines) with reciprocating cutting tools and are power driven by either steam, electricity or compressed air (Derb 2015)

The method is suitable for soft rocks like limestone, sandstone and so on. The quarrying is done by making vertical or oblique groove or channel on rocks. Channeling machine rapidly makes grooves of about 24 meter (m) length, a width of 50-70m and depth of about 2.40-3.7cm. When a single block of rock is required, grooves are cut at the sides and the back horizontally to meet the side channel at the base. (Chuahan 2012)

The channeling process involves cutting channels around the stone block to be removed, drilling horizontal holes beneath the block of stone. Wedges are then driven into the drilled holes and the block of stone is separated from the rest of the stone and hoisted transporting van, lorries or wagons. Single block as big as 10m long, 3m thick and 1-3m wide can be quarried using the channeling method of quarrying (Derb 2015)

Heating method is an old method of quarrying used for obtaining small quantity of stones. This method takes advantage of heating and cooling of rocks which results in differential expansion and contraction of the different rock layers therefore resulting in exfoliation of the outer layers (Derb 2015)

Wedging method of rock quarrying, metallic wedges are used to widen the cracks of the rock hence the name wedging. This implies that the method is suitable for jointed rocks that provide joints. (point of wedge application). The rocks are normally characterized by naturally occurring joints or cracks and so steel wedge is driven into the cracks by the help of a hammer. Just like the mechanism of weathering in freeze-thaw, the wedges widen the cracks in the rock hence weaken the rock joints. The split out blocks can be converted into marketable forms. If the natural cracks are absent in the rock, artificial cracks are

made by driving or drilling using pneumatic drills the artificial cracks are normally 10centimetrscm) in diameter and 20-25 cm in depth. Flat steel wedges are then used with its upper end curved outward. This is however possible for soft rocks like marble, limestone, or sandstone. After that, along iron bar is inserted in the hole and cracks the rock. The block is pushed forward to the free face of the quarry (Chauhan 2012)

Blasting method, the basic principles is to explode a small quantity of explosive materials at a calculated depth in the rock. The force generated due to this explosion is sufficient to only create a crack and loosen rocks of good size. The main purpose of blasting here is to loosen large rock blocks and not violently blow up rocks therefore the explosive to obtain small rock particles. This method is used when the rock to be broken is very hard and has no fissures or cracks. It is also used when the rocks is to be quarried on large scale. After blasting, the excavated rocks sorted in different size and categories. The tools used in blasting vary but most common one are blasting powder, blasting cotton dynamite and cordite. (Chauhan 2012)

It is important to understand that blasting of rocks if not properly done can be disastrous to both the person doing it and the surrounding community. This implies that precautions have to be taken. This process requires a very experienced person thoroughly acquainted with blasting explosive on one hand knowledge of strength qualities of rock on the other hand. (Derb 2015)

2.2 Positive impacts of stone quarrying on the socio economic development

Stone quarrying provides varying economic benefits to the surrounding community. In Baoho, Asante region, majority of the local people depend upon stone quarrying as a source of livelihood. Sustainable livelihood can be understood in the context of the three, Es (Economic, Environment, Equity). The environment component of sustainable development refers to conservation of natural resources (Bewiadzi et al 2005)

Many people who have not gone to school use stone quarrying as a way to maintain their livelihood. Quarrying is primarily a source of livelihood for migrant livelihood strategies and provides both direct and indirect employment and source of income to non-migrant household. This is in addition to medical facilities, accident insurance, provision of education and infrastructural development. (Bianca et al 2013)

Quarrying leads to creation of employment opportunities, establishment of lucrative local market, retention of skilled labor, constructions of schools, healthcare facilities (Winmore et al 2012). Abandoned quarries can be used as water supply reservoirs but depends on the size of the quarry, volume of water to be diverted and surface runoff can be a good water input according to Xiang et al (2009)

Quarrying has a significant importance on job creation and better income generation to households of stone workers. The finding show that quarrying in the study area helps to develop other informal business activities like petty trading, house renting and small scale transport provision which supports the local community in alternative means of livelihood strategy and to transform from rural to urban activities. Socio economic impacts include employment opportunities that is generated to the people of the area in the quarries and the cement industries and hence improved income and livelihood (Uche 1992)

Aggregates produced via quarrying are used extensively in the construction of industry and are considered vital for the development of any country. Based on selected quality, quarry dust has been developed and

lime stone dust collected for asphalt and concrete plants. Development of a simple method of production of building elements in order to massively recycle quarry dust by means of compaction molding. The optimal mix design as well as compaction pressure and water content were determined during experimental procedure. The result indicated that building elements with market acceptable quality is feasible. Specially proportioned mixture of homicide quarry dust, cement and sand can be compacted to produce the specimen (Michael et al 2012)

2.3 Negative impacts of quarrying on socio-economic development.

Most undesirable environmental outcomes such as soil erosion and loss of rich biodiversity are largely attributed to active and abandoned mines. (Mwangi, 2014). Such problems escalate due to lack of environmental awareness while operating mines. (Langer, 2009). The reason behind existence of the high number of abandoned quarry pits universally is because of the low reverses of excavated materials compelling mining corporations to relocate from time to time leaving behind environmental menace (phillips, 2012)

The most obvious engineering effect of quarrying is on environment. Quarrying distorts nature by disturbing unique habitats, significant alteration of topography and unchecked disruption of basic ecological relations (walker and Rel moral, Sharma and Roy 1997). Land is critical resource for people dependent on farming. Today, about 2 million hectares of agricultural lands are lost every year due to anthropogenic influences which disturb the ecosystem and cause severe land degradation. (Walker and Del moral, 2003). Open cast quarrying activities represent a major perturbation to the natural landscape, creating significant effects on habitat loss, (Menta 2012)

Quarrying and mining activities are destructive enterprises. Quarrying activities have altered vegetation cover worldwide such as Appalachian Mountains, Netherlands, Ghana, Germany and Nigeria. (Townsend et al 2008, Ata-Era, 2016, Tischew et al 2014, Akanwa et al, 2014 as cited in Isabella, 2006)

The quarrying activities have led to the destruction of habitat of various organisms. Most of quarrying sites particularly on the mountains used to lurk with leopards, hyenas and baboons but first two have completely disappeared with establishment and expansion of the quarries. High decibel noise and blasting have driven away animal. On the other hand, baboons and monkeys that can adapt to human dominated environment have had their numbers steadily increase. This domination of baboons and monkeys and the disappearance of leopards and hyenas are likely to trigger other unforeseen ecological chain reactions. Quarrying has led to lowering of the water tables in some areas and drying up of marshes in others. The process of construction, clearing of quarrying sites, blasting and transportation have resulted in loosening p of soil leading to increase erosion. The clearing of vegetation along slopes have resulted in slopes instability thereby resulting in such geomorphologic process such as rock falls and mudflows, processes that were not common in the area. The mass movements and soil erosion have contributed immensely to siltation of river systems and dams which are the backbone of horticulture. Some of the materials have buried prime agricultural land. A lot of waste is generated during the process of cutting rocks into the right size and shape. Boulders that do not meet the right size and shape are damped at the quarry sites hence abandoned quarry sites are characterized by scattered boulders, open pits and waste dumps. High decibel noise that is generated from frequent blasting, produces reverberations that can be felt 20-30 km away has also been reported to cause cracking of houses and other infrastructure in the nearby areas. This includes some of the class room blocks that have been donated by the quarrying companies. Another

problem is that of improper disposal of used oil at many quarry sites leading to pollution of soils and such oils eventually find their way to the underground water (Tanyaradzwa 2010)

