



**Wolkite University School of Graduate Studies**

**Assessment of Social and Economic Impacts of Mining of Construction  
Materials: The Case of Cheha Woreda in Gurage Zone, Central Ethiopia  
Regional State.**

**MA thesis**

**By: Nebiyu Daniel Gebreyes**

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**Assessment of Social and Economic Impacts of Mining of Construction  
Materials: The Case of Cheha Woreda in Gurage Zone, Central Ethiopia  
Regional State.**

**A thesis Submitted to School of Graduate Studies, in Partial Fulfillment of the  
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**By: Nebiyu Daniel Gebreyes**

**Major Advisor: Aschale Kassie (Assistance professor)**

**Co-Advisor: Miss Bayush Mekonen**

**Wolkite University,**

**Novembe, 2023**

## **WOLKITE UNIVERSITY SCHOOL OF GRADUATE STUDIES**

We hereby certify that we have read and evaluated this thesis titled “Assessment of Social and Economic Impacts of Mining of Construction Materials “prepared under our guidance by Nebiyu Daniel Gebreyes. We recommend that the thesis shall be submitted as fulfilling the Requirements for the award of a MA Degree Development Studies. (Development Planning and Management).

1. Major Advisor: Aschale Kassie (Assistance professor)

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

2. Co Advisor: Miss Bayush Mekonen

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

As members of the Board of Examiners of the MA Master’s degree open defense examination, we have read and evaluated this thesis prepared by Nebiyu Daniel Gebreyes and examined the candidate. We here by certify that, the thesis is accepted for fulfilling the requirements for the award of the degree of MA Degree in Development Studies. with Specialization in Development Planning and Management

• Internal Examiner

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

• External Examiner

Name \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

• Chairperson

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## **List of Abbreviations**

CERS	Central Ethiopia Regional State
CWPDO	Cheha Wereda Plane Development Office
E.C	Ethiopian Calendar
EPA	Environmental Protection Authority
ECWC	Ethiopian Construction Works Corporation
LULC	Land use and land cover result
FGD	Focus group discussion
GZ WMD	Gurage Zone Water Mine Department
SPSS	Statistical Package for Social Science
MCM	Mining of construction materials
WB	World Bank

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## **ABSTRACT**

Mining of construction materials has been recognized as a socioeconomic activity serving as a fundamental source of income for construction material manufacturers and for some communities. Nonetheless, most operations are often accompanied by adverse impacts on the same communities and the environment. Thus, the study sought to establish the social and economic impacts of mining of construction materials activities in Gurage Zone, Cheha woreda central Ethiopia's regional state. Gasorena-keracha kebele. Specifically, it sought to examine the social impacts of construction mining activities in the study area, assess the impacts of construction mining activities on the economic life of the local community, and evaluate the level of awareness of the people about the rules and regulations governing the operations of construction mining in the study area. The study applied qualitative and quantitative approaches with a sample size of 310 households, 88 quarry workers, 16 focus group discussions, and 15 key informants. The sampling methods used were census for the quarry workers, stratified sampling for households, and purposive sampling for the key informants. Data were collected using questionnaires, in-depth interviews, observation, and pictorials. Data were analyzed through content analysis, descriptive analysis, and inferential analysis. The findings show that mining of construction materials activities a health hazard, and the majority of quarry workers do not use protective clothing or gear at work. The damage to buildings and other household property, and generally the noise pollution and vibration, have indeed important implications for the social impacts, disadvantages, or negative concerns. However, the study confirmed to some extent that each of the two study areas indicated positive impacts. Majority of the respondents considered MCM (quarrying) activities has often had a negative impact on the community. It was concluded that awareness of socioeconomic rules and regulations on the MCM significantly influences the local community and environmental degradation. The study recommended that the Cheha wereda and Gurage Zone Mine and Energy Departments fulfill their responsibilities by implementing the country's decree and directive, enforcing compliance with social and economic rules, regulations, policies, and principles governing the mining of construction materials in the area, and developing a county quarrying and mining policy.

**Key words:** Quarrying, stone and gravel quarrying, Socio-economic impacts, small-scale mining of construction materials

# CHAPTER ONE

## INTRODUCTION

### 1. 1. Background of the Study

Aggregate resources are vital for our way of life because they are the major raw materials used in the construction of roads, rail lines, bridges, hospitals, schools, air ports, factories and homes. (Transportation and US Department of 2011) Agriculture and infrastructural development ensures the growth of the country's economy, thus the importance of the quarry industry. ( Lamare and Singh 2017)

Rock quarrying and stone crushing is a global phenomenon and has been one of the causes of concern everywhere in the world, including in developed countries. (Transportation and US Department of 2011). Quarrying of natural stone, including sand, gravel and crushed rock, represents the main source of construction materials used throughout the world. There is an increasing demand for building materials. Demand is caused by the growing need for domestic housing, the construction building industry and increased demand for major transport facilities such as airports, roads and ports. This has in turn led to an increase in the extraction of aggregates from coral reef ecosystems. (Sustainably Managing Natural Resources and the Need for ConstructionMaterials in Pacific Island Countries 2015)

The socio-economic impacts of construction material mining sites are the intended or unintended positive or negative social consequences of mining sites .These can be experienced at the individual, family or community level in various spheres of life, including culture, communities, political systems, the environment, health, lifestyles, personal or property rights, fears, and aspirations. While many of the impacts are local, the wider societal context in which mining activities take place may also affect the perceptions and expectations towards a specific mining project. (Social and environmental impacts of mining activities in the EU 2022)

However, operations of quarrying whether small- or large-scale, are inherently disruptive to the environment (Impact of Mining Activity on Soil Quality and Plant Biodiversity in Senkele Faris, West Shoa Zone, Ethiopia 2016) Mining of stones frequently generates land use conflicts in populated areas due to its negative externalities including loss of vegetation,

noise, dust, truck traffic, pollution and visually unpleasant landscapes. It also causes a conflict with competing land uses such as farming, especially in areas where high-value farmland is scarce and where post mining restoration may be infeasible (: Z. Abate 2016). This in turn affects the ecological sustainability which is a threat to the overall economic sustainability. With regards to the prevailing environmental legislation and its enforcement, there is total lack of efforts in monitoring, rehabilitation, restoration or post-mining programs to minimize adverse environmental impacts. Small-scale mining has brought both major problems and immeasurable socio-economic benefits to a number of developing countries. In recent years, however, the bulk of research has been devoted to analyzing the negative aspects of the industry (Hilson 2002). Quarrying of natural stone including sand, gravel and crushed rock that contribute to the construction and provide both economic and social benefits. However, the intensive activities of Construction material mining sites disregarding the impact leads to a series of socio-economic problems .

In Gurage Zone, 34 construction mine manufacturers are engaged in small and micro mining of construction materials production, while another 214 are engaged in traditional construction mining production. In Cheha Wereda, currently 14 construction mine manufacturers are registered in the production of small and micro construction materials mining on 84.5 hectares of land for an average of 7 years. In addition, 36 associations are engaged in the production of traditional Mining of Construction Materials. (P/D, Gurage Zone Abstract Document Fainalz 2013 E.C.)

Socio-economic impact is affecting the study area in the case of quarry excavation, blasting, and aggregate production, and it has caused serious problems. Therefore it needs to conduct research on the area to identify the degree of impacts and to take remedial measures. Hence, the study seeks to investigate the social and economic impacts of the production of construction materials in the study area.

## **1.2 Statement of the Problem**

Following the rapid expansion of infrastructure projects under way in all over the country of Ethiopia, there is a significant boom in construction material supply. However, the intensive activities of quarrying and stone crushing disregard for the environment impact lead to a series of socioeconomic and environmental problems. (Gizaw 2020) Damte Balcha1 and

Semayat Oyda Assessed the impact of stone quarrying on the landscape, crop and grazing land degradation in Loma Bosa District, Dawuro Zone, Southern Ethiopia. The quarrying activities in the area are not manageable, there is no specified stakeholder, their target (the excavator) is only gaining economic benefit, and they did not examine the other related problems of the activities. (Damte Balchal Semayat Oyda2 2021) Different researchers have done studies on impacts of mining of construction materials in different parts of Ethiopia. They also have not focused on socio economic impacts of mining of construction materials.

The level of awareness of the people about the rules and regulation governing the operations of construction mining and which is likely to determine the impacts of these operations in the area, has not been studied as well as the available literature. This requires extensive research on construction mining area so that the degree of the impacts and rules that can be taken are identified. Therefore, this study seeks to investigate the impacts of construction mining site on the selected quarry site in the study area. The study will further examine the level of awareness of the people about the rules and regulations governing the operations of construction mining.

The rapid urban expansion of Gurage Zone and surrounding areas, extensive infrastructure and housing development projects are under way and there is a significant boom in construction material supply, most of which is mainly extracted from the Gurage Zone Cheha Woreda . However, as far as the researcher's knowledge is concerned, there is a research gap on the issues of the socio-economic impact on construction mining areas (P/D, Gurage Zone Abstract Document Fainalz 2013 E.C.).

Earlier, this construction material manufacturing site was managed by Cheha Wereda. Recently, when the work of delimiting the rural areas around Wolkite to the city was carried out, some of the mining of construction materials and the Gasoren-akeracha Kebele were moved to Wolkite. However, there is no structure or organization of a government office of the Department of Water, Mine and Energy at the city level. However, according to the information I received from the Gurage Zone Water, Mine and Energy Department, according to the operating instructions regarding construction material production, since there is no Water, Mine and Energy Office at the city level, the procedure stipulates that the

Water, Mine and Energy Office should be managed in the nearby district. Accordingly, the construction material productions are managed under Cheha Wereda..

In an attempt to contribute to bridging the above stated gap, this research study would focus on assessing socio-economic impacts of construction mining area in the Guraghe zone with a specific case from Cheha Wereda. The reason why this site was selected is that it is among the Ethiopian areas that are facing the socio-economic impact of construction mining problems. In addition, in this area, so far no study has been done on issues related to the socio-economic impact of construction mining. To this end, the study would attempt to assess such issues as socio-economic impact of mining or production of construction materials in Cheha Wereda.

There are various development projects in Gurage Zone, Wolkete, These activities are still ongoing. The area is significantly rich in construction material supply, most of which are extracted around Gurage, Zone Cheha Wereda and Wolkite city. Many quarrying sites are also owned by individuals around Cheha Wereda. In those areas, there are quarries used to produce aggregate that contributes to the various types of construction and provides both economic and social benefits. The construction material manufacturers are given permission from the Gurage Zone mining and energy department.

However, socio-economic impact is affecting the study area in the case of quarry excavation, blasting, and aggregate production. (S. Mulat 2013) It is observed that various economic and social problems such as the operation of land clearing led to loss of vegetation cover, soil removal, spring eye spot extinction, scenic quality loss, formation of ugly scenery, susceptible geomorphology for erosion, land stability problem where the rock falling on the slop foot can be seen easily, creation of deep wells and ponds and land degradation. More than that, the quarry is located near the urban center where there are institutions such as residential houses, schools and offices, which can reinforce and diversify the problem. The process of blasting through the explosion of dynamite produces vibrations that run for long distances which in turn causes sound pollution, air pollution, injury because of fly rocks, damage to buildings and other household property, psychological problems for children, patient, and aged people due to explosives. (s. Mulat 2013). The study area is one of the most potential quarry sites that create large job opportunities and supply different

construction materials for building construction. In addition to this, various socio-economic and health problems, such as the excavated site being abandoned and left as wasteland, resident houses cracked as a result of blasting, the land being degraded. In addition, it leads to pollution like air and sound and also damages property. Therefore, this study seeks to investigate the impacts of quarry excavation, and aggregate production on the environment selected quarry site in the study area.

Furthermore, from the researcher's observation in the area there are ample construction mining natural resources and quarry sites in Gurage Zone ; however, it had not been well exploited so far. Those had not been investigated, identified or well recorded and there was an absence of coordinated effort by the concerned bodies. Therefore, this study seeks to investigate the impacts of mining or production of construction materials on socioeconomic situation of selected quarry site in the study area.

### **1. 3. Objectives of the Study**

#### **1.3.1 General Objective**

The General objective of this study is to assess socio-economic impacts of mining or production of construction materials in Cheha Woreda, Gurage Zone, Gasorena-keracha Kebele : Central Ethiopia Regional State.

#### **1.3.2 Specific objectives**

- To examine the social impacts of construction mining activities in the study area.
- To assess effects of construction mining activities on the economic life of local community.
- To evaluate the level of awareness of the people about rules and regulation governing the operations of construction mining.

### **1.4 Research Questions**

The study attempted to answer the following questions for socio - economic impacts of mining or production of construction materials in Cheha Woreda, Gurage Zone, Gasorena-keracha Kebele, Central Ethiopia Regional State.: -

- i. What are the social impacts of construction mining activities in the study area?
- ii. How have construction mining activities affected the economic situation of the local community in Gasorena-keracha Kebele?
- iii. What is the level of awareness of social and economic rules and regulations governing construction mining activities (quarrying operations) of quarry workers and local community in ChehaWoreda, Gasorenakeracha Kebele?

### **1.5 Significance of the study**

Cheha Woreda in Gurage Zone has great potential of mining or production of construction materials (quarrying) in Gasorena-keracha Kebele. As the area hosting several stone and gravel extraction sites. Quarrying operations in the study area, including the stone and gravel quarrying activities, have been linked to the socio - economic challenges facing the area and their adverse implications on the lives of communities in the area. These issues, some of which cannot be effectively mitigated with the application of available quarrying guidelines, rules, and regulations developed by the Environmental protection Authority and the Mining Policy, The researcher's preliminary observations revealed that quarrying operations took place even less than 50 meters away from homes in the study area, and quarry workers did not wear any protective gear, contrary to the stipulated ECWC guidelines. health and safety hazards to the employees and the surrounding community, cracks in the buildings of surrounding communities in this area, tension or conflict between quarries and the surrounding communities falling rocks, landslides, pollution vibration and clearing of vegetation were also the aftermath of quarrying in the area. Despite the great potential for stone and gravel quarrying in the study area, this activity's social and economic impacts in the area had not been highlighted in past research. To fill these gaps, the researcher embarked on a study to establish the socio-economic impacts of production of construction materials in the Gasorena-keracha Kebele location.

Therefore, the findings of this research would be beneficial to government departments, the department of mining, and other relevant bodies on the need for instituting proper measures, policies, and regulations to govern the mining or production of construction materials in the area and elsewhere. Given that no other research had been conducted in the study despite its significance to the mining industry sector in the county, the document would form a crucial

reference point for researchers in carrying out studies as recommended. Generally, the data that can be collected about quarrying activities, their impacts and the perception of the respondents about the quarrying activities in the study area can be useful for all those involved in quarry operation and further study.

### **1.6 Scope of the study**

Even though mining or production of construction materials (quarrying) activities have impacts that cut across several aspects, this confined itself to establishing the social and economic impacts of mining or production of construction materials (quarrying) activities in Cheha Woreda in Gurage Zone, in Gasorena-keracha Kebele, while determining whether there is a linkage between awareness of social and economic principles, rules, and regulations governing mining or production of construction materials (quarrying) and the harshness and severity of the implications. The study focused on two villages with two active quarries within Gasorena-keracha Kebele. The specific villages were chosen because they hosted the two active quarrying sites; those quarrying operations have been going on for several years, and many homes are located very close to the quarries. The study targeted quarry workers, households not involved in stone quarrying, Zone and Woreda Water Mine and Energy Department expertise, Woreda administrators, kebele development agents, kebele administrators, health extension workers, and community elders. The study was carried out between January and November 2023.

### **1.7 Limitations of the Study**

A number of limitations were faced while conducting this study. Some of the quarry workers at first showed an unwillingness to share some crucial information required in this study for fear that the information collected could be used to their disadvantage, for instance, the closure of quarrying sites by relevant authorities. Others did not allow the researcher to take photos at the quarrying sites. As a result, the researcher had to spend more time assuring them that the study was being conducted solely for academic purposes. The information provided by the household heads and observations made by the researcher were crucial in providing detailed insights where the quarry workers withheld crucial information. To deal with this challenge, the researcher was cognizant of other scholars' findings and was also guided by the research supervisors' comments. The researcher also faced financial and

time constraints, even though the researcher had prior planning. There is also a limitation in the available data and methods of turbidity testing because it need a laboratory test. The research depends on only questioning, observation, key informant interviews, and focus group discussions.