Quarrying negatively affects the environment in a number of ways during exploration, blasting, transportation and disposal of wastes rocks. This study asserts that the major environmental effects are destruction of vegetation, disruption of animal's habitat, diversion and blockade of natural drainage erosion and river siltation noise, vibrations and dust pollution. Quarries may also damage or destroy sites of cultural interests and affect the local tourism industry. (Maponga and Munyanduri 1998)

Quarrying has land use implications. It's either agriculture versus quarrying or coexistence with agriculture. Often, the source of conflict is over the traditional land use. Land clearing to open up roads and clearing of mining sites destroys vegetation which is a habitat for wild animal and reduces sources of plant life for human beings and animal besides affecting the natural environment. (Chizoro et

Quarrying affects the ecological balance by disrupting the food chain (Munyanduri 1998). Quarrying activities exert tremendous pressure on limited soil and water resource thus increasing the rates of erosion and subsequent damage of arable land, high dust emission from quarries is a threat to animals and crops and human life. (Winmore et al 2012)

The level of land degradation caused by quarrying in Ghana has concerns whether the activity should be allowed to continue or not, this is according to (Nartey et al 2012). More over some four people are reported to die annually as a result of acute respiratory diseases in developing countries. The most part being aggravated by environment pollution emanating from quarrying, sand blasting and emission of dangerous chemicals (Langer 2001) and (Asante et al 2014)

Fatal accidents, physical injuries and respiratory diseases such as silicosis and tuberculosis are some of the health problem resulting from working in quarries (Abate 2016). Some of environmental disturbance like change n geomorphology and conversion of land use is caused directly by engineering process and activities during aggregate extraction. This could be accompanied by loss of habitat, noise, vibrations, sedimentation and dereliction of the mine site (Reddy 2014)

Despite vast body of research on the impacts of quarrying activities on eco system in Nigeria, little has been done for the challenges. The most damaging effect of quarrying is the vibration and consequent damage of houses as a result of rock blasts and ceilings by fly rocks. Others are ailments like cough, eye problem and other irritations arising from dust from yield and farm incomes (Bangbose et al 2014)

The effect of quarrying on the surrounding people varies from displacement of people. This happens at the time of establishment of the quarry since the original land occupants and those at the vicinity have to pave way for the quarry development. Rehabilitation at the end of the quarrying life cycle is another issue of concern and often they are left in dangerous state for human's life and grazing animal (Jason 2012)

Although quarrying is economically lucrative, it is an extractive and exploitative industry which inevitably and irreplaceably exploits natural resources. The bilk of excavation pits, overburden waste together with poor management of quarries results in land cover of landscape hence changes in landscape causing land degradation and water resource depletion. Un rehabilitated open pits and hip cliff of waste materials cause insecurity when the quarry pits collect water in the rainy season and cause accident while children and youths swim in the accumulated stagnant water (Zalelem 2016)

The people who live or work in Nigeria cement company, Nkalagu and its operational air shed are generally polluted and the noise created by the company activities generally constitute a serious hazard to nearby residents. Furthermore, important sources of drinking water upon which communities depend have been contaminated by quarry wastes emanating from the quarry. In spite of the values attached to the land by Igboas people, residential, forest and agricultural land are lost or polluted as quarry and cement production activities continue. The company has resulted in displacement of people and distortion of the local economy. (Uche 1992)

The following environmental damage is caused by irrational gravel quarrying. Rupture of lag caves, displacement of soil, landscape disruption, soil compaction and dust fall out. Radar sat images, aerial photographs and show that soil compaction and landscape disruption are among the major significant mechanisms of land degradation. The infiltration capacity of compacted soils has reduced to one third (1/3) in comparison to uncompacted (unaffected) soils over exploitation of gravel and intensive off road vehicles resulted in severe immediate and long term damage (Jasem 2001)

Controversies over natural resource often reflect how urban migrants and established residents view natural resources one such disagreements took place in Haimes Township over a proposed limestone quarry. The quarry dispute revealed an internal division between new comer and old timers. Some new comers were concerned that the operations of the new quarry would deteriorate the quality of the life of the community and organized to stop it. (Sezer and Luloff 2003)

Black granite quarrying has also brought to the area some costs with it including inter alia, the creation of labor bottlenecks for peasant agriculture, encroachment on limited prime agricultural land, lowering of the table. Quarrying has employed unskilled labor force hence they are lowly paid. The average monthly income of the workers is \$ 70 which is far below the poverty datum of \$ 300 per family of six. Secondly there is no value addition or processing of the black granite at the quarry site. The processing job is therefore exported to Harare where only about 30% are processed. This exposes the developing country-syndrome of exporting low value high bulk raw materials and if this does not change, the developing countries will always be developing and never develop. (Tanyaradzwa 2010)

The excavation and blasting of black granite in some areas have resulted in the lowering of the water table as extensive granite stretches that acted as aquifers are blasted away. Some areas have been devastated economically a gardening wells have dried for example Nyamzuwe, Kawazva, and Kowo areas. Some peoples land has been taken p either through road construction or the actual quarrying process. The impacts of such loss of land to a rural household cannot be over emphasized as agriculture is the major economic activity. Because of the communal land tenure system where farmers do not have tenure rights, efforts to claim compensation have been unsuccessful as farmers are only compensated for houses and other infrastructure. Black granite quarrying has also removed most of the able bodied men from the fields to the quarry sites creating labor bottlenecks for peasant agriculture. This has left women and children to tend the fields and in many cases further reducing the traditionally low yields and compromising food security. (Tanyaradzwa 2010)

History of quarrying is marred by a legacy of negative impacts. Among the negative impacts of mining include: the destruction of the natural landscape, pollution of surface and groundwater resources, contamination of soils, erosion and disturbance of local vegetation, disturbance of ecosystems and displacement of local wildlife, creation of ghost towns, and impingement of human health and safety,

including extreme cases of death of mine workers through accidents at work (Kesler, 1994; Eaton, 1996). For example, in 1988 it was estimated that mining in Zimbabwe was responsible for moving at least 85 million tons of soil and rock (Ministry of Natural Resources and Tourism, 1998). On February 1, 1998, a tailing dump at How Mine failed after a heavy downpour and flowed into the local river systems. To ameliorate possible cyanide contamination of water systems, the mines spent about Z \$20 million in a clean-up operation (United Nations Environment Program, 2001). In June 1972, 427 workers perished underground at Wankie Colliery when an explosion occurred in the morning shift (Eaton, 1996).

Consequently, a high demand for construction necessitates more volume of aggregates to be extracted from quarry sites. Gravel and sand, the most common extractive resources, are two of the most important materials in the construction industry. Gravel is categorized as coarse aggregate, while sand, is the fine aggregate. Both are materials for concreting, and are extracted from mountains. Such extractions alter the normal occurrences of nature. Earth hauled from mountains affects the watershed. Gravel and sand extractions widen the river banks, lower its elevation, and weaken soil cohesion. (Norma et al 2008)

2:4 mitigation measures to negative impacts of stone quarrying

Mitigation can be achieved if operations are planned prior to commencement resource efficient and sustainable mining techniques are used and stakeholder participation enhanced. Government provides technical support to operators, regulations improved and regulatory implementations receive strict follow up (Hailu 2007)

The government of Zimbabwe through the recently passed Environmental Management Act (2004) requires that all major projects carry out Environmental Impact Assessment (EIA) before project construction in order to mitigate any negative biophysical, economic, social and cultural impacts. EIA aims at enhancing positive impacts. This is crucial if sustainable development is to be achieved. However, in many developing countries, EIA has not been mainstreamed and integrated into environment policies due to various shortcomings. The government of Zimbabwe has also embarked on growth Centre strategy as a way of decentralizing economic growth and development. This has however failed due to many reasons like the presence of black granite which makes Mutoko a growth point but can be possible if certain measures are taken. First of all, there is need for a black granite quarrying plant at Mutoko. This will create employment than those currently provided by the extractive work. The value addition will stimulate related industries and services like equipment hire, equipment maintenance services man (power development services etc. thereby creating agglomeration economics of scale. This will eventually transform Mutoko growth point in a viable mining town (Tanyaradzwa 2010)

The company(s) must adopt effective management tools to reduce dust emission hence enhance the wholesome benefits arced by the local people. This will significantly improve the quality of lives of the people surrounding through poverty reduction (Winmore et al 2012)

The Mutoko Rural District Council as the planning authority over the mining area. This should include the power to offer mining claims to the quarrying companies and claiming of royalties from them. Such a move will strengthen the revenue of the council which will enable it pursue its development goals more effectively. This therefore calls for the amendment of the all-powerful mines and mineral acts which controls virtually all mining activities in the Zimbabwe. Such approach would become a model for all districts seeking to have full control over the nature resources they are endowed with. Black granite quarry workers should form strong unions through which they can air out their concerns with one voice

they could then affiliate themselves to national level trade unions like Zimbabwe Congress of Trade Unions(ZCTU) in order to have more clout and bargaining power. Such unions will help them solve problems like low wages, compensation for injury or death at work place, health and safety, pension among other grievances. Currently, they have weak fragmented representative bodies. Quarry companies should as a matter of urgency bankroll HIV/AIDS awareness campaigns targeting their workers, vendors and villagers to stop the spread of the deadly disease. This they can do in collaboration with Government (Parastatal) Organizations and Non-Government Organizations (NGOs) with vast experience in HIV/AIDS awareness and prevention. Quarrying companies should stop destroying the graves during quarrying operations. They should exhume and rebury all human remains within their mining claims in collaboration with relatives of the deceased. This will help create a good rapport between them (mining companies) and the local community. Selective quarrying should be done to ensure the survival of other economic activities like horticulture (Tanyaradzwa 2010)

Collaboration among the key stakeholders in the sector like Environment Protection Agency (EPA), cobble stone project offices, local governments, quarry work enterprises and local communities to enhance the utilization of resources and minimize the externalities of quarrying on the natural environment through awareness creation, proper management and rehabilitation of abandoned quarries (quarry pits) for a sustainable environment. (Zalelem 2016)

Quarrying companies should carryout full EIA and third party environmental compliance and it is as a matter of urgency and also come up with environmental management plans including mining closure plans required by the Environmental Management Act. Mining companies failing to perform according to the set environmental standards will forfeit their money. (Tanyaradzwa 2010)

Seeking views and ideas of the affected population and those in charge of environmental conservation can fashion viable environment plans (Banez et al, 2010). Admas, (2015) gives a case in Ethiopia where conservatory measures are barely observed because the experts are hardly available screening can also help reduce noise. Screens in the context of stone quarrying are materials that assist to moderate the sounds produced by quarrying apparatus and processes (Fahy and Walker, 1998). This is necessary intervention despite being complicated for these screens have to be shifted from time to time as machineries relocate to other fresh excavation location or points. Walls are ideally most preferred because of costs involved and their ability to deflect sound (Kotzen and English (2009)

Controlling of dust ranges from a simple act of sprinkling water on the earth surface to setting up of suitable barricades to serve as buffer zone. At Hanson aggregates, stone mining in San Marcos, California, the corporation created barrier walls around the excavation to eradicate dust reaching local residents. (Reuben, 2004). Restoration of quarries is also a good idea. To carry out quarry restoration, a strong partnership between stake holders, policy, ecology, research and community is important. (Legwila et al, 2015). Restoration process that begins from designing the aftercare enables the dilapidated land revert to its original use such as agriculture or gets transformed to recreational place. (Tongway & Ludwig, 2011)

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter looks at the procedure that was used in the study. It states the methods that were used in the field during the study (data collection). It also defines the sampling process.

3.1 Research design

The study involved collection of both primary and secondary data. The data was both qualitative and quantitative data expressed numerically using tables and graphs while qualitative data using plate and description.

3.2 Sampling procedure

The sampling procedure followed a multistage sampling beginning with purposive sampling of the sub county where quarrying activities were taking place. This was followed by stratified sampling in which the major stake holders in the quarrying sector with in the sub county were divided into quarry workers (quarry men and women), truck drivers, stone traders and administrators. The different strata were proportionally sampled randomly to come up with a sample population of 40 respondents.

3.3 Method of data collection

The data was collected from the selected sample population by interview, schedules and questionnaire. These were in addition to observation and recording by the researchers while in the field.

3.3.1 Interview

This involve face to face interview for the easily accessed respondents and in the case of hard to access respondents, the telephone interviews were employed.

3.3.2 Schedules

The researcher employed schedules and he did the enumeration in person. This enabled the researcher to keep to the study objective while interviewing.

3.3.3 Questionnaire

Questionnaires were used to collect data during the study with both open and closed questions. Whereas the closed question limited the respondents to a list already provided answer the open question provided freedom but all was within context of the impact of quarrying on the socio economic development of Eastern division.

3.3.4 Observation

Where observable, the researcher used observation to obtain data in the field.

3.3.5 Recording

The information obtained from the respondents was recorded using tables, graphs and plates for interpretation and data analysis

3.3.6 Data analysis technique

The data collected was analyzed through generation of descriptive statistic graphs and tables. Plates were also used for qualitative data that could not be quantified.

3.3.7 Ethical consideration

The researcher assured the respondents of the confidentiality of the data they provided including their own personal information. The respondents were informed of the purpose of the study that was academic purpose only. This enabled the respondents to provide all the necessary information without fear and suspicion.

CHAPTER FOUR.

DATA PRESENTATION, INTERPRETATION AND ANALYSIS.

4.0 Introduction

This chapter presents all the data collected during the study of the impact of quarrying on the socioeconomic development of Eastern Division in Tororo district. The data was collected by means of questionnaire, interviews, recording and observations from the field.

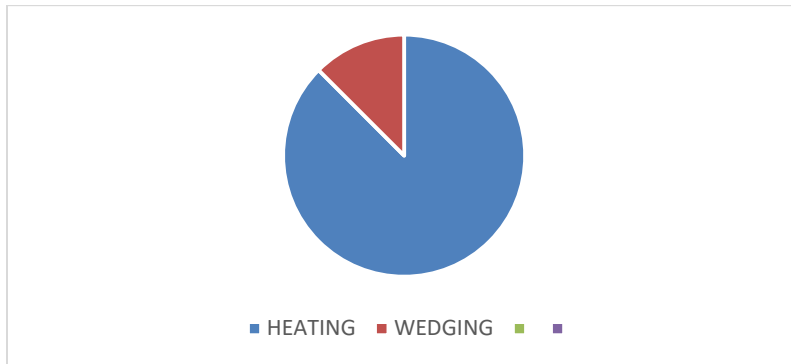
4.1 The dominant methods of quarrying in Eastern Division

There are two methods of quarrying used in Eastern Division that is heating and wedging. The information collected however points out that heating is the most dominant methods of quarrying used in Eastern division. The table below gives a summary of dominant methods of quarrying used.