### **1.8 Organization of the study**

The main purpose of this paper was to investigate the impacts of mining or production of construction materials on socio economic of the local community in the study area. The paper has been organized into five different chapters that include:

Chapter one: explains the introductory section which depicts the background of the research about mining or production of construction materials (quarrying). Also presents, the statement of the problem under investigation, Research Questions, the objectives , Scope and limitation of the study and Organization of the study . Chapter two: highlights about the theoretical and analytical framework relevant to the study in which the relevant literatures on the topics of mining or production of construction materials (quarrying)., the interaction of quarrying and socio-economic, quarrying and livelihood and sustainability issues and conceptual framework of the study are treated. Chapter three: This chapter consists research methodology which involves description of the study area, research design, types and sources of data, study population, sample design, data collection methods and data analysis and presentation. Chapter four: This chapter presents the findings of the research.results and discussion. Chapter five: This chapter of consists research Summery, Conclusion and Recommendations.

## **CHAPTER TWO**

### **Literature Review**

#### **2.1 What is mining?**

Mining is the process of extracting useful materials from the earth. Some examples of substances that are mined include coal, gold, or iron ore. Iron ore is the material from which the metal iron is produced. The process of mining dates back to prehistoric times. Prehistoric people first mined flint, which was ideal for tools and weapons since it breaks into shards with sharp edges. The mining of gold and copper also dates back to prehistoric times (Encyclopedia 2022).

The term also includes the removal of soil. Materials recovered by mining include base 8 metals, precious metals, iron, uranium, coal, diamonds, limestone, oil shale, rock salt and potash. (Jafaru 2013) Mining of stone and metal has been done since pre-historic times. Modern and organized mining processes involve prospecting for ore bodies, analysis of the profit potential of a proposed mine, extraction of the desired materials and finally reclamation of the land to prepare it for other uses once the mine is closed (W. H. Langer 2001).

#### **2.2 Types of mining**

The type of mining activity needed to exploit a particular resource depends on a few key factors. Firstly, the type of mineral excavated plays a key role in mine planning. Secondly, the location and position of the deposit must be carefully considered. Finally, the available volume of minerals influences the type of mine to be used. Considering these factors (Reginald Davey Jun and ,Reviewed by Laura Thomson 2022). He also classified mining into surface mining (usually associated with gravel, sand and sometimes mineral), deep mining (mostly associated with pure mineral), in-stream mining (mostly for sand, petroleum etc.) and upland mining (mostly gravel, stone etc.) depending on their locations.

##### **2.2.1 Aggregate Deposit and Sources**

Aggregate can be defined as any hard, inert material such as gravel, sand, crushed stone or other mineral material that is used in the construction industry. the suitability of quarry materials for aggregate use depends on their composition (e.g., silt-clay content; ) (Carter

2016). Limestone, dolomite, and marble - the carbonate rocks- are the principal karst-forming rocks. Karst is a type of topography formed by limestone, gypsum, and other rocks by dissolution and characterized by sinkholes, caves, and underground drainage regions. Karst areas constitute about 10 percent of the land surface of the world (Drew, 1999), and there is widespread concern for the effects that human activities have upon the karst environment.

Many human activities can negatively impact karst areas, including deforestation, agricultural practices, urbanization, tourism, military activities, water exploitation, mining, and quarrying (Drew, 1999). Much of the resource extractions conducted in areas of karst are for the rock itself. Un weathered carbonate rocks provide crushed stone and dimension stone resources. (Robert Biikman<sup>1</sup> Aand Merio Parise<sup>2</sup> 2012)

### 2.2.2 Quarrying and Aggregate production Process

It is usually done by open-cast method using rock drills, explosion of dynamite and use of other methods. Stripping is the initial step in the quarrying operation and involves removal of topsoil and sub soil that covers mineable materials. A variety of equipment is used to strip, transport and redeposit sub-soil. (S. Bewiadzi<sup>1\*</sup>,and R. Awubomu<sup>1</sup> 2018)

#### *i. The Exploration Process*

The procedure used to produce aggregates ranges from extraction through processing. Extraction includes stripping, drilling and blasting, shot rock or gravel bank as the initial phase. Crushing comes initially in the industrial process following quarry or pit extraction. Most reduction and sizing activities include crushing. Nevertheless, some operations include a phase called scalping that is utilized to deflect particles at a jaw primary crusher in order to increase crusher efficiency. (Melaku 2007)

An early geology assessment is the initial stage of aggregate exploration. Geologic and topographic maps, as well as geologic and engineering studies, can be used to identify prospective regions or, conversely, to omit regions from future investigation. To more precisely determine the boundaries of the prospective sources of aggregate, thorough studies that use satellite images, aerial photography, geophysical research, and field reconnaissance studies of target areas may be conducted after preliminary investigations. Samples obtained

from surface outcrops using hand sampling techniques and from subsurface samples obtained using various drilling techniques are frequently used to enhance field studies. Depending on the type of possible resource and the anticipated uses, a source of aggregate must be thoroughly investigated. Bulk samples can be taken with backhoes, while deeper underground samples can be taken with truck-mounted power augers or drill rigs. Geophysical investigations may also be used to give continuity between drill holes, measure the thickness of overburden (overlying material), and identify significant changes within the deposit (such as transitions from gravel to sand or shale to sandstone). Environment disruption is rare when natural aggregate resources are being explored. Geophysical surveys, drill holes used to assess an area for mineral resources, and trenching and digging test pits for sand and gravel resources can cause modest environmental disruptions. (Melaku 2007)

### *ii. Aggregate Quarrying*

To reveal the sand, gravel, or stone, the overburden must first be removed at an aggregate quarry. Bulldozing and standard loaders and haul trucks can be used to move soil and partially weathered rock. Often, organic soil is removed from the remainder of the overburden separately and heaped up for restoration efforts. Overburden may be stacked, sold, or utilized to build berms, which are ledges, walls, or mounds. When the overburden has been removed, typical building methods are used to build berms, transport roads, processing and maintenance facilities, and other plant infrastructure. Whether sand and gravel or crushed stone is being mined, the site's natural characteristics, the intended product, and operator choice all affect the quarrying techniques (Carter 2016).

### *iii. Quarrying Crushed Stone*

Quarrying crushed stone differs from quarrying sand and gravel because the bedrock, in most situations, must first be drilled and blasted. The technology of blasting rock is highly developed and regulated. Holes are drilled into the rock and are partially filled with explosives. The top portion of the hole is filled with nonexclusive material (usually sand, crushed stone, or a manufactured plug) that is referred as stemming. The explosive in each hole is initiated with detonators that create delay periods between blasts in individual holes. The total blast commonly lasts only a fraction of a second and consists of many smaller

individual blasts separated by delays of a few thousandths of a second (B. W. Langer 2001). Controlled sequential blasting commonly breaks the rock into pieces suitable for crushing. If the rubble is too large, secondary breaking may be required and usually is accomplished with hydraulic hammers, drop balls, or other mechanical devices. The blasted material is dry and can be extracted by using conventional earth-moving equipment, such as bulldozers, front loaders, back hoes, and hydraulic excavators. Rock quarries that do not penetrate the water table and sites where groundwater naturally drains from the quarry commonly are mined dry. Where quarries penetrate the water table, they commonly are dewatered by collecting and pumping the groundwater. The rock is then mined by the same procedures used in a dry quarry (B. W. Langer 2001)

### **2.2.3 Gravel mining**

The removal or acquiring of gravel for industrial applications, such as road building material, housing material, filling materials, and landscaping, is referred to as gravel mining. Gravel extraction frequently takes place repeatedly and at several locations, either along a specific stream or from an open plain, leading to consequences that are likely to be chronic and cumulative. A net "mining" situation arises because of the cumulative loss of gravel when the rate of gravel extraction outpaces the rate of natural deposition over an extended period of time. (Nelson, D.W. and Sommers, L.E 1996) In practically all construction projects, including those involving buildings, roads, bridges, and airports, gravel is a crucial component of the building materials. Gravel mining in Ethiopia primarily takes place on lands. These areas are often either fallow or agriculturally farmed. Top soils and other vegetative elements, including trees, are typically removed during the gravel mining activities. Nelson and Sommers (1996) assert that the removal of gravel can drastically change the physical, chemical, and biological properties of mined sources. (Nelson, D.W. and Sommers, L.E 1996)

## **2.3. Impact of quarry operation on environment**

There are wide ranges of potential environmental impact caused by quarry operation. Those impacts are land scape change, change to the visual scene, erosion, habitat loss, loss of flora and fauna and stability problem, noise, vibration, dust, security problem, effect on the

amount and quality of water, high traffic and waste materials are the common problem in the development of quarry operation. The descriptions of some of the impacts are as follow

### **2.3.1. Land use change and Land degradation**

Land use refers to the human uses of land, or immediate actions modifying or converting land cover. On the other hand, land cover refers to the natural cover that characterize a particular area (De Sherbinin , 2002). In this regard quarrying is one of the land use obtained by extraction of non-fuel and non-metal minerals from rock (Ukpong, 2012). According to Chizoro et al., (1997) quarrying has land use policy implications. it is either agriculture vs. quarrying or a coexistence of agriculture, often a source of conflict over traditional uses of land. He also added that the clearing of land to develop access roads and to open up mining sites destroys habitats for wild animals, reduces grazing and reduces sources of plant life for human beings and animals (Chizoro et al., 1997). quarrying operations can intensely modify preexisting ecosystems and disturb hydro-geological and hydrological regimes. They can strongly modify the substratum, transform landscape patterns and integrity, destruct natural habitat and disrupt natural succession, as well as change genetic resources. Castro and Nielsen (2001) explain that, conflicts resulting from natural resource exploitation are typically “severe and debilitating, resulting in violence, resource degradation, and the uprooting of communities”, and if not addressed,” can threaten to unravel the entire fabric of society”. “Each party wants to pursue its own interests to the full, and in doing so ends up contradicting, compromising, or even defeating the interest of the other” (Ochieng-Odhiambo,2000).

### **2.3.2. Noise and vibration**

The primary source of noise during stone quarrying is from earth-moving and, processing equipment, and blasting (B. W. Langer 2001). Blasting which occurs at quarries, can give rise to vibration, audible noise, fly rock and dust. The levels of vibration caused by blasting are well below those which can cause structural damage to properties. Nonetheless, vibration transmitted through the ground and pressure waves through the air (“air overpressure”) can shake buildings and people and may cause nuisance. Audible noise accompanies overpressure. Noise can cause annoyance; nuisance, sleep disturbance and can also affect wildlife. Residential properties, schools, hospitals, nursing homes, churches, etc.

are also noise sensitive receptors. The impacts of noise are highly dependent on the sound source, the topography, land use, ground cover of the surrounding site, and climatic conditions. The beat, rhythm, pitch of noise, and distance from the noise source affect the impact of the noise on the receiver (Langer 1988) .

### **2.3.3. Dust Deposition and Air Pollution**

Dust is one of the most visible, invasive, and potentially irritating impacts associated with quarrying, and its visibility often raises concerns that are not directly proportional to its impact on human health and the environment (Howard and Cameron, 1998). Dust may occur as fugitive dust from excavation, haul roads, and blasting, or point sources, such as drilling, crushing and screening (Langer, 2001). Dust pollution from quarrying operations affects local air quality. Quarry dust not only pollutes the air, but may also lead to serious health problems. Quarrying generates dust both on site and on roads. Dust emissions tend to affect animals, vegetation and agriculture, although the precise effects still need to be more extensively researched, (Netherlands Committee for IUCN, 1996). However, incidences of animals inhaling dust containing dangerous (silica) substances have been recorded, as well as oxygen deprivation of plants and trees, which may lead to a plant disease called asphyxia (World Rainforest Movement, 2004). Dust emissions may be controlled by water sprays and wet processing. However, in quarrying – as opposed to processing – this is rare. Therefore, Residents living in proximity to quarries and quarry workers can potentially be affected by dust. The main potential impacts of dust are visual impacts, coating/soiling of property (including housing, washing, and cars), coating of vegetation, contamination of soils, water pollution, change in plant species composition, loss of sensitive plant species, increased inputs of mineral nutrients and altered pH balances.

### **2.3.4. Surface and Ground Water**

Degradation Quarrying can substantially modify the routing and water quality (Gunn and Hobbs, 1999). Commonly the first impact of quarrying is to remove the overlying vegetation and soil. The removal of topsoil, overburden and aggregates may affect the quality of water recharging of an aquifer, and excavation below the water table may lead to de-watering of adjacent watercourses and wells (Gunn and Hobbs, 1999). If the protective soil cover or unsaturated rock is removed, the hole created by the mining may focus surface

water to the ground-water system. As a result, the quantity, and physical and chemical quality, of surface waters and ground waters may be affected and flows can be increased or decreased and may be contaminated by runoff or dust from the quarry.(Hobbs and Gunn, 1998; Ekmekçi, 1993)

## **2.4. Socio-economic impacts of quarrying**

Even though agriculture remains the key strategy for rural poverty reduction, small scale mineral extraction is as well playing a critical role in rural livelihood improvement there by creating additional job opportunity and helping to generate additional income (Fellmann et al., 2005). According to Wang et al, (2010), over 500 million people in developing countries engaged in occupations such as small-scale surface mining and quarrying for survival In Africa, East Asia, Southeast Asia and Latin America, accessibility to natural resources plays a critical role in the livelihood conditions of people. Since the formal sectors in developing countries have very little potential in terms of job creation (Ibrahim, 2007) the informal sector has become an attractive alternative for achieving livelihood needs.

### **.2.4.1 Social impacts of quarry**

Characterization of social, economic, and cultural impacts of quarry operation are relatively straight forward and consists of an assessment of past and current impacts and projected future effects of quarry operations at production levels. Past finding indicate Msc thesis on impact assessment and restoration of quarry site on urban environment that due to the plantation of a quarry there is a change in land use and in economic activity leads to increase in population change the habit, culture belief and value of the local resident. If the proposed quarry is in near to urban center where surrounded by residential land of high scenic values, quarry operation will negatively impact on these values. The quarry would be visible to homes, parks and open space. The quarry operations will produce fugitive dust from blasting, vehicular emissions and other mining operation which would deterioration of air quality. The dust will negatively affect the health and the well-being of residents. The effect is the stronger the drier the weather, the heavier the wind and the more silt and fine sand is including the extracted material. The dust effect is still worse near the open quarries where rock aggregate is extracted by blasting and crushing. Dust from blasting and aggregate production is fine and needle-sharp (Räisänen, 2004). Dust from crushed rock seems to be

both smearing and when breathing unhealthy. Past studies show that increasing risk of lung cancer among those exposed to silicic rock dust (Guo, 2005). Earth movement from blasting operation would increase the risk of rock fall which damage to surrounding properties and cause injury to human life. The noise level rise and fall throughout the work day as activity ebbs and flows. The human ear has an extremely large range of response to air pressure variations which in case of sound are represented by air pressure waves that cause the eardrum to vibrate. The smallest steady state air pressure that can be detected by the ear is three billionth of a pound per square inch. The largest steady state pressure that can be perceived without pain is three-thousandths of a pound per square inch. Decibel scales ranges between these two extremes with various frequency weighting networks employed to better characterize the human response to sound. In general 70db is the point at which noise begin to harm hearing (U.S geological survey 1997). Heavy truck of city traffic has 90db noise level and a very annoying hearing damage (after 8 hours). Hence the quarry operation has more than these noise levels which can lead to extreme effect to happen (U.S geological survey 1997). For quarry stone producers, blasting is the primary crushing stages which produce seismic amplitude and cause explosions. The effect of explosions that are used in quarry blasting practice varies greatly between mines and within mines and in-mine instrumentation (Chan, 2005). Generally on the creation of infrasound signal during blasting operation through seismicity which cause psychological problem to the vicinity, damage of property fracturing of the building like bridge, house or any man-made structure in the surrounding area. Air pressure vibrations from air blast can cause primarily from the transmission of ground vibrations into the atmosphere and direct release of high-pressure explosion gases and gas vibrations into the atmosphere (Hertzer, 2000). Air blast pressure also effect in noises that are heard and concussion effects that can rattle windows. The world health organization suggests that noise can affect human health and well-being in the following ways: creating feeling of annoyance, disturb sleep, interfere with communication particular listening, interfere with learning, cause antisocial or aggressive behavior and cause hearing loss (WHO,1992) The decrease negative impact on resident through the operation of quarry activity can be decreased by on determining a buffer zone between the resident and the quarry area. As James 1998, suggested the minimum distance between workings and residents which has been permitted or suggested varies considerable up to

400m for sand and gravel and 300- 900m for hard rock workings. The effectiveness of distance as a means of control varies with topography and local environmental sensitivity. There is little or no benefit to either operators or residents if the permitted distances are too small. The operators will find that the pressures of cost and expediency encourage them to "chance it" in tight situations. Residents will find that conditions are often at or over the borderline of acceptability and that the operator is not very responsive to their complaints. It is not possible to define a distance that is safe with regards to fly rock from blasting. The focus therefore must be on preventing any fly rock from being generated (James P.1998)

#### **2.4.2. Employment and Income**

Quarrying activities generate employment and contribute to a country's gross national product, both through production for the local market and for export trade. (National council of Bhutan, 2013).KuntalaLahiri-Dutt, (2000) also added that stone quarrying generate considerable employment opportunities as it is a relatively labor intensive, under-mechanized industry. Even if the availability of accurate data on the sector's contribution to overall employment is difficult, for example in India around 2 million people were employed in the sand stone mining However, population growth and its concomitant high demand for natural resources have put severe stress on the available resources with consequences on their sustainability. Overexploitation of the natural environment has depleted most resources and rendered most productive land beyond repairs (IEG, World Bank, 2008). This development is likely to compound the health and unemployment problems of the poor majority seeking alternative means of livelihoods in rural areas.