Table 4.1 showing the dominant methods of quarrying

Method of quarrying	Frequency
Heating	35
Wedging	5

Figure 4.1 showing the dominant methods of quarrying.



4.1.1 Heating

The study found out that heating is the most common method of quarrying in Eastern division. The study indicates that out of 40 respondents involved in the study, 35 maintained that heating is the most dominant method used to quarry. This accounts for 87.5% of respondents.

This method involves removal of soil around the rock by use of hand hoe, pick axes and spade. Fire is then set on the rock block until the rock breaks to manageable size so the duration of fire depends on the size of the rock.

Plate 4.1.1 shows a block of rock being heated



Source: Field Photo as on 24/07/2024

4.1.2 Wedging

The study found out that Wedging was also method of quarrying in Eastern division. This involves use of metallic wedges to widen the naturally occurring rock joints given the jointed nature of rocks, this methods is widely used because the finding of the study found that 5 out of respondents agree that this is the most dominant methods of quarrying. This puts Wedging as the second most dominant method of quarrying.

Plate 4.1.2 shows block of rocks undergoing wedging of quarrying.



Source: Field as on 24/07/2024

4.2 Positive impact of quarrying on the socioeconomic development of Eastern division

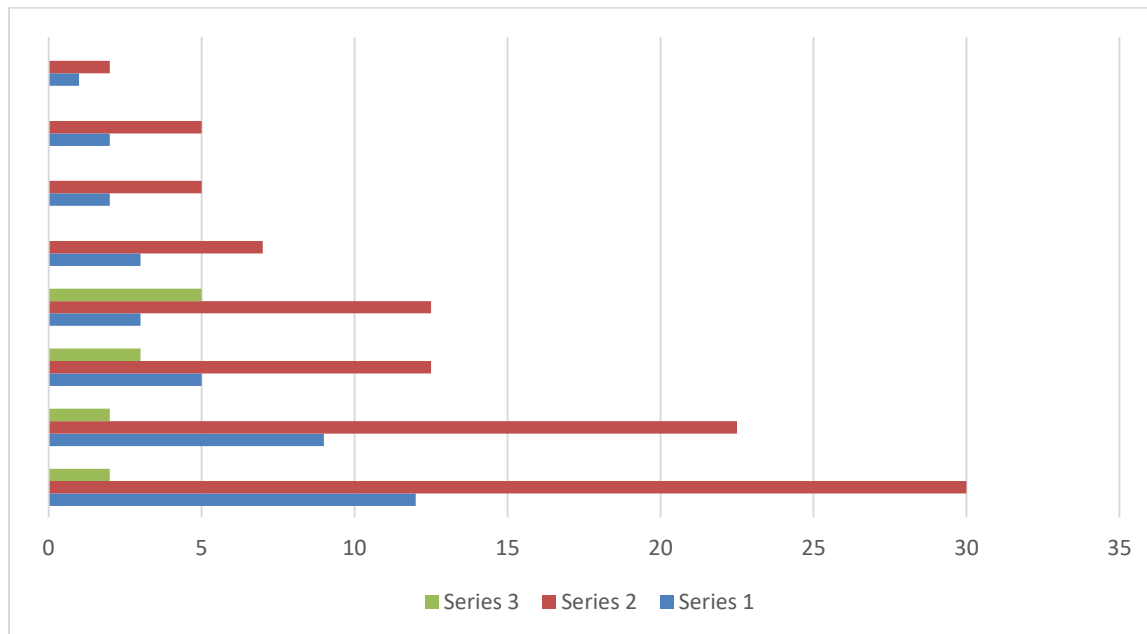
Quarrying impact positively on socioeconomic development in several ways ranging from source of income as indicated by 30% of the respondents or 12 in number, provision of employment opportunities as indicated by 22.5% of the respondents that was 9 in number, economic diversification as proposed by 5 respondents accounting 12.5 %, development of trade and commerce as put forward by 3 of the respondents a figure that represent 7.5 of the respondents, development of infrastructure as put forward by 3 respondents accounting for 7.5% utilization of idle resources was indicated by one of the respondents, 5% of respondents suggested that quarrying provides building materials, source of water was suggested by 5% of respondents.

Table 4.2.1 shows the positive impact of quarrying on the socioeconomic development of Eastern division

Impact	Number of respondents	Percentage %
Source of income	12	30
Provision of employment opportunities	9	22.5
Economic diversification	5	12.5
Development of trade and commerce	3	7
Development of infrastructures	3	7
Provision of building materials	2	5
Source of water	2	5
Utilization of idle resources	1	2

The above results was represented on a bar graph in figure 4.2.1 below to enhance understanding and easy comprehension.

Figure 4.2.2 showing the positive impact of quarrying on the socioeconomic development of Eastern division



Source of income

The study indicated that the quarry workers and those involved in related activities earn income from quarrying. The study found that the price of quarry products which include stone dust, aggregates in range of quarter inch (1/4 inch), half inch (1/2 inch) and one inch(1 inch)

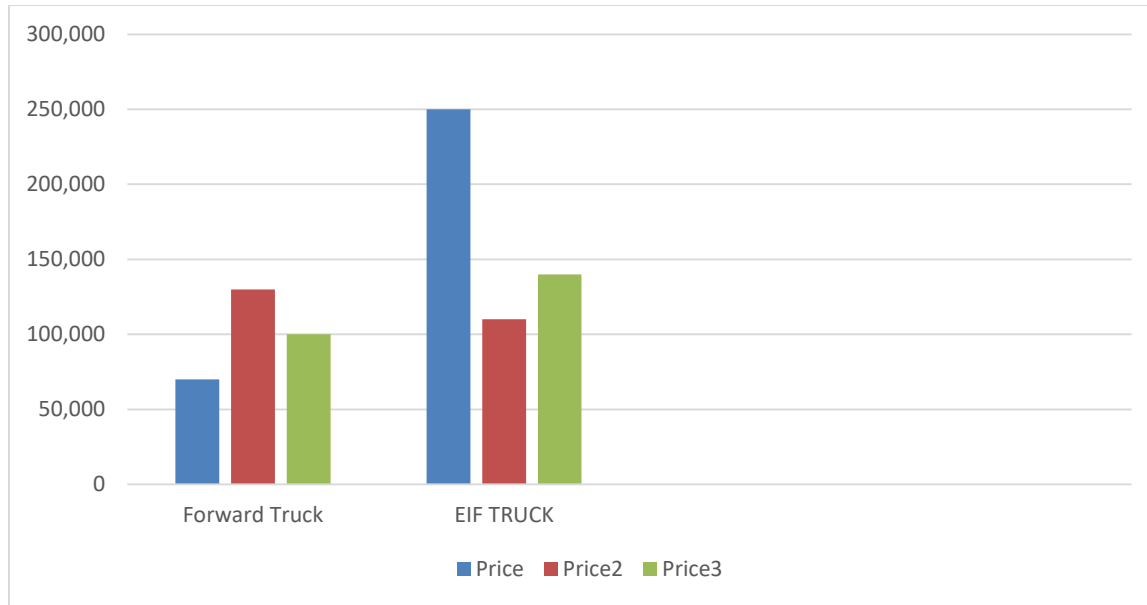
The Income from the different products and based on the different truck sizes were tabulated in the table below.

Table 4.2.2 showing the income got from the different quarry products

Quarry products	Price per truck	
	Forward truck	EIF truck
Aggregate 1 inch	70,000	250,000
Aggregate ¼ inch	130,000	110,000
Aggregate ½ inch	100,000	140,000

The above results was represented in bar graph in figure 4.2.2 as below

Figure 4.2.2 showing the income got from the different quarry products



The study found out that quarrying also generates income in Eastern Division through auxiliary and supplementary activities for example transportation of quarry products and loading of quarry. The study indicated that the cost of transportation is negotiable and dependent on other variable like distance, state of the road from quarry to the destination.

4.2.2 Provision of employment opportunities

The study revealed that quarrying in Eastern division is source of employment opportunities 9 out of 40 respondents accounting for 22.5% of the respondents appreciate the fact that the quarry employs people from all walks of life. The study found out that the quarry is non selective/ non segregative employer and that there are several employment avenues in the quarries. Out of the sample of 40 the distribution of employment basing on job description in the quarry was summarized in the table

Table 4.2.3 showing distribution of employment based on job description in quarry

Job description	Number of people	Percentage %
Stone traders	2	5
Truck drivers	1	5
Truck loaders	5	13
Stone breakers	30	80
Others	2	8

This was represented on bar graph in figure 4.2.3 below for easy comprehension and analysis

Figure 4.2.3 showing distribution of employment bases on job description in quarrying.

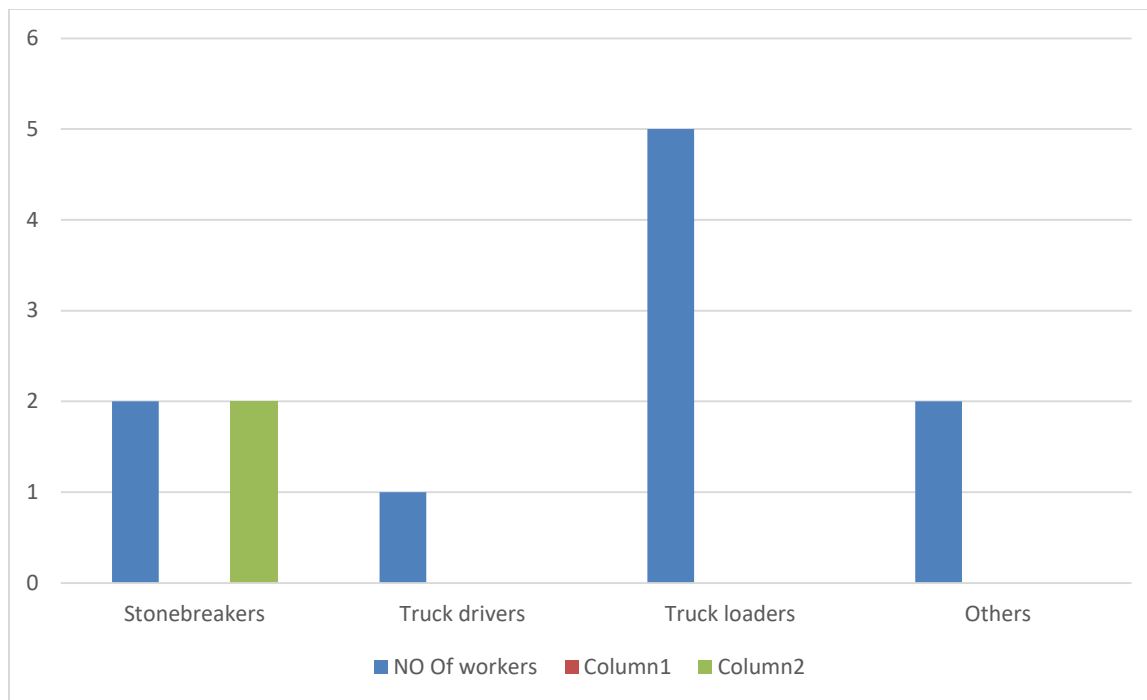


Plate 4.2.2 Showing people engaged in quarrying as workers



Source: Field photo as on 24/07/2024

4.2.3 Economic diversification

The found out that quarrying provides a mean of economic diversification. The study found out that all the quarry workers are involved in other economic activities in addition to quarrying. The study therefore maintained that quarry workers engage in quarrying as a mean of diversifying their economies the two trucks drivers for example revealed that they transport other goods apart from quarry products, the same applies to the truck loaders, stone breakers and the stone trades.

4.2.4 Development of infrastructure

7.5% of the respondents indicated that quarrying resulted in the development of infrastructure. The study found out that access roads inform of dry weather roads connecting to the quarry centers to the nearest all weather roads

4.2.5 Development of trade and commerce

The study revealed stone quarrying has contributed to the development of trade and commerce. The respondents agree that income from the quarry sustains the trading centers established with in the quarry like Naluwerere, Corner UCI. The study found out that small scale traders deal in merchandise like mandazi, ripe banana, fried cassava have found market with in the quarries.

4.2.6 Provision of building materials

5% of the respondents agreed that quarrying has resulted in the production of building materials. The study found out that has resulted in the production of five different building materials that is hard core, stone dust, quarter inch aggregates, half inch aggregates, one inch aggregates. The study found out that the availability of building materials in Eastern division has bosted the building and construction

industry in Tororo municipality by cutting down the cost of transportation of these qurry products to construction sites

Figure: 4.2.6 Showing building materials inform of aggregates



Source: Field Photo as on 24/07/2024

4.2.7 Utilization of iddle resources

One of the respondents pointed out that quarrying enables the people to exploit the rocks in the area of which without quarrying would be lying iddle. The study found out that people have limited alternatives to use their rock endowment therefore the study insists that quarrying has provided an avenue for exploitation of would be iddle resources.

Plate 4.2.7 shows idle resources un utilized.



Source Field Photo as on 24/07/2024

4.2.8 Source of water

The study found out that long term quarrying has resulted in the stone breakers reaching the underground water table and this has resulted in spring that flow from the quarry. This spring is utilized for watering the animals and this was noted by two of respondents which accounted for 5% of respondents

Plate 4 .2.8 shows the source of water.



Source: Field as on 24/07/2024

4.3 Negative impacts of quarrying on socioeconomic development.

Quarrying also has resulted negative impacts on the socioeconomic development of Eastern division. The table below was used to summarize these impacts

Table 4.2.3.1 negative impacts of quarrying on the socioeconomic development of Eastern division

The above was represented in bar graph in figure 4.3.1 for easier interpretation and Comprehension

4.3.1 Accidents

The study found out that quarrying results in accidents during rock breaking and transportation. 27% of respondents revealed that quarrying is related with accidents. The respondents pointed out that the accidents range from minor bruises to serious accidents like loss of eyes or amputation of fingers as a result of working tool like hammering the hands and flying rock pieces during rock breaking process

4.3.2 Deforestation

Eight of the respondents unleashed that quarrying has resulted in deforestation of the quarry fringes. The 20% of respondents who pointed out deforestation as a concern related to quarry argue that the need for fire wood for heating the rocks results in deforestation with in the quarry vicinity

4.3.3 Accelerated school dropout and increased levels of students absenteeism from school

The respondents also pointed out that quarrying has accelerated school dropout rates and increased the level school absenteeism. In the respondents 'argument the income earned from quarrying lure the pupils and students from quarrying areas into absenteeism and prolonged absenteeism results into dropping out. This was revealed by 6 of the 40 respondents accounting for 15% of th respondents

4.3.4 Moral decay

5 of the respondents pointed out that quarrying is associated with moral decay. This 12.5 of the fraction of respondents argue that some stone breakers use psychoactive drugs like cannabis to boost their energy

for the tedious work. Some of these respondents also argue that the extra income earned from quarrying has been used by the quarry workers to lure young school girls from the school that are proximal to the quarries like Rock High School, Rock view primary school, Tororo Girls school, into sexual relationship and these respondents stressed that this was serious impacts as it led to unwanted pregnancies, spread of diseases among others

4.3.5 Encouraged child labor

The study established that quarrying has encouraged the use of child labor. According to the information on table 4.2.5 it is evident that 3 out of the 40 respondents were below the age of 18 and these are children. Exposing such children to tedious work puts their growth and development at stake and they may experience the effects in future.