#### **2.4.3. Occupational health and safety Impact**

The mining and quarrying sector is traditionally a sector that poses large risks to occupational health and safety. Even in modern quarries and mines, fatal injuries occur regularly ("Sustainability of jewelry sold in the Netherlands", CR (yamane 1967)EM, 2005).

The most frequent occupational risks related to stone quarrying include:

- Fatal accidents;
- Physical injuries requiring medical treatment;

- Work-related illnesses: respiratory diseases such as silicosis and tuberculosis due to inhalation of dust. Work-related illnesses endemic to the natural stone industry include the respiratory diseases silicosis and tuberculosis (or silica-tuberculosis). Large numbers of quarry workers suffer from silicosis or tuberculosis due to prolonged inhalation of silica-dust. According to Langer, (2001), it is estimated that some 4 million people die each year from acute respiratory problems in developing countries, for the most part being aggravated by environmental pollution emanating from quarrying, sandblasting and emission of dangerous chemicals.

## 2.5 Quarry operation in Gurage Zone Chehawereda

Cheha Wereda is endowed with construction minerals such as Gravel, basalt for the production of crushed aggregates, weathered and fractured basalts used for the production of selected material, ignimbrite for masonry work and there are a lot of quarry sites in the wereda. While, there is lack of research related to when stone quarrying operation was started. But some evidence shows that, for example, GibrilHairu, Begashaw and Abubeker Fedlu quarry site opened before 2010 E.C and active until now, (Grage Zone water and Mine Department, 2015E.C). In recent Years, with increasing infrastructure development activities the demand of construction material increasing alarmingly due to this the quarrying operation also increased, according to Gurage Zone water and Mine Department In Gurage Zone, 34 construction mining manufacturers are engaged in small and micro construction mining production, while another 214 are engaged in traditional construction mining production. In Cheha district, currently 14 manufacturers of construction materials are engaged in the production of small and micro construction materials on 84.5 hectares of land for an average of 7 years. In addition, 36 associations are engaged in the production of traditional construction materials.

, (GZ WMD,2015). Despite this quarrying become one of the most potential sector to create job opportunity, moreover, it is labor-intensive and requiring low skills. While apart from creating job opportunity and satisfying the ever increasing demand of minerals in the construction sector of the area, quarry activities can lead to loss of vegetation cover, soil removal, spring eye spot extinction, scenic quality loss, formation of ugly scenery, susceptible geomorphology for erosion, land stability problem, destruction of the existing

natural landforms & resulting in fast degradation, (Enatfenta Melaku, 2007). Moreover it was aggravated due to lack of the proper technical, financial, law enforcement mechanism with respect to quarry rehabilitation and closure legislation, (Setegn Berie, 2013). However, still there are no environmental interventions incorporated in the operation of most quarry projects. As a result different problems have occurred and become a set of environmental and socioeconomic issue that need to be considered in order to reduce the problems of these activities and ensure that the quarrying operation could be carried out in an environmental friendly manner by designing quarry rehabilitation program (Setegn Berie, 2013).

## 2.6 theoretical framework

The neo-Malthusian theory developed from the Malthusian idea by the political economist Thomas Robert Malthus in 1798 and revised in 1803 forms a basis for this study. (Malthus 1798) The Malthusian theory explains that the population grows exponentially while food supply increased arithmetically (Mayhew, 2014). Over the years, its proponents have updated the theory leading to the neo-Malthusian theory of population, which focuses more on population and environmental degradation. It gained prominence in the 1960s. According to Neo – Malthusian theory, population growth translates to overuse of scarce natural resources, resulting in adverse effects on the environment that ultimately impact human well – being. Neo – Malthusian theory predicted what is being experienced in the twenty – first century: climate change, famine, drought, desertification, and floods (Robertson, 2012). While the Neo – Malthusian theory is considered a vital school of thought in explaining environmental sustainability, it is criticized for failing to recognize the shifting population growth rate dynamics and technological advancement, which is being progressively adopted in the quarrying sector (Friedrichs 2014). It is argued Neo – Malthusian theory analysis fails to recognize the role of technological and scientific innovations in influencing the market prices and demand for specific resources. (White, Rudy, and Gareau 2017) Thus, in this case, population growth is considered less of a factor, which is contrary to neo – Malthusian theory. Environmental neo – Malthusians such as Dr. Paul Ehrlich and Prof Robert M. Hardaway argued that environmental impacts such as loss of biodiversity and land degradation destabilize nature's ability to regenerate. (Friedrichs 2014) Over time, the environmental impact increases while ecological resources

decline. Consequently , humanity is forced to exploit more from the degraded environment causing more harm. The theory forms a basis for this project because building stones are limited natural resources. Population growth, demand for improved roads and buildings have contributed to increased stone quarrying operations . The need to satisfy human wants and needs , including food supply that agricultural production cannot fulfill, also explain why people opt for stone quarrying as source of income in Cheha Wereda sub location .

## **2.7. Empirical literature**

In a quarry operation, drilling, crushing, and road haulage are the main sources of dust. The risk of the workers breathing in the released dust, which is harmful to their health, exists. While dust deposition causes skin and eye problems, inhaling the dust can result in serious health issues, including respiratory and pulmonary issues. (Mengesha & Bekele in 1998). Nwibo (2012) discovered that quarry workers had a variety of respiratory issues, including chest pain, coughing, wheezing, and shortness of breath in his study on pulmonary issues among quarry workers. According to the report, up to 98.3% of the workers lacked safety precautions. According to the study's data, consuming tobacco or using cigarettes while working longer hours may further raise the chance of developing respiratory issues and reduced lung function from exposure to dust from rock crushing. According to Ugboogu's 2009 investigation on the prevalence of respiratory and skin conditions among manual stone laborers, up to 85% of the workers experienced respiratory symptoms and 77% had skin infections. The survey also found that, despite a high degree of knowledge of the negative health effects of dust, using protective gear and clothes was not common. According to a research by Ilyas (2010), when owners of stone-crushing units failed to take the necessary precautions to safeguard their employees, dust-related problems became worse. According to the survey, self-medication is the most popular form of therapy, and the employees had no access to health insurance at all. Compared to developed countries, developing countries are more vulnerable to environmental and health problems. This is a result of the subpar quality of the working environment and the lack of adequate healthcare in underdeveloped nations. (Ilyas&Rasheed, 2010). This study also discovered that because of unequal livelihood patterns, poor working conditions, and the health effects of dust, an increase in respiratory disorders is linked to deteriorating air quality, which is brought on by many forms of environmental pollution. Numerous investigations have demonstrated that various

types of rock contain crystalline silica in varying amounts. The geology report for the kajiado area lists 19 examinations of limestone rock samples showing various silica concentrations, with the highest being 11.38% in a sample taken from the kenya marble quarry. (Matheson, 1966). However, little study has been done on the effects of limestone quarry dust on the health of the employees, therefore the size of the issue is not known. There is a substantial body of data linking exposure to crystalline silica with illness, according to other investigations. (Rosner & Markowitz, 2006). According to other research by Goldsmith (2006), McDonald (2005), and Steen Land (2001), populations exposed to crystalline silica can experience psychological changes, illness, and even death. Numerous illnesses, including silicosis, lung cancer, kidney cancer, chronic obstructive pulmonary disease (COPD), and rheumatoid arthritis, were brought on by the exposure. (Bridge, 2009).

## 2.8 Conceptual Framework

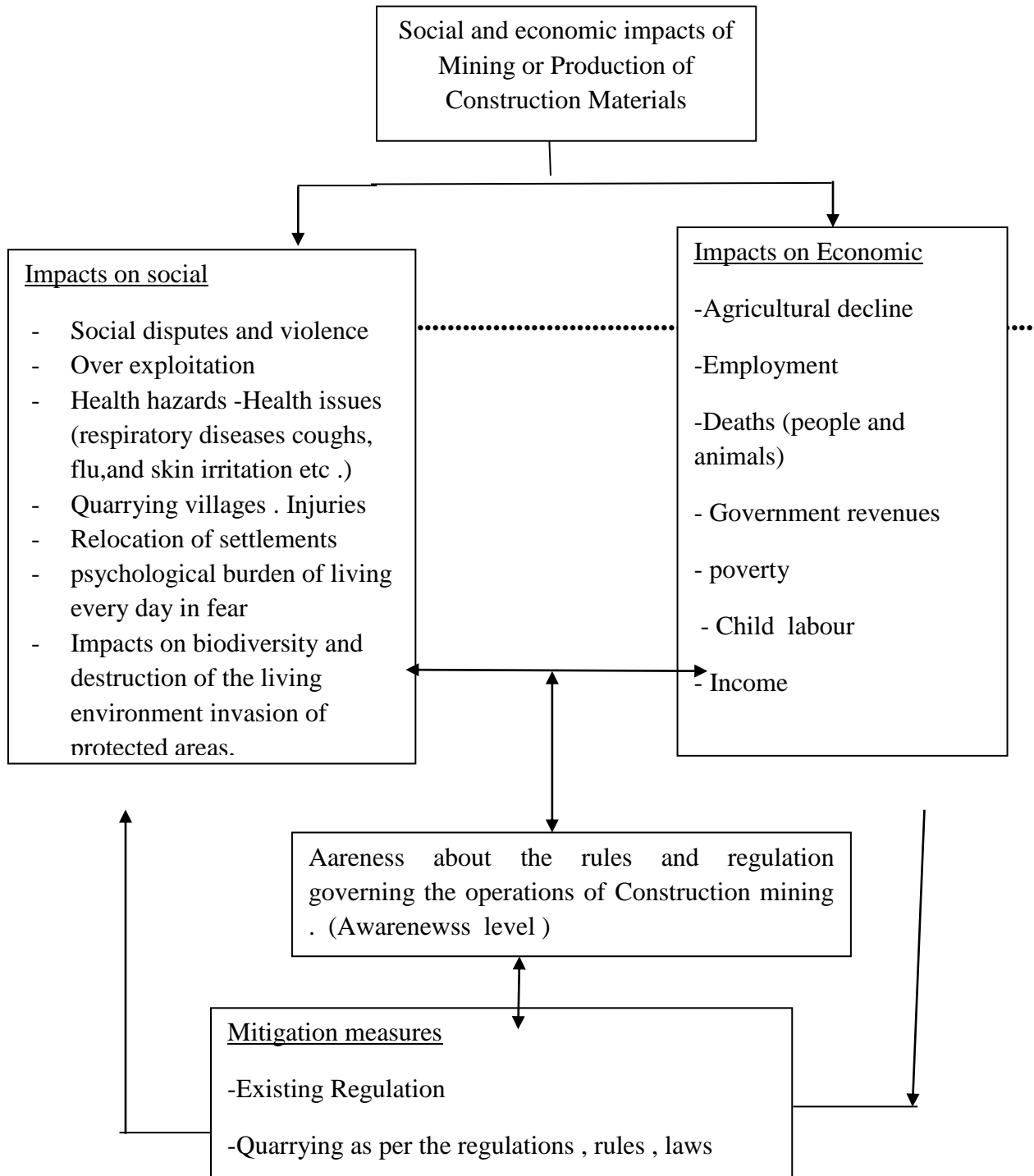


Figure 2 .1 Conceptual Framework

Source: by the researcher, 2015 E.C

## 2.9 Summary of Gaps from Literature Review

In mining activities numerous concerns and impacts are involved. It is, however, difficult to generalise these impacts as the location, size, and mined ore of mines vary widely. What works well in one place may have negative impacts and cause problems elsewhere. Individual mining projects are always a balance between the benefits and impacts at different locations and on varying scales. Mining is place dependent and global at the same time. It is connected to global cyclical economic changes and risks of continuity are always present. The variety of potential environmental and social impacts from mining activities is broad and in individual mining projects only some of them are realised. (Social and environmental impacts of mining activities in the EU 2022)

There is limited information on the level of knowledge and practices as well as the impacts of stone quarrying in Ethiopia. In most cases quarrying is done without considering the impacts to the environment, even there is little done to ensure that there is no overexploitation and collapse of stone quarrying in most regions. If research was well done, there were a lot of opportunities in managing stone quarrying in the area without posing danger to the surrounding community and lives of stone miners and even the related negative impacts to the environment. The government policy and legislation was the most limiting factor in controlling exploitation of stones but there is therefore the need to measure the stone quarrying activities and the immediate impacts to the environment. Therefore such study is important since it focuses on future environmental conservation in the country and development of the technology in stone quarrying in the regions. Besides, it will address the negative issues of stone quarrying and immediate control measure for sustainable development in vision 2030. The study is important in the areas; since there are pressures in stone quarrying and environmental degradation which need urgent address from both stakeholders and the government. Human encroachment and collapse of quarries which has led to recent conflicts in the areas making the research to be the most appropriate to determine the future sustainable development in the areas. The result will help not only in formation of similar interventions, but also in the design of policies that could be used to address issues on stone quarrying for sustainable development. The cited conceptual and research literature provided the researchers adequate knowledge and pertinent information

about quarrying industry. Most of the information presented are closely related to the present study. The present study is different from the previous study in terms of the respondents involved in all study areas. With these concepts as reach background, this study will anchor the trust to determine the quarrying industries in Ethiopia. Hence, the researchers strongly believe that quarrying activities can be controlled or regulated if the quarry operators will comply with the laws issued by government. From these inputs from the studies, they can assess that they really add substance to the content of the present study. However despite similarities at some points, it can be said that the present study is not a duplication of any of the aforementioned studies therefore, it has a distinct personality of its own. Most literature reviewed in this study focused on enforcement and implementation of environmental rules, regulations, and guidelines governing stone quarrying operation while locking out the aspect of awareness, a limitation this study sought to fill. (Girma 2012)

Most empirical studies reviewed by (: Z. Abate 2016) and (Damte Balcha1 Semayat Oyda2 2021) evaluated the social and environmental impacts of stone quarrying without considering the significance of awareness and comprehension of the relevant socio - economic rules and regulations that could influence the community. This is a gap this study sought to fill by establishing whether there is a linkage between awareness of socio - economic rules, regulations, and principles on Mining or Production of Construction Materials and impacts on social and economic aspects of the community.

The study only highlights the impacts without considering the Social and economic impacts of Mining or Production of Construction Materials and the frequency of occurrence, aspects that this research attempted to address. The review established that there was no existing document on the subject matter under investigation in Cheha wereda, Gasorena-Keracha Qebele administration a gap this study pursued.

## **CHAPTER THREE**

### **STUDY METHODOLOGY**

#### **3.1. Description of the Study Area**

Cheha woreda is one of the woredas that are found in Guraghe zone, Central Ethiopia; about 185 km south west of Addis Ababa. It is located between 7° 55' – 8° 54' and 38° 5' -38° - 40'. According to the Cheha Woreda Plan Development Office, due to the use of minerals, many opportunities have been created by organizing associations to produce construction materials and giving legal licenses.

Accordingly, in Cheha woreda, currently 14 manufacturers of construction materials are engaged in the production of small and micro construction materials on 84.5 hectares of land for an average of 7 years. In addition, 36 associations are engaged in the production of traditional construction materials., and this has created employment opportunities for 1800 people (17000 men and 100 women). (d.office 2014)

##### **3.1.1/Climate and Rain fall**

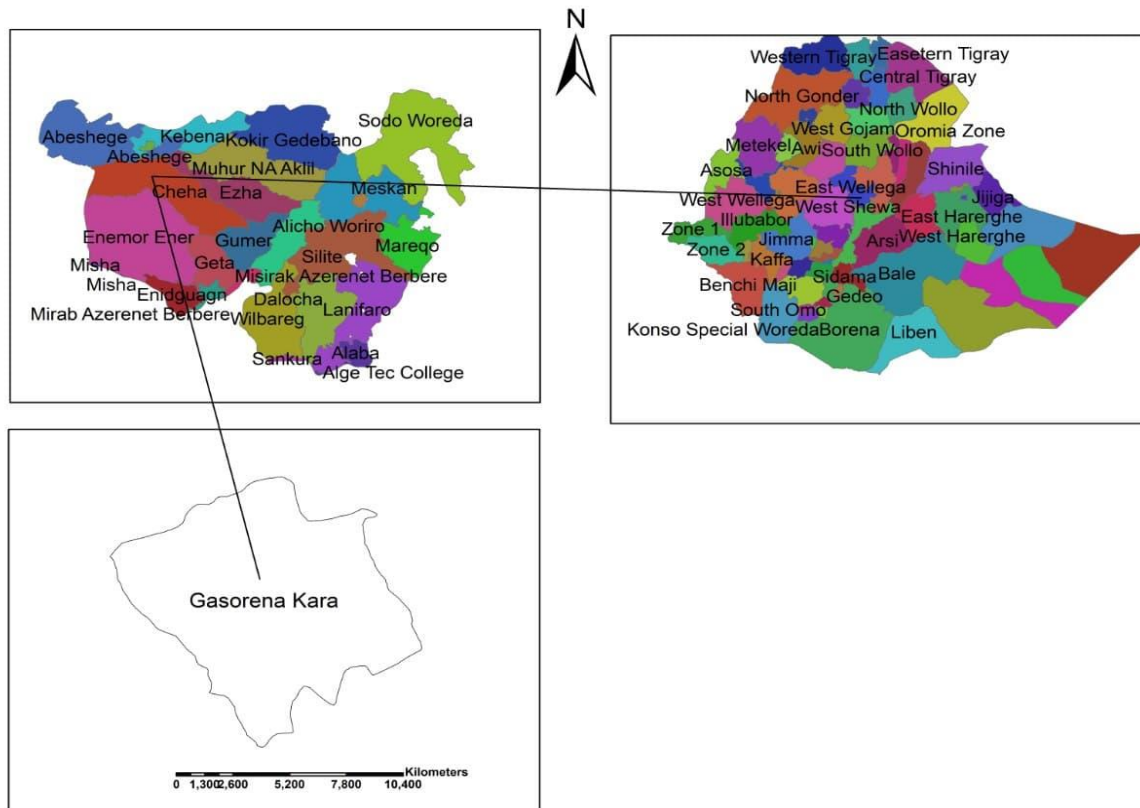
According to Cheha woreda CWPDO the area is highly undulating and hilly topography intersected by valley bottoms and gullies, which constitute about 60 % of the woreda's land area, 25% is mountainous land and the remaining 15 % is that plains. (Ansah , 2015 ) The average annual rainfall ranges from 2500mm to 1500mm; and unevenly distributed throughout the year. Extreme fluctuations in rainfall, both in its annual totals and the distribution throughout the year, are the primary constraints for agriculture particularly under rain - fed conditions. The mean annual temperature of the area ranges from 28°C to 18°C in the Dega and Woina Dega agro-ecological zones respectively. (GZPDD 2022)

##### **3.1.2. Population**

Based on the 2022 projection, of the Guraghe Zone Plan and Development Department, the population of ChehaWereda is 123,974 while the total land area of the woreda is 560.6 Square kilometers, Out of this total population, 59, 963 (48.36%) are males, while 64,011 (51.63%) are females.

### 3.1.3. Location of Case Study Area

Cheha woreda is one of the woredas that are found in Guraghe zone, Central Ethiopia; about 185 km south west of Addis Ababa and 300 km from Hawassa. Cheha woreda has a total of 36 kebeles, including 33 rural kebeles and 3 cities. The project will be executed in Cheha woreda, Gasorena-Keracha Qebele Administration. This area is accessible for road, electricity or power and telecommunication. The study site is part of Cheha woreda which is seriously affected by quarrying in the area through construction mining operations.



Source: Arc Gis 10.8 File SNNPR shepe file

### 3.2. . Research Design

The study was aimed to assess the impact of Mining or Production of Construction Materials on the economy and the societies in the case of Cheha woreda, Gasorena-Keracha kebele. To obtain appropriate information, a descriptive survey research design was used because it is suitable for describing the existing situation, narrating facts and investigating phenomena.

### **3.3 Research approach**

This research have been used quantitative and qualitative approaches of data collection and analysis so as to capture the details and adequate information. It was done based on a mixed approach when the qualitative methodology aims at describing phenomena to rich contextual data by unearthing information that could not be easily quantified and; can be gathered through interview, focus group discussion and observation, whereas, the quantitative method was used to support the qualitative method and assesse and analyze the perception as well as both the negative and positive contributions of construction mining area to people's livelihood, using open-ended questioners; in relation to the socio-demographic characteristics of the quarry workers and the local communities.

#### **3.3.1 Samplig Frame, Sampling Technique and Sample Size**

According to the Gurage Zone Water and Energy Department, in the past years, 14 construction material manufacturers in the district have taken the license of small and micro construction material manufacturers. But currently only 4 are in operation and production. The rest have had their licenses revoked for not coming to work on time and for various reasons. These 4 construction material manufacturers that are currently working and producing are also located in the same study area and Kebele.

The study area has 4 manufacturers of construction materials and more than 4 quarry sites, consideration of all sites was very difficult regarding time and financial constraints. Therefore, the researcher purposely selected only two nearby quarry sites where, there are 2 stone crushing plants associated with the quarries. two study areas were selected for the study, these are: - 1. Gibril Hairu manufacturers of construction materials 2. Gashaw Asefa manufacturers of construction materials in Gasorena-Keracha Qebele Cheha Wereda.

#### **3.3.2. Population Sample Frame**

Due to the characteristics of the population in the study area the population is categorizes in to two sample frames, i.e. the quarry employees and the local residence community that they reside for long period in the study area. Regarding population size, during the reconnaissance survey and the data obtained from manufacturers of construction materials Manageres, the two manufacturers of construction materials, there were about 88 employees in the quarrying and Gravel chiseling works. concerning the local community, the study

only focuses on residents who are living near the quarry and crushing site. Concerning the local community the woreda Plan Developmento ffice told me there were around 1390 households living there 80 herctar of the study areas, hence in the study area the size of the population were 88 quarry workers employee and 5560 resident communities respectively.

### 3.3.3 Household Sampling and Sample Size Determination

#### *i. Sample Size Determination*

Due to the small number of regular quarry workers in the two quarries, acensus of all these quarry workers was taken. hence all the 88 were considered in this study. purposive sampling was used to sample all the two qauarry managers. In determining the sample size for the household heads the study applied the (yamane 1967) formula basing it on 95 % confidence or at 0.05 rejection level, the sample size was determined as follows :

$$n = \frac{N}{1 + N(e^2)}$$

Where

n = the sample seize

N = the size of the population

e = Errer margin or the precision level or the significance level which is 0.05 (95 % confidence level)

Using the formula yields a sample size of

$$n = \frac{1390}{1+1390(0.05^2)} = 311$$

Therefore, the study obtained a sample size of 311 household heads while the samples from the two villages were proportionately determined Therefore, stratified sampling method was used to ensure that house heads from the two villages were well represented in the study . Table 3.2 summarizes the sample size and sampling technique used for each category of study participants.

Table 3.2: Population of the study area

Category	Target population	Sample Size	Sampling Technique
Household heads	1390	311	Stratified sampling
Quarry workers	88	88	Census
quarry Managers	2	2	Purposive sampling

Focus group discussion helps to generate data on group dynamics, and allows a small group of respondents to be guided by a skilled moderator, to focus on key issues of the research topic. The focus group discussion was included households of respective selected kebele. At a kebele, one focus group discussion was held that include local elders, poor women and men, youth, and adult men and women.

Table 3.4, Composition of Focus Group Discussion

Name	Members of Focus Group			Remark
	Men	Women	Total	
local elders	2	2	4	
poor women and men	2	2	4	
youth	2	2	4	
adult men and women.	2	2	4	
Total	8	8	16	Discussion will be held in one group

**Source:** By the researcher, 2023

Key informants Interviews were conducted with people from different offices with different responsibilities, and expertise knowledge as well as experience to collect data related to quarry impact and possible suggestions in the view of communities and quarry owners to handle the social and economic impact of mining or production of construction materials using checklists.

### **3.3.4. Data Sources and Type**

For the purpose of this research both primary and secondary sources of data were utilized.

#### **3.3.4.1. Primary Data**

The primary data were gathered from the cross-sectional survey through questionnaire, interviews and observation.

##### **i. Questionnaires**

Data were collected from the local residence community and quarry employees using open and close-ended questions. Open-ended question enable respondents to freely express their options and view without prejudices, and hence obtain adequate information in relation to the objectives set for this study. However, the close-ended questions, apart from reducing time consumption, made it easier for data analysis and processing of factual information. Questionnaires were administered to these groups of respondents to get their views and perceptions on the impact of stone quarrying on individual employment status, income as well as health issues and on the Social and economic condition of the locality.

##### **ii. Key informants Interview**

key informant interviews were often used to collect qualitative data and they were conducted in face-to-face manner. Interviews were included, 3 community elders, 3 Woreda Water mine and Energy Office expertise and 3 Zone Water mine and Energy Department expertise 1 kebeles development agent 2 kebele administrators, 1 health extension worker and 2 Woreda administrators.

### **iii. Observation**

Observation was important because it provided background information about the environment where the study was taken. Therefore, an extensive personal observation was undertaken in order to support the primary data that was gathered and be able to gain a richer understanding about the phenomena in a natural setting and qualify the nature of the problem. In addition to interviews, I access non-verbal information through observation. The observation was made with the help of a checklist as per the objective of the study. The checklist includes issues like the status of quarrying operation, rehabilitation conditions, and impact of quarry problems on the existing situation, highly affected problematic areas, social and economic conditions, vegetation cover as well as the working environment of workers and other related issues in the study area. The observable information's were captured as photos, sketches and notes.

#### **3.3.4.2. Secondary data**

##### **i. Non -Spatial Data Source**

Relevant non-spatial secondary data were collected from different sources, particularly, from government organizations such as Gurage Zone Mining Department, Cheha woreda Mining Office, and kebele Administration offices. The main data gathered from such institutions are different year existing spatial data of the study area, plan report documents, mining operation legal frameworks (policy, proclamation, and regulations of mining activity). Moreover extensively used Internet browsing for academia and literature reviewing of best practices from selected countries on the socio economic impact of mining or production of construction materials were discussed.

##### **ii. Spatial Data source**

In order to verify the spatial data analysis, a 2022 Google Earth Image was extracted from Google earth and spatial data such as 2012 base maps were collected.

#### **3.3.5. Data Collection Methods**

The study employed both qualitative and quantitative data collecting tools. Qualitative data was collected through semi-structured interview and focus group discussion (FGDs) from households of the respective selected kebele; the focus group discussion was conducted with

a group composed of men and women representatives. Qualitative data were gathered from experts of mining department and leaders of the Water and mine office at Wereda and zonal administration through semi-structured interview. The quantitative data were collected from quarry site workers through interview questionnaire or schedule (which was prepared using Likert Scale). Prior to data collection four data collectors were purposely selected and trained for one day to get necessary information about field tasks. Then, the tools were pre-tested to determine their validity and reliability of the tool.

### **33.6. Results and Discussion**

Since both quantitative and qualitative data were generated, quantitative and qualitative data analysis was considered. Data which was obtained from structured household survey were analyzed through statistical packages for social scientists (SPSS).

Data were entered into the computer after coding the variables and descriptive statistics such as: percentages, mean and standard deviation were computed through this software program and results were presented in tables and interpreted accordingly. Similarly, qualitative data obtained through interviews and focus group discussions was analyzed by describing and interpreting the situation deeply and contextually, So that real picture of the impact of construction mining area on socio economic status of the local community in the study area was revealed.

Non-spatial raw data were collected in order to make it ready for analyzing using SPSS software. Then statistical tools used in the analysis were SPSS and Excel. Whiles descriptive analysis is used to describe the socio-demographic characteristics (mainly in the form of tables, bar charts and pie charts for the purpose of visual expression). For spatial data analysis, digital image processing of the satellite data is carried out for extraction of pertinent information using GIS. In order to verify the existing situation of the ground truth, satellite image processing are supported by secondary spatial data of the area as well as the photos captured during site observation. Finally the acquired information from the analysis was presented in the form of standard maps and tables.

### 3.3.7 Definitions of the variables

Variables description

**Independent variables,** The intensive activities of production of construction material on mining sites. the case of quarry excavation, blasting, and aggregate production., undertaken by manufacturers of construction materials activities .

**Dependent variable,** Social Impacts: These are the impacts on the social life of a local community as a result of an activity. Indicators for this aspect include,: Social disputes and violence, Health hazards -Health issues (respiratory diseases coughs, flu, and skin irritation etc.), Relocation of settlements, psychological burden of living every day in fear ,etc.

Economic Impacts: impacts on the positive and negative levels of a local community as a result of a activities of production of Construction material on mining sites. Indicators for this aspect includes: employment, income level, agricultural decline, deaths (people and animals), Government revenues , Child labor etc.

Intervening variables, the economic and social impacts were also influenced by awareness about the rules and regulation governing the operations of construction mining activities. level of education of the community involved in the study area, and/ Mitigation measures existing regulation, quarrying as per the regulations, rules, laws.

### 3.3.8 Validity and Reliability of the Research Tools

Errors are eliminated with reliable data gathering equipment. Thus, adviser comments were sought after the research instruments to assure validity. The adviser had already looked over the tool. To evaluate the tool before starting the real data gathering process, a pilot study was carried out. To determine if the instrument consistently obtains the necessary data, the feedback that was gathered was assessed. To establish the dependability of the research tools, a test and retest method was done on a few individuals, 5 quarry workers and 15 household heads in Gasorena-Keracha kebele two villages, that is, 10% of the actual sample for the two groups of participants. The feedback collected was evaluated to ascertain whether the instrument captures the desired data consistently.

The overall reliability coefficients were 0.758 for the quarry workers' questionnaire and 0.731 for the household heads questionnaire. According to (Mohajan 2020), the questionnaires were therefore taken into consideration for use in the primary study. Quality and dependability were guaranteed. through every process being documented. Additionally, the researcher reviewed the written responses from the interviews for any clear errors, ensuring that there was no deviation in during the coding procedure, definitions of codes or applications of the objects were made sure of. Meeting communications were recorded. The findings were also compared with the findings of different studies which were independently derived.

### **3.3.9. Ethical Considerations**

Ethical considerations are a critical part of a study (Zhang 2018) . This study ensured that it conformed to the ethical guidelines to assure the confidentiality and anonymity of the respondents and upheld integrity throughout the research process. Voluntary and informed consent was sought from the respondents. Persons under the age of 18 and those considered vulnerable or of special needs did not participate in the study. The researcher sought letters of authorization to collect data in Gasorena-Keracha Kebele, from Wolkite University College of Social Science and Humanities Department of Governance and Development Studies.

## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### 4.1 Introduction

This chapter presents the findings of the research. The organization of the chapter is guided by the specific objectives of the study. For the qualitative data, content analysis was conducted while both descriptive analysis and inferential analysis were carried out in analyzing the quantitative data. The results are presented in frequency, tables, charts, narratives and photograph.

#### 4.2 Response Rate

The study participants consisted of household heads, quarry workers, quarry managers, key informant interviews and checklist for focus group discussion in Cheha Wereda Gasorena-keracha Kebele. To this end, the researcher administered 310 questionnaires to the household heads and 88 questionnaires to the quarry workers. Out of the 310 questionnaires administered to the household heads, 276 questionnaires were properly filled and returned while 76 questionnaires were received from the quarry workers. This represented 89.03% and 86.36% successful response rates for the household heads and quarry workers respectively.

#### 4.3. Demographic features of respondents

The educational background of respondents shows that majority of the local community respondents Cannot read and write, as can be seen in the table where 48.2 % Cannot read and write, 40.2 % Read and write, 10.5 % Primary education, 1.1 % Secondary education and none in First degree and above. This implies that majority of the the local community respondents Cannot understand the issue of socio – economic impact of mining of construction materials activities (quarrying ) in the study area.