4.3.6 Dangers of unfilled mine pits

The study found out that quarrying is associated with unfilled mine pits as quarry workers don't care about refilling the left over pits after quarrying. This was indicated by 5% out of the 40 respondents who maintained that the pits have created a danger of accidents because as young children follow their parents to the their work place, they stand a danger of falling into such pits, when rains fall, the pits collect water which provides a potential breeding ground for mosquito and related malaria outbreak both within the quarry and proximity

Plate 4.3.6 shows the unfilled minepits



Source: field photo as of 24/07/2024

4.3.7 Poor drainage

As already noted above that the quarries consist of water bearing rocks and that results of quarrying has been formation of water sources, the study noted that the flaws of such water so it is that it has resulted into poor drainage within the quarry and its vicinity. 2 respondents which accounted for 5% insisted that the water flowing through the quarry as shown in figure above has resulted in poor drainage

with in the quarry and this results in blocking of transport routes with in the quarry including footpath and trunk path as shown in the figure below



Source: field photo as on 24/7/2024

4.3.8 Destruction of the land scape

2.5% of the respondents noted that quarrying has resulted into destruction of the landscape. The respondents noted that long term quarrying has reduced what is used to be hills into flat land and basins

Plate 4.3.8 showing destruction of land scape



4.4 Mitigation measures to the negative impacts of quarrying on the socio economic development of Eastern division

The study found out a lot has been done to mitigate the negative impact of quarrying on the socioeconomic development of Eastern division

4.4.1 Mitigation measures to accidents

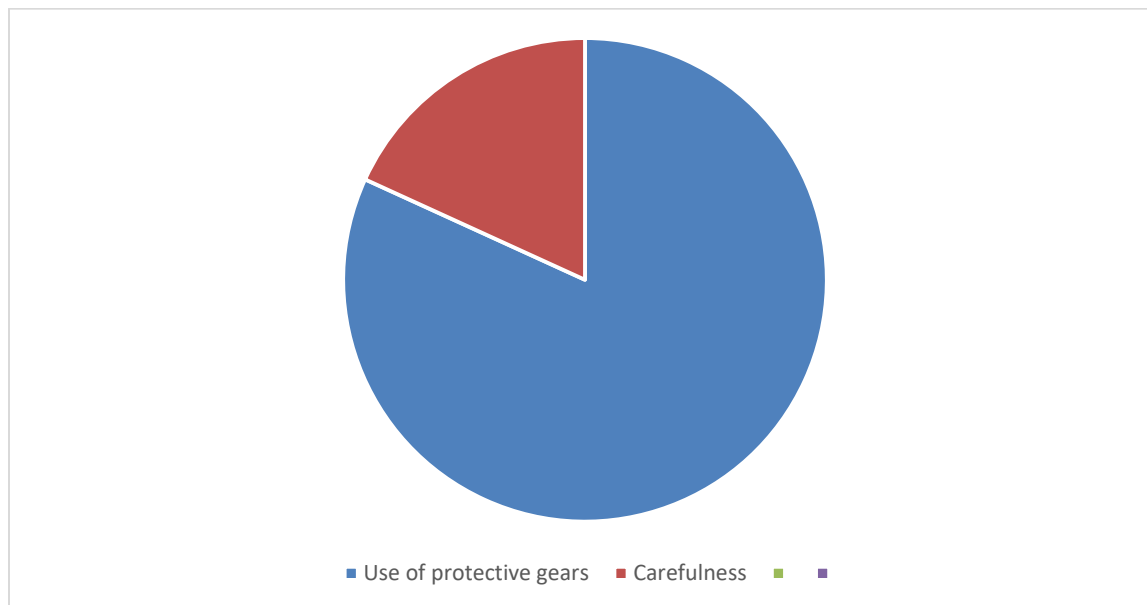
The study found out that out 11 respondents who ear marked accidents as a negative impact of stone quarrying on the socioeconomic development of Eastern division, 9 of them pointed that the use of proactive gears has been employed to mitigate the impacts of accidents accounting for 81.8% of the respondents who pointed out accidents and 22.5%of the sample population. The other 2 pointed carefulness. This accounts for18%of those who pointed out accidents and 5%ofthe sample population. This statistic was represented on the table as shown 4.4.2below

Table 4.42showing mitigation measures to impact of accidents resulting from quarrying.

Mitigation measures	Frequency
Use of protective gears	9
Carefulness	2

The above data was represented in pie chart to ease interpretation and comprehension from quarrying

Figure 4.4.2 showing the mitigation measures to the impact of accidents resulting from stone quarrying



4.4.2 Mitigation measures to deforestation

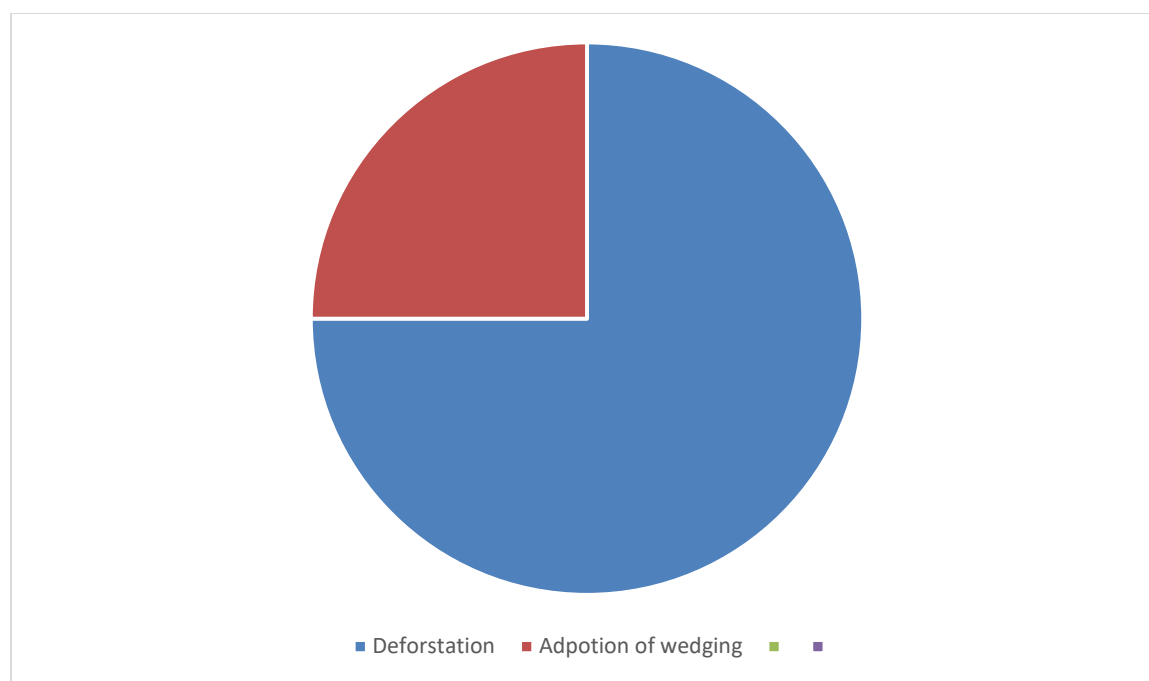
The study found that 8 respondents who pointed out that deforestation has negative impact of stone quarrying on the socio economic development of Eastern region 6 of the maintained that impact of deforestation resulting from stone quarrying, the county has been mitigated by tree planting. This accounts for 75% of the respondents who put forward deforestation as a negative impact of quarrying and