The marital status of the respondents was also determined. The findings are presented in the table.4.1 It was found that 24 (31.6%) of the quarry workers were single, 50 (65.8%) were married, 1 (1.3%) divorced while 1 (1.3%)of the quarry workers were widowed. Regarding to the household heads, 3 (1.1%) were single, 243 (88.0%) were married, 8 (2.9%) Divorced

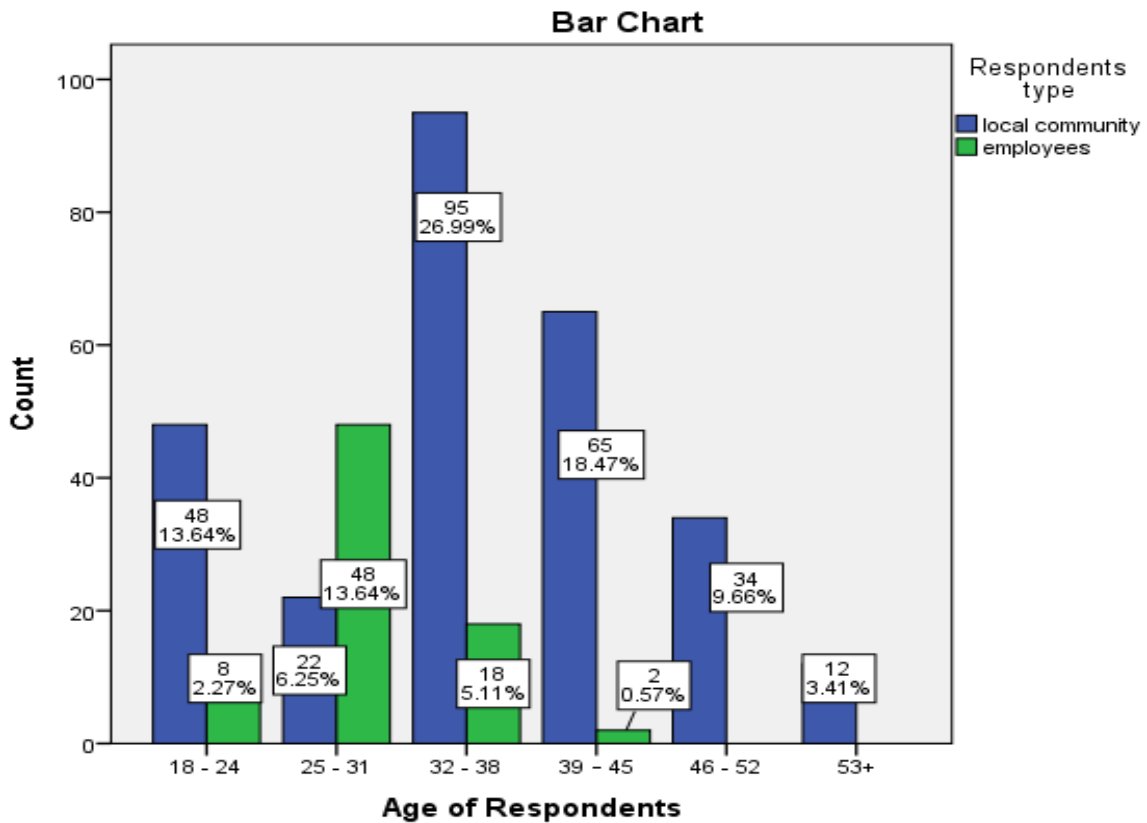
while 22 (8.0%) of the household heads were widowed. These findings imply that most of the respondents are family people and for the quarry workers, the added responsibilities of supporting their dependents. They have more family responsibilities. That's why they're employed in this job as well.

Table 4.1 demographic features of respondents

House Hold Size of the Respondents				
	local community		employees	
House Hold Size:	Frequency	Percent	Frequency	Percent
1 - 2	23	8.3	31.6	31.6
3 - 4	41	14.9	47.4	78.9
5 - 6	119	43.1	19.7	98.7
7 - 8	74	26.8	1.3	100.0
9+	19	6.9	--	---
Total	276	100.0	100.0	
Educational background of the Respondents				
Cannot read and write	133	48.2	2	2.6
Read and write	111	40.2	9	11.8
Primary	29	10.5	32	42.1
Secondary	3	1.1	30	39.5
First degree and above			3	3.9
Total	276	100.0	76	100.0
Marital status of the Respondents				
Single	3	1.1	24	31.6
Married	243	88.0	50	65.8
Divorced	8	2.9	1	1.3
Widowed	22	8.0	1	1.3

Total	276	100.0	76	100.0
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The study sought to find out the age of the respondents. The findings as outlined in Bar Chart reveal that generally, a large number of the quarry workers in the two mining of construction materials activities (quarrying) area were youthful. (Gibril Hairu manufacturers of construction materials and Gashaw Asefa manufacturers of construction materials in Gasorena-Keracha kebele Cheha Wereda). This could be attributed to the nature of the stone and gravel quarry activities which required mostly energetic people. This therefore, limited it to the youth and the able bodied. The findings also show that overall, most of the households in the study area were headed by relatively young *people*..



#### 4.1 Age of respondents

## **4.4 Social impacts of Production of Construction Materials activities**

The study examined the social impacts of production of construction materials activities (quarrying) in Cheha wereda, Gasorena Keracha Qebele from the perspective of both the quarry workers and local community.

### **4.4.1 Mining of Construction Materials activities operation as a health and safety hazared**

The study examined the social impacts of production of construction materials activities in the study area from the perspective of both quarry workers and household heads. The findings in Figure 4.3 show that 66 (18.80%) of the quarry workers, the majority, noted that the activities were a health and safety hazard. The study also found that 192 (54.70%) of the household heads in deed considered the operations a health and safety hazard for the quarry workers and the surrounding communities. All eight key informants and focus group discussions interviewed in this study also considered these operations a threat to the health and safety of residents in the study area. It can therefore be inferred from these findings that, stone and gravel quarrying operations in the study area were considered a health and safety hazard to quarry workers and (Ghosh1 2022)the surrounding communities by a large proportion of the residents.



Fig. 4.2 Quarrying areas posing a threat to the health and safety of quarry workers and residents

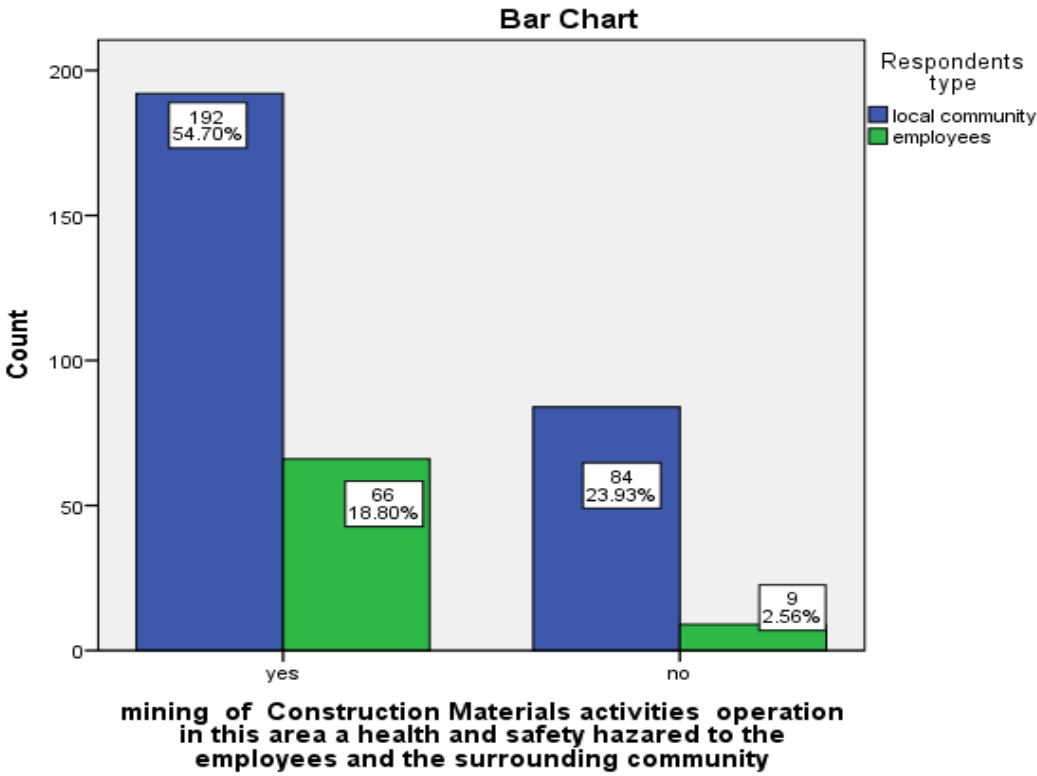


Fig. 4.3 health and safety hazared to the employees and the surrounding community

From the interviews conducted, the health extension worker, kebele administrator, kebele development agent, and community elders underscored that these operations had greatly threatened human lives. This argument by the healthcare worker was supported by the kebele administrator, kebele development agent, and community elders, who not only considered the stone, gravel, and quarrying operations a threat to humans but also animals. As the official explained, there are many health problems caused by stone and gravel mining sites in the study area. He pointed out that at these sites, the workers at stone, gravel, and mining sites do not use protective gear, and thus they are exposed to problems. Among other ailments, respiratory diseases, injuries, and other problems were observed. It has become a place for animals and children to fall, causing death and breeding of diseases due to the created cliffs and the water in the gorges. The findings supported that of (Assessment of Land Use Land Cover Change Detection Using Geospatial Techniques in Southeast Rajasthan 2021) that quarrying activities impacted the life of the communities living around the quarry zones and those working in the quarry where accidents and health hazards occurred due to existence of abandoned quarry pits.

#### **4.4.2 Household Members Suffering from Illnesses Associated with Production of Construction Materials activities**

The study probed whether any member(s) of the sampled households had suffered illnesses associated with quarrying operations in the study area. Quite a number of household members, 192 (69.6%), noted in deed that a member or members of their households suffered from ailments linked to the quarrying operations in the area, while the rest, 23 (26.4%), stated that none of their household members had suffered from such diseases. These findings meant that there was a large proportion of households in the study area whose members had contracted ailments linked to stone and gravel quarrying activities in the area. The number of respondents indicates that there are people suffering from the disease. However, the study could not show this high number based on data from the provider's hospital. These findings were consistent with those of (Impact of Granite Quarrying on the Health of Workers and Nearby Residents in Abeokuta Ogun State 2009) who found that residents who lived near quarrying sites suffered both psychological and health problems such as shock, nasal infection and asthma and due to their general low socio-economic status, they were incapable

From the responses given by the health worker, it was evident that they had received patients with illnesses associated with quarrying operations. According to the healthcare worker, on a monthly basis, chest related problems were reported. On an average, 1 death per year were being reported.

of taking any decisive measure towards relocating elsewhere. average, they normally receive 4 patients with physical injuries and 8 patients with chest-related problems on a yearly basis. lost their lives, where an average of 1 death per year was being reported.

#### **4.4.3 Number of Times Household Member(s) suffered illnesses associated with Production of Construction Materials activities**

The household members who had indicated that their household member(s) had suffered from ailments linked to *stone and gravel* quarrying operations in the area were further required to state the number of times, on average, the affected household member(s) had sought treatment for an ailment related to activities in the area of production of construction materials for the past year. It was established that 140 (50.7%) of the household heads stated that the affected members had sought treatment once; 47 (17.0%) noted that treatment had been sought 2–3 times, while the rest, 7 (2.5%), indicated that the affected household members had sought treatment more than 3 times. These findings meant that most of the residents who were at risk of contracting diseases linked to the activities in the quarries considered in this study were at risk of ailing from these illnesses more than one time. This could be attributed to the frequency of occurrence of the health hazards and how regularly the residents were exposed to these health risks. According to (Caroline 2020) the regularity of individual's interaction with such cells (zones) of varying hazards determined their possibility of contacting diseases related to quarrying operations.

#### **4.4.4 Production of Construction Materials activities Related Ailments for which ailment (s) were they treated**

The ailments for which the household members sought treatment, as indicated by the household heads, are shown in Table 4. 2 According to the study findings, 12 (3.4%) of the household heads stated that their household member(s) had been treated for fatal accidents, 8 (2.3%) noted that treatment had been sought for chest problems, 20 (5.6%) highlighted hearing problems among their household member(s), and 58 (16.4%) and 51 (14.4%) of the household heads asserted that their household member(s) had sought treatment for respiratory infections and physical injuries requiring medical treatment, respectively.

The results further revealed that the household member(s) had been treated for other related diseases, as noted by 2 (6.%) of the household.

Table 4.2 Production of Construction Materials activities (quarrying) Related Ailments for which ailment (s ) were they treated for

ailment (s )	Frequency	Percent
Fatal accidents	12	3.4
Headache fever	11	3.1
Eye problems	16	4.5
Skin irritation	45	12.7
Chest problems	8	2.3
Hearing problems	20	5.6
Allergy	36	10.2
Respiratory infection (e.g. coughs , pneumonia )	58	16.4
Physical injuries requiring medical treatment	51	14.4
Others	2	.6
Total	340	100.0

The respiratory problems observed in the present study were coughing, shortness of breath, chest pain, asthma, bronchitis, etc.

Activities such as digging, blasting, unloading, crushing, and loading release dust particles of variable sizes into the immediate atmosphere. The workers are exposed to substantial dust and noise, which may lead to the manifestation of various occupational diseases in long term

Some of the social impacts of mining are fatal accidents, physical injury, health effects, and noise.. (Communities' awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021)



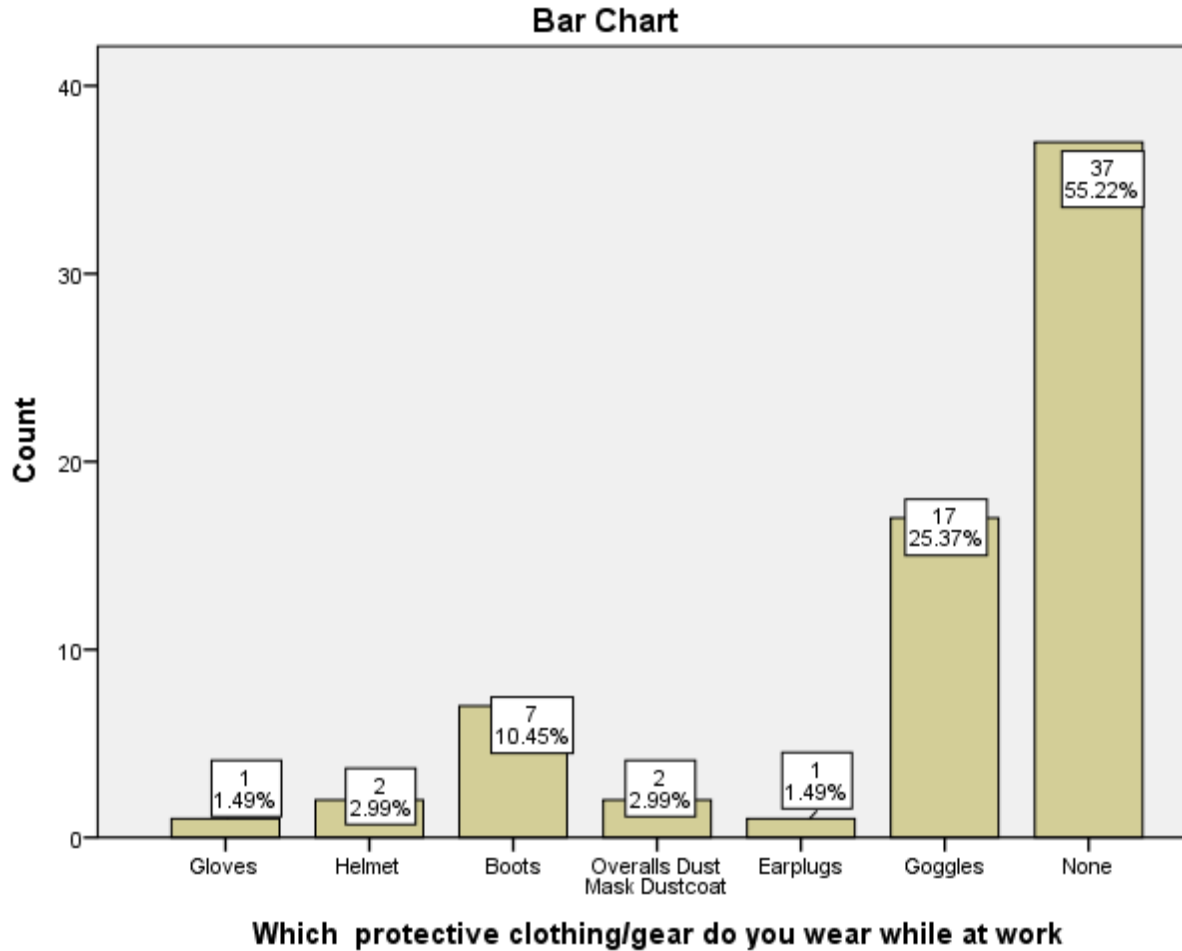
**Fig. 4.3 Stone crushing plant of Gibril Hairu manufacturers of construction materials**

#### 4.4.5 Use of protective clothing/gear at work

In the ECWC, the labor union and management collective agreement clearly stated all the necessary devices that workers should be provided based on their work areas. And safety shoes, overall, But the study results showed that few workers protected themselves from the harms of quarrying and crushing. Goggles and boots were common among a small number of workers, 17 (25.37%) and 7 (10.45%), respectively, but using other devices was not a common practice among most workers. During observation, welders use an eye goggle, which is more commonly practiced by crusher operators and laborers working around the plants.



**Fig. 4.4 Quarry worker going about his daily activities without protective gear**



**Fig. 4.5 Use of protective clothing/gear at work**

#### **4.4.6 Displacement of Communities due to the Production of Construction Materials activities**

The study examined whether there had been any displacement of communities due to the production of construction materials activities in the study area. The findings showed that 231 (63.7%) of the household heads indicated that displacement had actually occurred, while the rest, 45 (16.3%), noted that no displacement had occurred as a result of production of construction materials activities. The quarry workers were also asked to rate the level of displacement of communities due to the stone, gravel and hard quarrying in the study area.

The findings are presented. It can be seen that 69 (90.8%) of the quarry workers believed there was no displacement, and 7 (9.2%) stated that the displacement had occurred as a result of production of construction materials activities. These findings are in tune with those (Daniel K. Twerefou, Kwadwo Tutu, John Owusu-Afriyie and Kwame Adjei-Mantey May, 2015) the resettlement community poses serious challenges that can impact on the attitude of communities towards mining sector policies and intervention. who found that due to increased stone crushing and quarrying activities, various social challenges and conflicts were also reported in many parts of the world and these included among others the displacement of communities. As I have personally observed and talked to the farmers, I have seen that the company is expanding its holdings given under the contract and buying the farm land from the farmers to produce more stone and gravel.

#### **4.4.7 Production of Construction Materials activities Supporting Provision of Social Amenities**

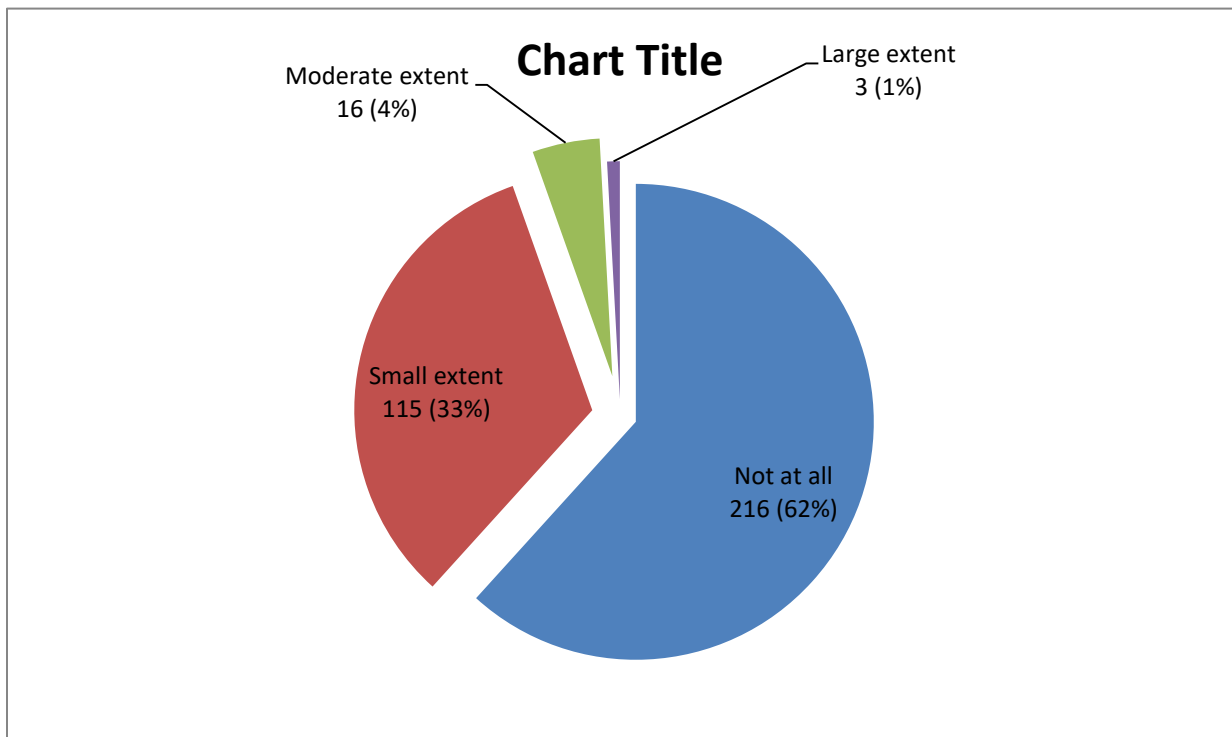
The study investigated whether production of construction materials activities had supported the provision of social amenities such as clinics and schools, as well as boreholes, for the betterment of the wellbeing of society in the study area. The findings showed that 203 (73.6%) of the household heads had not at all, 69 (25.0%) had a small extent, 2 (0.7%) had a moderate extent, and 1 (0.4%) had a large extent that such activities had supported the provision of social amenities.

The quarry workers also provided their views on the extent to which stone and gravel quarrying activities supported the provision of social amenities for the betterment of the wellbeing of society in the study area. The study findings are given in Fig. 4.6. 13 (17.1%) of the quarry workers Not at all, 46 (60.5%) had a small extent, 14 (18.4%) had a moderate extent, and 2 (2.6%) had a large extent that such activities had supported the provision of social amenities

The quarry manager from Gibril Hairu Construction Materials Manufacturer noted that the activities had helped residents, especially those engaged in agriculture, diversify their incomes. According to the manager, the economic wellbeing of the area residents was highly dependent on these activities. They noted that incomes from these activities were used to pay school fees and meet other household needs. Water line distribution and electric

utilities had also been constructed. Other amenities, including the supply of school furniture at Gasore Primary Schools, were facilitated by these activities.

One source of conflict that could affect the attitude of mining communities towards mining sector policies is the extent to which mining companies fulfill their promises made to the communities when they were about to start their mining activities. (Attitudes of Local People to Mining Policies and Interventions May, 2015) . According to the respondents, they have helped a few villages in the area of the production, laying of water lines, electricity and some people in need. However, the organization first promised to build electricity, water, and roads for the entire Kebele population, not to provide water and electricity to a few individuals. So he did not fulfill his promise. Even though they have electricity and water, there is a complaint. What is the value if this is done to us? They suggested that our house is being destroyed due to the explosion, fruits are drying up due to the cracking and dust of the blast, the noise is disturbing us day and night, and the dug-up ground is causing danger to cattle and people. As a result, it is difficult for us to live the peaceful life we used to have



**Fig. 4.6 Supporting Provision of Social Amenities**

#### 4.4.8 cases in relation to development of cracks in the buildings of surrounding communities

The study sought to establish whether there had been any reported cases relating to the development of cracks in the buildings of surrounding communities in the study area. The study established that 174 (49.57%) of the household heads stated that many buildings in the area had developed such cracks, 69 (19.66%) of the household heads stated that very many buildings in the area had developed such cracks, 23 (6.55%) of the household heads stated that a few buildings in the area had developed such cracks, and 12 (3.42%) of the household heads stated that none of buildings in the area had developed such cracks. The quarry workers were also asked to state on average, the number of cases that had been reported in relation to development of cracks in the buildings of surrounding communities in the area. The findings in Fig. 4.7 reveal that 12 (3.42%) of the quarry workers indicated that there were no reported cases, 23 (6.55%) noted that the cases were a few, 8 (2.28%) argued that the cases were many. Fig. 4.7 cases in relation to development of cracks in the buildings of surrounding communities

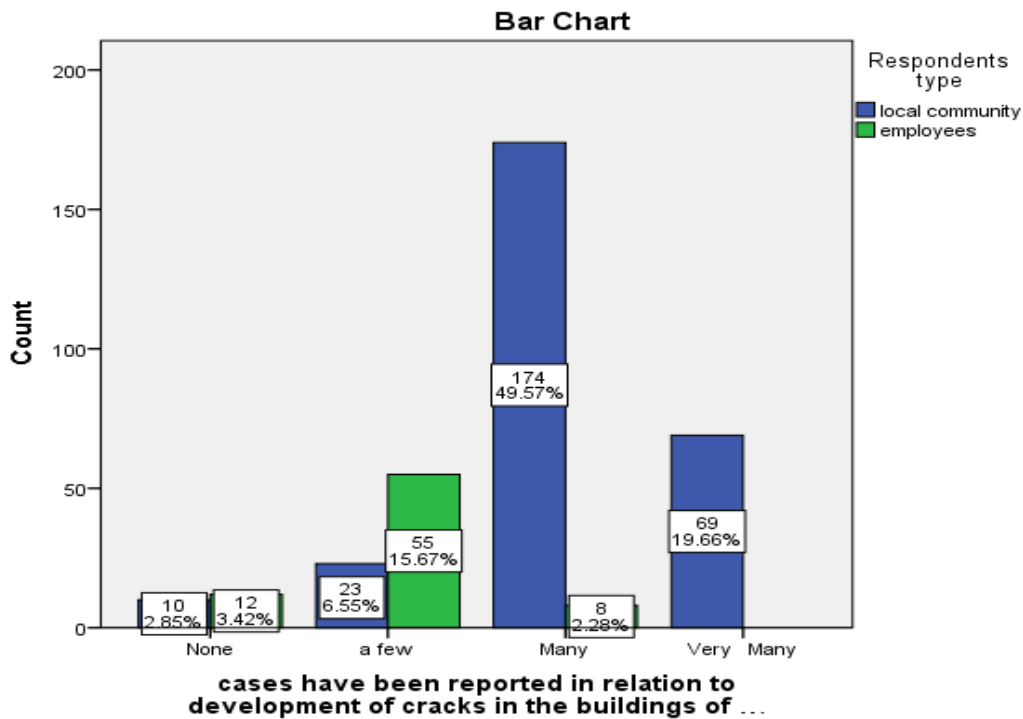


Fig. 4.7 cases in relation to development of cracks in the buildings of surrounding communities



Fig. 4.8 cracks in the houses of residents

Most of the household respondents said, and as I personally observed, cracks in residents' houses, collapse of toilets during explosions, collapse of house ceilings, and breakage of household equipment were seen. In addition, the eruption has brought about a drying trend in garden crops such as Chat and Gesho. They also stated that the well water in the house of the residents is drying up due to the cracking of the ground.

One activity of many mining companies is the use of explosives to blast the ore in which the gold is found. Some of the vibrations are so high that they can affect communities by creating cracks in their buildings, aside from the noise that they generate. One has to observe that the impact of the cracks on the communities is real and could lead to other problems. The question is, in the event of such a thing happening, will the mining company be prepared to address it as their responsibility or leave it to the affected person? (Attitudes of Local People to Mining Policies and Interventions May, 2015).

#### 4.4.9 Cases of Conflict between Quarry Workers and the Surrounding Communities

The study further probed whether there had been any cases of tension or conflict between the quarry workers and the surrounding communities in the study area. The findings are given in According to the responses, 56 (76.3%) of the quarry workers and 211 (76.4%) of the household heads stated that cases of tension or conflict between these parties had been witnessed in the study area.

The conflicts witnessed, as highlighted by the respondents, were attributed to issues such as the destruction of farms, noise and the development of cracks in the surrounding buildings, quarrying close to homes, leading to mass wastage and landslides, the falling of rocks, the destruction of fences by falling stones, as well as the blockage of animal paths. Through personal observation and focus group discussion, I have observed that there is a conflict with the youth regarding what he promised to do for the area, namely, that he did not build a road connecting the kebele to the main road and that he did not deliver electricity and water to the kebele except for a few individuals. In addition to this, since the explosion is causing damage to property and people, even though we have sent an elder to both organizations at different times to reduce the explosion and vibration, they have not been able to fix the problem.

These findings support the sentiments by (Communities' awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021) Stone quarrying activities are work-intensive; it makes job opportunities for building manufacturers; applies natural and domestic materials. However, this economic activity is the cause of socioeconomic and environmental adverse impacts of stone quarrying are the key cause of conflicts among quarrying firms and the societies existing nearby the mining neighborhoods As a result, based on the conflict we see between the local residents and the construction material manufacturing company and based on the data shown in the study, it indicates that there is no good relationship.

**4.4.10. Social impacts /disadvantages or negative /of Production of Construction Materials activities.**

Mining of construction materials (quarrying) activities has often disadvantages or a negative impact on society because of the pollution it causes. The impact of mining of construction materials (quarrying) activities on the community is disadvantageous in different aspects. The damage to buildings and other household property, and generally the noise pollution and vibration, have indeed important implications for the social impacts, disadvantages, or negative concerns.

Air pollution, noise pollution, and psychological problems for children, patients, and elderly people in the study sites and their surroundings are the major social problems that need to be addressed. It has contributed to human health problems, the destruction of vegetation, and the eventual loss of fertility on farmlands. People living in households close to the quarry share their opinions on the social impacts caused by the existence of quarry and crushing sites. Their views are presented in Table 4.3.

Table 4.3 Social disadvantages or negative of Production of Construction Materials activities.

Statistics

		change in social norms, culture and customs	psychological problem on children, patient and aged people	Dust pollution	damage to buildings and other household property,	Noise pollution and vibration	Source of breeding grounds for mosquitoes and spread of diseases	Impact on school enrolment (children involved in quarrying activities)
N	Valid	351	349	352	350	351	350	352
	Missing	2	4	1	3	2	3	1
Mean		2.40	1.72	1.47	1.45	1.46	2.49	2.65

### Agreement value of disadvantages or negative impact of Social impacts

1. 1.00 – 1.80 Strongly agree
2. 1.81 – 2.60 Agree
3. 2.61 – 3.40 somewhat agree
4. 3.41 – 4.20 Not agree
5. 4.21 – 5.00 Strongly disagree

The ranking of problems or disadvantages shown in Table above indicates the local people's perceptions of the problems experienced in the community, which reveals that the most pressing problems are damage to buildings and other household property, noise pollution and vibration, dust pollution, and psychological problems for children, patients, and elderly people. These are the top four problems or disadvantages.

Dust pollution affects human, vegetation, and plants. The degree of proximity to the Mining of Construction Materials (quarrying) activities sites are direct linkage with the extremes of impact on the victims. (Communities' awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021) The dust emitted is first from shot holes by use of power driven drills. Then blasting, Crushing and material transportation are the main sources of air pollution. Dust is one of the most visible, invasive, and potentially the most irritating impact associated with quarrying . (Impacts of Stone Quarrying on Environment and Livelihood of Local Community November, 2016)

Noise pollution is common in all quarry sites. This takes place from the first stage of drilling to crushing. However, the blasting stage produces the highest level of noise pollution. (Gizaw 2019) The impact of noise pollution from blasting affects human, animals and the surrounding buildings. Excessive noise is a pervasive occupational hazard with many adverse impacts , including elevated blood pressure, reduced performance, sleeping difficulty, annoying and stress .



Fig. 4.9 Dust pollution In the study area



Fig. 4.10 blasting in Gibril hairu Construction Materials manufacturer site

## **4.4 Economical impacts of Production of Construction Materials activities**

### **4.4.1 Economic activity of local Community**

In the study area, respondents reported that they were involved in diverse economic activities, including quarrying, government and non-government employment, subsistence business activities, and mixed labor, while the dominant activity in the area was agriculture, which accounts for 55.8% of the local community, and 5.4% of the total respondents in the

sample were engaged in mixed labor in agriculture and quarry works and 5.1 % in agriculture and small business. In contrast, there were no people fully engaged in agricultural activities.

Table 4.4 Economic activity of local Community

	Frequency	Percent
Agriculture	197	55.8
government employs	2	.6
Private Sector employs	13	3.7
Own business	3	.8
quarry labor	15	4.2
Mixed labor in agriculture and quarry	19	5.4
Mixed labor in agriculture and small business	18	5.1
none	8	2.3
Total	275	77.9

In general, as shown in table 4.4 the economic activity of most people is agriculture. The number of residents who are employed in the construction site nearby is very small.

#### 4.4.2 Land cover before given to Construction Materials manufacturers.

The study sought to establish what the land cover was before it was given to construction material manufacturers. They gave different answers. 129 (46.7%) of the household heads stated that they were all covered by forest, 131 (47.47%) were partially covered with forest, and the rest, 16 (5.8%), stated it was bare land. For land cover before using pattern analysis of the study area, I used Land Sat images from 2012 and 2022.



Fig. 4.11 LULC change analysis map of (2012 and 2022)

Based on the land use land cover analysis result of the respective year presented in Fig. 4.11, in 2012, partially covered with forest was the dominant land use function in the area, where functions were insignificant and quarries were none at a time. Whereas in 2022, land use and land cover resulted in forestry use functions declining and quarry and built-up land use functions expanding.