15% of the sample population 25% of those who pointed out deforestation maintained that impact has been mitigated by adopting wedging methods of stone quarrying since this does not require wood fuel

Table 4.4.3 shows mitigation measures to deforestation resulting from stone quarrying

Mitigation measures	Frequency
Deforestation	6
Adoption of wedging	2

Figure 4.4.3 showing mitigation measures to deforestation resulting from stone quarrying



4.4.3 Mitigation to school dropout and absenteeism

The study found out that the six respondents who identified school dropout and absenteeism as negative socioeconomic impact of quarrying all agree that the mitigation measures in place is the use of local council through the use of bylaws banning school going children from going to quarry during school hours. This remedy received 100% consensus by the 15% of the total sample population

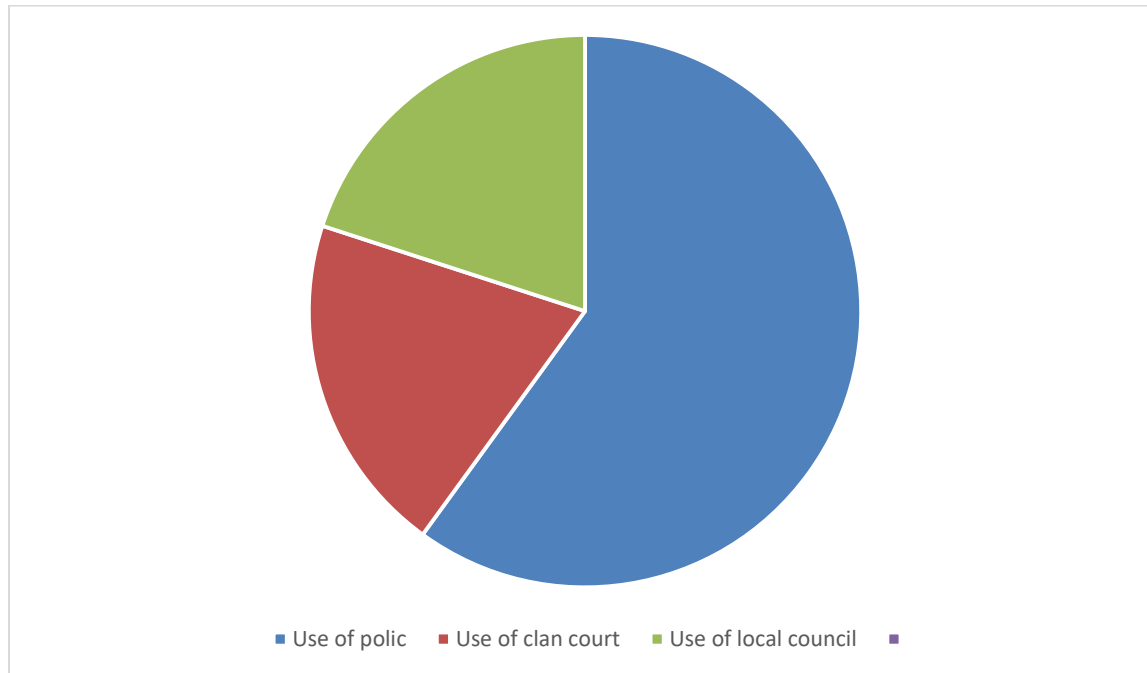
4.4.4 Mitigation to moral decay

The study found out that 5 respondents pointed out moral decay as a negative impact of stone quarrying on the socioeconomic development of Eastern division, 60% that is 3 in number pointed out the use of police has mitigated the vice, 20% or 1 respondent to be more specific argued that the clan court has helped to sweep out the problem. The other 1 respondent suggested and argued that the local council has helped to sort out mess.

This was tabulated for easier interpretation as shown

Mitigation measures	Frequency
Use of police	3
Use clan court	1
Use of local council	1

The above results was graphically expressed in a pie chart for easier interpretation



4.4.5 Mitigation to Child labor

The study found out that nothing was being done about child labor. The four respondents who pointed out labor as a negative impact resulting from stone quarrying indicated that nothing is being done about the problem or impact. The 4 out of 4 respondents who brought the impact on the table indicate 100% in parentage

4.4.6 Mitigation to poor drainage

The study uncovered the fact that the impact of poor drainage quarrying site has been mitigated by digging water channel to enable water freely flow away from the quarry site to low land vicinal to the quarry sites This was pointed by out by 2 of the respondents.

4.4.7 Mitigation to destruction of land scape.

The study came across the fact that nothing has been done to mitigate the impact of stone quarrying inform of destruction of the land scape. This was pointed out by the respondents who pointed out destruction of the land scape as one of the negative impacts stone quarrying

4.4.8 Mitigation to unfilled quarry pits.

The study established that the impact of quarrying manifesting itself as unfilled quarry pits by refilling the quarry pits. This too was unanimous result as the two respondents who identified the impact suggested that it was mitigated by refiling the pits

4.4.9 Mitigation to danger of water borne diseases

The study bumped on the fact that the danger of water borne diseases has been mitigated by use of insecticides treated treated the mosquito nets and spraying of houses. The study found out that the above measures has enabled the communities to stay safe or mitigate the impacts of stone quarrying as manifested inform of dangers of water borne disease

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATION.

5.0 Introduction

This chapter presents the discussion of the research finding, conclusions and recommendation from the research finding of the study which conducted in Eastern division Tororo district

Discussion

5.1 Dominant methods

Heating is the most dominant methods of quarrying in Eastern division. 35 out of 40 respondents involved in the study of the impact of quarrying on socioeconomic development revealed that heating was the most dominant method of quarrying. This is in agreement with Chauhan (2012) who says that heap of fuel is piled on the surface of rocks and heated for few hours

Wedging method is also used for stone quarrying in Eastern division. 5 out 40 respondents identified that wedging is dominant method of quarrying. This is in line with Chauhan (2012) who says wedging method, metallic wedges are used to widen the crack of rocks hence the name wedging

5.2 Positive impacts of stone quarrying on the socioeconomic development of Eastern division

Source of income: Out of the 40 respondents, 12 of them accounting for 30% of the respondents pointed out that quarrying was a source income to the people. The income was earned direct and indirect employment as presented in chapter 4.2.2 above. This agrees with Uche (1992) who says that quarrying has a significant importance on job creation and better income generation to household of stone.