#### **4.4.3 Land use purpose of before given to Construction Materials manufacturers**

The land-use/land-cover purpose of before given to construction materials manufacturers results presented that 171 (48.6%) were for forestry, 24 (6.8%) were for agriculture, 134 (38.1%) were for grazing land, and 20 (5.7%) were for fruit and vegetable purposes. The analysis of the 2012 map also shows that the forestry constitutes the largest proportion of land in the study area. quarry covered the smallest area of all the land-use and land-cover classification results of the 2022 image revealed that the LU and LC

However, the coverage of the quarry has increased. It shows a high percentage of expansion in the study area. The area expansion of Quarry 2022 increased. Generally, forestry is the major land-use or land-cover purpose before given to construction materials manufacturers. Abate Zelalem (2016) also found that the rate of change in quarry land use functions increased by 18.09 percent yearly. Also, agricultural and forest land decreased by 21.33% and 2.51%, respectively, in the considered year as a result of quarry activity.

#### **4.4.4 Mining of Construction Materials (quarrying ) activities create a reliable and alternative job opportunity for communities**

As stated in the literature, quarrying is labor-intensive work that creates substantial job opportunities in many countries. Similarly, the government of Ethiopia identified it as one of the livelihood strategies that facilitates the provision of resources such as land, credit, tools, training, and information to those who want to be engaged in the sector. Hence, in the study area, some people were employed in quarrying activities to fulfill their livelihood needs. From the data analysis, it revealed that 99 (28.3%) of the household heads respondents said yes, the activities create a reliable and alternative job opportunity for communities, 177 (50.6%) of the household heads respondents said no, and/or 68 (19.43%)

of quarry works respondents said yes, the activities create a reliable and alternative job opportunity for communities, and 6 (1.7% of the quarry works respondents said no.

Respondents from each of the two study areas indicated positive impacts of mining of construction materials (quarrying) activities, activities as providing employment to mine workers, enhancing infrastructural developments such as roads, and providing income for landowners and owners of mining of construction materials (quarrying) activities. The plants guarantee direct employment to the local people from nearby villages. Further generates indirect employment for several persons in different associated activities like local trading, loading of materials, etc.

According to a project analysis on the socioeconomic impacts of a quarrying project, employment is considered one of the visible benefits of a given community. The document demonstrates that employment is generated at different stages of quarrying from exploration to rehabilitation phases. Most jobs are created externally through road pathway and road construction to and out of the quarry, the establishment of new business to serve the demands of the immigrants. (Caroline 2020)

In general, according to the information provided by the respondents, there are few local residents who are employed by the construction materials manufacturing company. According to the two managers of the construction material manufacturing company, the reason for this is that the industry requires professional knowledge and the local residents are not interested in working with the available labor.

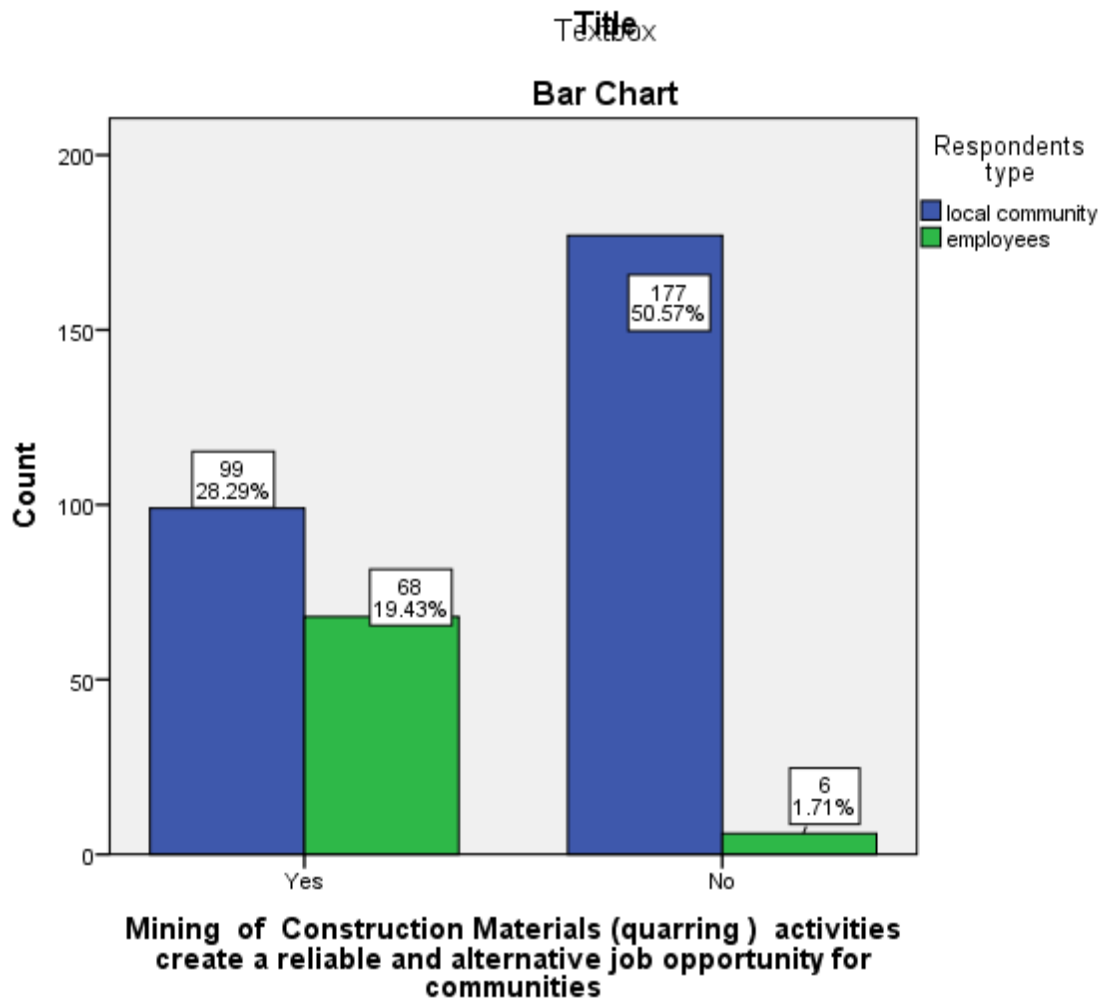


Fig. 4.12 (quarrying) activities create a reliable and alternative job opportunity for communities

#### 4.4.5 Mining Construction Materials (quarrying) activities are contributing to the scarcity of agricultural lands.

Land-use and land-cover classes in the study area have indicated a vital change between 2012 and 2022. Mining construction materials (quarrying) activities are contributing to the scarcity of agricultural lands in the study area. Hence, mining construction materials (quarrying) activities are contributing to the scarcity of agricultural lands in the study area. From the data analysis, it was revealed that 76 (21.6%) of the household respondents said strongly agree, 204 (58.0%) of the household respondents said agree, and 71 (20.2%) of the household respondents said strongly disagree. These findings meant that, to some extent,

mining construction materials (quarrying) activities are contributing to the scarcity of agricultural lands in the study area.

Quarrying of sand and gravel mining are some of the present serious environmental problems globally resulting to loss of agricultural land and biodiversity. It is among industries in the world that has remained widespread, highly unregulated, uncontrolled and is being carried out indiscriminately. (Quarrying and Land Degradation in Nyakach Sub County, Kenya 2021)r The adverse effects of quarrying go beyond the immediate community and threaten not only the environment but also food security. As a result, quarrying activities in the study area were responsible for massive land degradation, as witnessed by numerous gullies caused by stone and gravel extraction. In mining of construction materials (quarrying) activities , the expansion and increase of quarrying do not only lead to the scarcity of agricultural lands; it also leads to a decrease in grazing land, land degradation, and climate change.

#### **4.4.6 Economical impacts /disadvantages or negative /of Production of Construction**

##### **Materials activities.**

Mining of construction materials (quarrying) activities has often a negative impact on the community because of the destruction of landscape and beauty it causes. The impact of mining of construction materials (quarrying) activities on the environment impacts different economic aspects. The overexploitation and, generally, the reduction of farmlands and grazing lands have indeed important implications for the environment concerned.

particularly, which is often the main economic activity. Overexploitation and destruction of landscape and beauty at the study sites and their surroundings are the major environmental problems that need to be addressed. It has contributed to economic problems or disadvantages. destruction of vegetation and eventual loss of fertility on farm lands. People living in households close to the quarry share their opinions on the environmental impacts and impacts caused by the existence of quarry and crushing sites. Their views are presented in Table 4.5..

Table 4.5 Economical disadvantages or negative of Production of Construction Materials activities.

disadvantages	Mean
	Statistic
Over exploitation	1.6875
Deaths (people and animals)	2.7500
Reduction of farm lands and grazing lands	2.1875
Destruction of landscape and beauty	1.6250
Many living things have lost their homes (habitats) due to rock removal, noise and dust deposition.	2.1250
Loss of vegetation and deforestation	1.7500
run-off from the quarry enter the river and pollute the water	2.5625

The ranking of economic disadvantages or negatives of production of construction materials activities, shown in Table above, indicates the local people's perceptions of the disadvantages or problems experienced in the community, which reveals that the most pressing problems are destruction of landscape and beauty, overexploitation, loss of vegetation and deforestation, and reduction of farm lands and grazing lands, which are the top four problems. The cutting down of important trees and the destruction of the vegetative cover have led to ecological imbalance in the quarry areas. According to some respondents, their lands were very fertile for agricultural productivity. However, due to quarry activities, some land within the community can no longer support effective agricultural productivity. The eruption has brought about a drying trend in garden crops such as Chat and Gesho. As a result, quarry activity had created several environmental and economical problems such as reducing agricultural land, change of landscapes, land degradation, impacts of dust pollution, reduction of agricultural yields, and loss of biodiversity, noise, health effects, fatal accident, and death. (Communities' awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021)



Fig. 4.13 Over exploitation, Loss of vegetation and deforestation and Reduction of farm lands and grazing lands of the study area,



Fig. 4.14 The explosion and the dust is affecting the drying condition of the fruits

## **4.5 Awareness of Socio –economical Rules and Regulation on Mining of Construction Materials activities**

The study sought to determine the level of awareness of socio-economic rules and regulations governing mining of construction materials activities among residents and quarry workers in Cheha Wereda, Gasorena-keracha Kebele. A series of questions were presented to the respondents.

### **4.5.1 awareness of any Socio –economical Rules and Regulation regarding Mining of Construction Materials activities**

The study assessed whether the quarry workers and household heads were aware of any Socio –economical rules and regulations regarding mining of construction materials activities.

The study noted that only 61(17.4%) of the quarry workers and 58 (18.5.0%) of the household heads indicated that they were aware of these rules and regulation. These finding (Communities’ awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021)s imply that a large proportion of the respondents were not aware of Socio –economical rules and regulations guiding Mining of Construction Materials activities.

Federal Democratic Republic of Ethiopia proclamation No.1213 /2020 A proclamation to amend the Mining operations proclamation and Federal Democrati (Authority 2003) (he Federal Democratic Republic of Ethiopia 2020)c Republic of Ethiopia Environmental Protection Authority (EPA)2003 is in charge of the environmental protection and sustainable use of natural resources, analyzes and sets about the Mining of Construction Materials activities of laws and regulations.

The awareness of communities towards social and environmental influences of stone quarrying was poor in the study area. (Communities’ awareness on environmental and social impacts of stone quarrying and its associated factors in Farta Woreda, Northwest, Ethiopia 2021) that most of them had no clue of the status of the quarries, the permissible quarrying standards as well as the rules and regulations governing the quarrying operations.

#### **4.5.2 Level of understanding comprehension of the current Socio –economical Rules and Regulation regarding Mining of Construction Materials activities**

Those who noted that they were aware of at least one socio-economic rule and regulation regarding mining of construction materials activities were also asked to rate their level of understanding or comprehension of such rules. As shown in Fig. 4.15, 14 (4.0%) of the quarry workers noted that they had poor understanding of the rules and regulations, 51 (14.57%) said they had average understanding, 9 (2.57%) noted that they had good understanding, and none had excellent understanding of these rules and regulations. With regards to household heads, 219 (62.57%) stated that their understanding of the current social and economic rules and regulations was poor, while the rest 40 (11.43%) asserted that their understanding was average. 16 (4.57%) noted that they had a good understanding, while none had an excellent understanding of these rules and regulations.

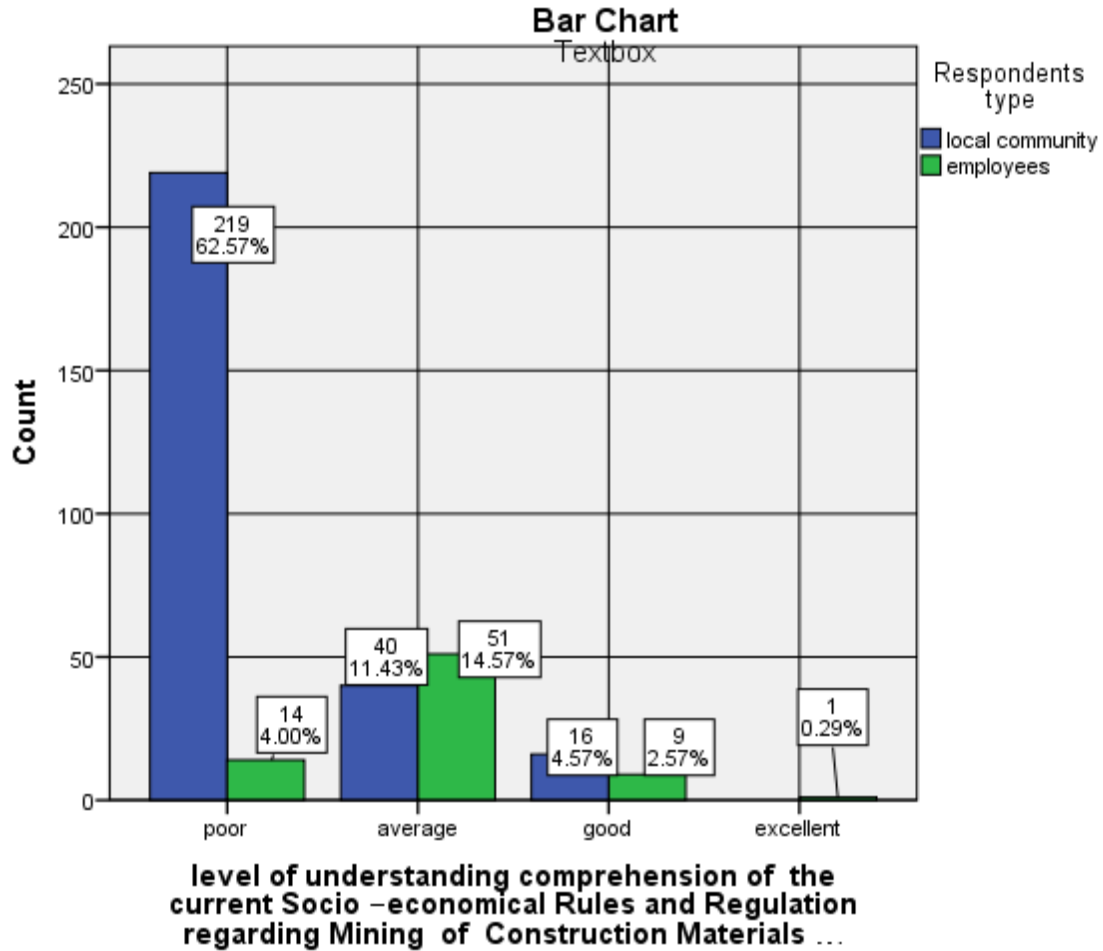


Fig. 4.15 level of understanding comprehension of the current socio –economical rules and regulation

The study findings imply that the comprehension of the requirements of the current socio-economic rules and regulations governing mining of construction Construction Materials activities was not adequate for most of the quarry workers and also the household heads. The findings supported that of (Daniel K. Twerefou, Kwadwo Tutu, John Owusu-Afriyie and Kwame Adjei-Mantey May, 2015) who established that individuals working in the extractive industry particularly on a small scale or even illegally, were aware of a few rules and regulations but had no idea of their details. During interactions between the researcher and the quarry workers, one of them argued that they quarried stone and gravel less than 70

meters from homes and the main road. because they had no idea of the specific distance between the quarry zone and the house and infrastructure.

In addition to this, the main electric line and the asphalt road, which are less than 50 meters away, are in danger of collapse, which violates the directive that stipulates that the production work should be installed at a distance of not less than 500 meters from the infrastructure. Where there were no complaints raised, they assumed that their activities were done according to the laws since no one had incriminated the quarry owners or workers.