Provision of employment opportunities 22.5% of the respondents pointed out that stone quarrying is a source employment opportunities. It was found out that stone quarrying provides various employment opportunities as presented in chapter 4.2.2 above and summarized in table above. This is in agreement with Tanygradzwa (2010) who found out that one of the major economic benefits of black granite quarrying in Mutoko district is that of employment

Economic diversification 5 out of the 40 respondents accounting for 12.5% of the respondents said that stone quarrying has contributed to economic diversification as presented in chapter 4.2.3 above. This is in line with agreement with Uche (1992) who says that quarrying supports the local community in alternative means of livelihood strategy and to transform from rural to urban activities

Development of trade and commerce 3 of the respondents accounting for 7.5% of the respondent said that stone quarrying contributed to the growth of trade and commerce as presented in chapter 4.2.4 above. This is in line with Uche (1992) who showed that quarrying in the study area helps to develop other informal business activities like petty trading, house renting and small scale transport service provision which supports the local community

Provision of building materials. Stone quarrying has provided building materials. This was pointed out 2 respondents accounting for 5% of the population as discussed in chapter 4.2.6 above. This is in line with the

finding of Michael et al, (2012) who says that aggregates produced via quarrying are used extensively in the construction of industry and are considered vital for development in any country

Utilization of idle resources 2.5% of the respondents pointed out that stone quarrying has contributed to the exploitation of idle resources .This was presented in section 4.2.8 above and this is not in line with any of the study finding cited above

5.3 Negative impact of stone quarrying on the socioeconomic development of Eastern division

The negative impact of quarrying on the socioeconomic development of Eastern division have been tabulated in table 4.3.1 above and they include.

Accidents: 11 of the respondents maintained that quarrying has resulted to accidents .This account for 27.5% and is in line with Abate (2016) who says that fatal accidents physical injuries and respiratory diseases such as silicosis and tuberculosis are some of the health problems from working in quarrying.

Accelerated school dropout: 6 of the respondents noted that stone quarrying has accelerated the rate of school dropout. A study by Tanyaradzwa (2010), suggest that quarrying has employed many people, this has translated into social cost for the community as due to the unskilled nature of the labor force, some pupils have dropped out of school hoping to find employment in the quarry once they make 18.

Child labor. Stone quarrying in Eastern division was also attributed to child labor by 4 out of the 40 respondents .This was not in line with any of the above studies but is important for the finding of this study.

Danger of water borne diseases. One of the respondents noted with concern that quarrying has resulted into dangers of water borne diseases. This is not in line with any of the above studies but is an important observation in the study.

Poor drainage. The found out that quarrying has contributed to poor drainage .This was maintained by two of the 40 respondents and is on point with Eaton (1996) pointed out that in January 1, 1998 a tailor dump at Howe mine failed after a heavy down pour and flowed into the local river system.

Unfilled quarry pits. 2 out 40 respondents' highlighted unfilled pits as one of the negative impacts of stone quarrying. Zalelem (2016) concurs with this when he said that un rehabilitated open pits and hip cliff of waste materials cause insecurity when the quarry pits collects water in the rainy season and cause accidents while children and youth swim in the accumulated stagnant water.

5.4 Mitigation Measures to the negative impacts of quarrying on the socioeconomic development of Eastern division.

The mitigation measures to the negative impact of quarrying on the socioeconomic development of Eastern division has been presented in figure 4.4.1a above and here is the discussion.

Mitigation to accidents. Two of the respondents noted that accident resulting from quarrying in Eastern division has been mitigated by carefulness. No studies were found in agreement to this finding but was important and worth mentioned

Mitigation to accelerated school dropout. The finding of the study show that seven respondents argue that the negative impact of stone quarrying inform of accelerated school dropout can be mitigated by use locally authorities as aged by Banez et al (2010) who says that seeking the views and ideas of the affected population and those in charge of environmental conservation can fashion viable environmental plans.

Mitigation to child labor. The four respondents who pointed out that child labor was a negative impact of quarrying on the socioeconomic development of pointed out that nothing has been done to mitigate the vice .This is not in line with any of the studies on quarrying as cited above.

The impact inform of water borne disease has been mitigated by the use of mosquito nets and house spraying by the government this can be attributed to the finding of Zalelem (2016) that quarrying companies should as a matter of urgency bankroll awareness campaigns targeting their workers, vendors and villagers to stop the spread of the deadly disease. This they can do in collaboration with the government organization and Non-government organization with vast experience

Mitigation measures to poor drainage. Two respondents pointed out digging water channels to drive the water out of the quarry sites as a mitigation measures to poor drainage as a result of stone quarrying. No above cited studies noted this but this study found it important.

Mitigation measures to unfilled quarry pits. 2 of the respondents pointed out that the unfilled quarry pits have been mitigated by refilling them. They are therefore concurrent with Zalelem (2016) who notes that collaboration among the key stakeholders in the sector like Environmental protection Agency (EPA) local government quarry worker enterprise, local communities to enhance the utilization of resources and minimize the externalities of quarrying on the natural environment through awareness creation, proper management and rehabilitation of abandoned quarries for sustainable environment

On the impact of quarrying destroying the land scape, the respondents noted that nothing has been done to mitigate this impact and this finding is not in line with any of the above

5.5 Conclusion

The impact aimed at finding out the impact of quarrying on the socioeconomic development of Eastern division and found out that the dominant method of quarrying was heating and wedging.

The positive impact of quarrying on the socioeconomic development of Eastern division are source of income, provision of employment opportunities, economic diversification, development of trade and commerce, development of infrastructures , provision of building materials, source of water and utilization of idle resources.

The negative impacts of quarrying include accidents , deforestation, accelerated absenteeism, school dropout, moral decay, child labor, poor drainage, dangers of water borne diseases,

The impact of quarrying have been mitigated by carefulness ,tree planting ,use of police, clan court, use of mosquitos, digging water channels, wedging use of local authorities

5.6 Recommendation

The study noted it that methods of quarrying are rudimentary therefore there is need to adopt modern quarrying methods to increase output and reduce labor cost

The quarrying activity should be regulated to make implementation of regulations aimed improving quarrying and conditions of work.

APPENDIX I

Questionnaire to quarry workers

My is Owor Mark Philip, a student of Busitema university pursuing a Bachelor of science with education and currently carrying out research on the impact of quarrying on the socio economic development Of Eastern division in Amagoro in Tororo district. All information given in this form will be kept confidential and strictly be used for academic purpose.

INSTRUCTION

Please tick against the appropriate response of choice.

- 1 Gender
Male ☐ Female ☐
 - 2 Age
Below 18 ☐ 18-31 ☐ 32- 45 ☐ 46-59 ☐ 60 and above ☐
 - 3 Marital status
Single ☐ Married ☐ Divorced ☐
 - 4 Level of education
Graduate ☐ Undergraduate ☐ secondary ☐ primary ☐ uneducated ☐
 - 5 What is the dominant method of quarrying
Heating ☐ Wedging ☐ Blasting ☐
 - 6 What are the positive impact of quarrying on the socioeconomic development of Eastern division
.....
.....
.....
 - 7 What are the negative impact of quarrying on the socioeconomic development of Eastern division
.....
.....
.....
 - 8 How can this negative impact be mitigated
.....
.....
.....
 - 9 Suggest recommendation(s) if any
.....
.....
.....
- Thanks you for your participation

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