#### **4.5.3 Responses to Statements Relating to Socio –economical Rules/Regulations on Mining of Construction Materials activities**

Both the quarry workers and household heads were presented with various statements relating to socio-economic rules and regulations on mining of construction materials activities. They were required to indicate whether they were aware of or unaware of them. The responses by the quarry workers are given in Table 4.6. The study found that 39 (51.3%) of the quarry workers were aware that an environmental impact assessment should be performed prior to quarrying begins in a given place, while the rest, 37 (48.7%), were unaware of this requirement. The findings also reveal that 37 (48.7%) of the quarry workers were aware that all quarry sites must be fenced; the rest, 39 (51.3%), were not aware of this regulation. Regarding the rehabilitation of depleted quarries by the landowners, 41 (53.9%) of the quarry workers stated that they were aware of the rule or regulation, while the rest, 35 (46.1%), were unaware of this requirement. The study results revealed that 38 (50.0%) of the quarry workers were aware that all persons working at the quarry sites should be provided with protective gear and first aid kits. The rest, 38 (50.0%), were unaware of the requirement. The findings further revealed that 39 (51.3%) of the quarry workers were aware that quarrying operations should be done 500 meters away from homes, while the rest, 37 (48.7%), were aware of this rule or regulation. The study noted that 39 (51.3%) of the quarry workers were aware that warning signs should be erected at the entry point of each quarry site; the rest, 37 (48.7%), were unaware of this requirement. The findings further revealed that 39 (51.3%) of the quarry workers were aware of the need to protect

citizens' health, safety, and environment from serious actual or threatened environmental harm. The rest, 37 (48.7%), were unaware of the requirement. Last but not least, the study noted that 43 (56.6%) of the quarry workers were aware that dusty roads should be watered regularly to reduce dust. The rest, 33 (43.4%), were unaware of the requirement.

Table 4.6 Statements Relating to Socio –economical Rules/Regulations on Mining of Construction Materials activities

Statement	local community				employeesa			
	Not Aware		Aware		Not Aware		Aware	
	Freq uenc y	Per cent	Fre que ncy	Perc ent	Freq uenc y	Per cent	Fre que ncy	Perce nt
1. ESIA Environmental and Social impact assessment should be performed prior to quarrying begins in a given place .	211	76.4	60	21.7	37	48.7	39	51.3
2. All quarry sites must be fenced.	219	79.3	56	20.3	39	51.3	37	48.7
3. Depleted quarries should be rehabilitated by the quarry owners.	214	77.5	61	22.1	35	46.1	41	53.9
4. All persons working at the quarry sites should be provided with protective gear and first aid kits.	213	77.2	60	21.7	38	50.0	38	50.0
5.Quarring operation should be done 500 m away from homes. (optimum buffer Zone between the quarry area and the local residen)	221	80.1	55	19.9	39	51.3	37	48.7
6. Warning signs should be erected at the entry point of each quarry site.	215	77.9	58	21.0	37	48.7	39	51.3
7. protect citizens' health, safety, and environment from serious actual or	213	77.2	62	22.5	37	48.7	39	51.3

threatened environmental harm.								
8. Dusty roads should be watered regularly to reduce dust Quarry work	212	76.8	63	22.8	33	43.4	43	56.6

The responses given by the household heads with regards to a number of statements relating to socio-economic rules and regulations are provided in Table 4.6. The findings show that 60 (21.7%) of the household heads were aware that environmental impact assessment should be performed before quarrying begins in a given place, and 211 (76.4%) were unaware of this requirement. With regards to the fencing of quarry sites, 50 (20.3%) of the household heads were aware that all quarry sites must be fenced, while the rest, 219 (79.3%), were unaware of this regulation. The study also established that while 61 (22.1%) of the household heads were aware that depleted quarries should be rehabilitated by the land owners, 214 (77.5%) of them were not aware of this requirement. The study findings further revealed that 60 (21.7%) of the household heads were aware that all persons working at the quarry sites should be provided with protective gear and first aid kits, while the rest 213 (77.2%) were not aware of this rule. The household heads aware that quarrying operations should be done 500 meters away from homes were 55 (19.9%), while the rest, 221 (80.1%), were unaware of this requirement. The findings also show that 58 (21.0%) of the household heads were aware that warning signs should be erected at the entry point of each quarry site, while 215 (77.9%) noted that they were unaware of the requirement. The findings further revealed that 62 (22.5%) of the household heads were aware that protecting citizens' health, safety, and environment from serious actual or threatened environmental harm. The rest, 213 (77.2%), were unaware of the requirement. The last study noted that 63 (22.8%) of the household heads were aware that dusty roads should be watered regularly to reduce dust quarry work. The rest, 212 (76.8%), were unaware of the requirement. Cheha wereda Water and Energy experts and Gurage Zone Water and Energy Department experts have informed me that an EIA will be done before the site is given to construction materials manufacturers. However, when the Gurage Zone Environmental Protection Office, construction material manufacturing license was given by the Gurage Zone Water Resources and Energy Department, we confirmed that the EIA was properly measured and the license should have been given. But this did not happen.

As we have seen in the responses to these problems of lack of awareness, before the site was given, the Cheha District Water Energy Office and the Gurage Zone Water Energy Department should have given preliminary discussion and training to the construction material manufacturing company and the local community on the guidelines of social and economic laws. The proclamation No. 678/2020, a proclamation to promote sustainable development of mineral resources, was approved by the federal government of Ethiopia and stipulates the same.

#### **4.6.1 Measures Currently Used to Mitigate the Negative Impacts of Mining of Construction Materials activities**

The study explored some of the measures currently used to mitigate the negative impacts of stone and gravel quarrying on the economy and society in the study area. The responses of the quarry workers are given in the findings, which reveal that 31 (40.8%) of the quarry workers emphasized Measures Currently Used to Mitigate the Negative Impacts of Mining of Construction Materials Activities were not efficient at all; 36 (47.4%) emphasized Somehow effective, the rest 8 (10.5%) emphasized Very effective. The responses of the household heads are given in the findings, which reveal that 207 (75.0%) of the household heads emphasized Measures Currently Used to Mitigate the Negative Impacts of Mining of Construction Materials Activities were not efficient at all; 24 (8.7%) emphasized Somehow effective, the rest 33 (12.0%) emphasized very effective. As the managers of both organizations told me and as I observed in person, tree planting and rehabilitation work can be seen in a few places. As we can see from the respondents, the situation shows us that the producer company did not properly carry out the rehabilitation work entered into a contract agreement with the Zonal Water Resources Department. The proclamation No. 678/2020, a proclamation to promote sustainable development of mineral resources, was approved by the federal government of Ethiopia and stipulates the same.

Table 4.7 Measures Currently Used to Mitigate the Negative Impacts of Mining of  
Construction Materials activities

	local community		employees	
	Frequency	Percent	Frequency	Percent
Not efficient at all	207	75.0	31	40.8
Somehow effective	24	8.7	36	47.4
Very effective	33	12.0	8	10.5
Total	268	97.1	75	98.7

## Chapter Five

### Summary, Conclusion and Recommendations

#### 5.1. Summary

The overall purpose of this study was to assess the social and economic impacts of mining of construction materials: the case of Cheha Woreda in Gurage Zone, Central Ethiopia, Gasorena-Keracha Qebele stone and gravel quarry area. Specifically, it aimed at assessing and examining the significant impacts of construction mining activities on the economic life of the local community and the social impacts of construction mining activities in the study area. The study also evaluates the level of awareness of the people about the rules and regulations governing the operations of construction mining areas.

The study was conducted using descriptive survey method. It employed reliability and validity test to confirm the stability, consistence, sampling adequacy and the strength of degree of relationship among the questionnaire items. After the reliability and validity test, the study applied descriptive analysis and inferential analysis using SPSS version 20 (Statistical Package for Social Science). The survey was conducted in Gurage Zone and Cheha wereda W/M/ E Department. This study utilized questionnaires consists of 39 items categorized into five sections where 7 items were for demographic variables, 32 items Independent and dependent variable items, fourteen point Likert-scale ranked from strongly disagree to strongly agree where 1 - “strongly disagree”, 2 - “disagree”, 3 - “somewhat agree”, 4 -“agree” and 5 - “strongly agree. And also there was Key Informant Interview questioner which has fifteen questions and it was distributed to the specific group,

Based on the analysis and interpretation of the data the researcher presented the summary of the major findings as shown below:

The study found that the majority of the local community respondents Cannot read and write, this implies most of them cannot understand the issue of the socio-economic impact of mining of construction Materials activities (quarrying) in the study area. The findings are presented as the majority of the local community and quarry workers respondents were married. These findings imply that most of the respondents were family people, and for the quarry workers, the added responsibilities of supporting their dependents They have more family responsibilities. The study also sought to find out the age of the respondents. The

findings reveal that generally, many of the quarry workers in the two mining of construction materials activities (quarrying) areas were young.

The study observed that many respondents considered quarrying activities in the area a health and safety hazard not only for the quarry workers but also for the local residents. Nearly half of the household heads noted that their household had suffered from ailments that were linked to the stone and gravel quarrying operations in the area. Some of the affected household members had sought treatment for such diseases more than once in the past few years. Some of the ailments I sought treatment for included physical injuries requiring medical treatment, chest problems, skin irritation, respiratory infections (such as coughs and pneumonia), hearing problems, and allergies. The findings revealed that a majority of the quarry workers in the area did not wear protective gear when carrying out their operations. Only a few were using Goggles and Boots .which were also largely considered not efficient in protecting them when undertaking the activities. In addition measures should be taken to control health hazards, such as creating awareness among the quarry workers of the consequences.

It was also noted that stone and gravel quarrying in the study area had led to the displacement of surrounding communities to some extent. Due to the company expanding its holdings given under the contract and buying farm land from the farmers to produce more stone and gravel

Due to rolling stones, those households at the base of the quarries were forced to relocate to other areas. Others moved due to the discomfort arising from noise and dust pollution, cracks, the loss of grazing land, and the destruction of the area's scenic value. Generally, mining of construction materials activities in one quarry was found to have supported to a small extent the provision of social amenities, such as that the activities had helped residents, especially those engaged in agriculture, diversify their incomes. They noted that incomes from these activities were used to pay school fees and meet other household needs. Water line distribution and electric utilities had also been constructed. Other amenities, including the supply of school furniture at Gasore Primary Schools, had been facilitated by these activities. According to the respondents, they have helped a few villages in the area of production, the laying of water lines and electricity, and some people in need. However, the organization first promised to build electricity, water, and roads for the entire population of

Kebele, not to provide water and electricity to a few individuals. So he did not fulfill his promise. Even though they have electricity and water, there is a complaint. What is the value if this is done to us? They suggested that our house is being destroyed due to the explosion, fruits are drying up due to the cracking and dust of the blast, the noise is disturbing us day and night, and the dug-up ground is causing danger to cattle and people. As a result, it is difficult for us to live the peaceful life we used to have.

The study found that there were reported cases of the development of cracks in the buildings and structures of the residents linked to stone and gravel quarrying. Such cases had been noted mostly in places where blasting and intensive quarrying were taking place. In such incidences, cracks that were small in size progressed to huge cracks that endangered the lives of residents and their properties. In addition, the eruption and dust have brought about a drying trend in garden crops such as Chat and Gesho. They also stated that the well water in the house of the residents is drying up due to the cracking of the ground.

Cases of conflict between the quarry workers and surrounding communities were also reported with the youth regarding what he promised to do for the area, namely, that he did not build a road connecting the kebele to the main road and that he did not deliver electricity and water to the kebele except for a few individuals. In addition to this, since the explosion is causing damage to property and people, even though we have sent an elder to both organizations at different times to reduce the explosion and vibration, they have not been able to fix the problem. As a result, based on the conflict we see between the local residents and the construction material manufacturing company and based on the data shown in the study, it indicates that there is no good relationship.

Mining of construction materials (quarrying) activities has often disadvantages or a negative impact on society because of the pollution it causes. The impact of mining of construction materials (quarrying) activities on the community is disadvantageous in different aspects. The damage to buildings and other household property, and generally the noise pollution and vibration, have indeed important implications for the social impacts, disadvantages, or negative concerns.

Air pollution, noise pollution, and psychological problems for children, patients, and elderly people in the study sites and their surroundings are the major social problems that need to be

addressed. It has contributed to human health problems, the destruction of vegetation, and the eventual loss of fertility on farmlands. People living in households close to the quarry share their opinion on the environmental impact caused by the existence of quarry and crushing sites. The ranking of problems or disadvantages shown or indicates the local people's perceptions of the problems experienced in the community, which reveals that the most pressing problems are damage to buildings and other household property, Noise pollution and vibration, dust pollution, and psychological problems in children, patients, and elderly people are the top four problems or disadvantages.

The economic activity of most local communities is agriculture. The number of residents who are employed at the construction site nearby is very small. Construction mining activities in the study area were carried out primarily using machines; some of the quarry workers took part in digging or excavating the stones. Other activities undertaken by the quarry workers included wedging, crushing and breaking of stones, blasting, grinding, heating of the stones, disposal of waste rocks, and loading stones onto vehicles. Others work in security and in the office. The study found that the land cover before given to construction materials manufacturers. Most of the household heads stated that 131 (47.1%) were partially covered with forest. The land use purpose of this quarry area before being given to construction materials that were used for forestry grazing land was The leading damages to the physical environment, as highlighted by the mining of construction materials (quarring) activities were the destruction of original vegetation cover and crops, loss of aesthetic value, permanent alteration of the original landform, land degradation, as well as the loss of topsoil and disruption of animal habitats. The coverage of the quarry has increased. It shows a high percentage of expansion in the study area. The area expansion of Quarry 2022 increased. Generally, forestry is the major land-use or land-cover purpose before given to construction materials manufacturers. The study findings meant that, to some extent, mining construction materials (quarrying) activities are contributing to the scarcity of agricultural lands in the study area.

The study confirmed that, to some extent, each of the two study areas indicated positive impacts of mining of construction Materials (quarrying) activities, activities as providing employment to mine workers, enhancing infrastructural developments such as roads, and providing income for landowners and owners of mining of construction Materials

(quarrying) activities. The plants guarantee direct employment to the local people from nearby villages. Further, it generates indirect employment for several people in different associated activities like local trading, etc. In general, according to the information provided by the respondents, there are few local residents who are employed by the construction materials manufacturing company. According to the two managers of the construction material manufacturing company, the reason for this is that the industry requires professional knowledge, and the residents are not interested in working with the available labor.

Mining of construction materials (quarrying) activities has often a negative impact on the community because of the destruction of landscape and beauty it causes. The impact of mining of construction materials (quarrying) activities on the environment impacts different economic aspects. Overexploitation and, generally, reduction of farmlands and grazing lands have indeed important implications for the environment concerned, particularly agriculture, which is often the main economic activity. Overexploitation and destruction of landscape and beauty at the study sites and their surroundings are the major environmental problems that need to be addressed. It has contributed to economic problems or disadvantages. The ranking of economic disadvantages or negatives of production of construction materials activities shown or indicates the local people's perceptions of the disadvantages or problems experienced in the community, which reveals that the most pressing problems are Destruction of landscape and beauty, Overexploitation, loss of vegetation, deforestation, and reduction of farmlands and grazing lands are the top four problems. The cutting down of important trees and the destruction of the vegetative cover have led to ecological imbalance in the quarry areas. According to some respondents, their lands were very fertile for agricultural productivity. However, due to quarry activities, some land within the community can no longer support effective agricultural productivity. The eruption has brought about a drying trend in garden crops such as Chat and Gesho.

The study sought to determine the level of awareness of socio-economic rules and regulations governing mining of construction materials activities among residents and quarry workers in Cheha Wereda, Gasorena-keracha Kebele. A series of questions were presented to the respondents. Although some workers and local residents stated that they were aware of any socio-economic rules and regulations regarding mining and of construction materials activities, in general, quarry workers had an average understanding of the rules and regulations. With regards to household heads, their understanding of the current environmental rules and regulations was poor. Mining of construction construction materials activities (quarrying) in this area were not done according to the relevant socio-economic rules and regulations. these problems of lack of awareness, before the site was given, the Cheha Woreda Water Energy Office and the Gurage Zone Water Energy Department should have given preliminary discussion and training to the construction manufacturing company and the local community on the guidelines of social and economic laws.

As we can see from the respondents, the situation shows us that the producer company did not properly carry out the rehabilitation work entered into a contract agreement with the Gurage Zone Water Mine and Energy Department.

## **5.2 CONCLUSIONS**

The purpose of this study was to assess the social and economic impacts of mining construction materials: the case of Cheha Woreda in Gurage Zone, Central Ethiopia, Gasorena-Keracha Qebele stone and gravel quarry area. It can be concluded that there is potential that mining of construction materials activities (stone and gravel quarrying) may contribute significantly to economic improvement, but the pollution affects the health of workers and the people living very close to the site by making life difficult. The study concludes that problems or disadvantages are shown or indicate the local people's perceptions of the problems experienced in the community, which reveals that the most pressing problems are damage to buildings and other household property. Noise pollution and vibration, dust pollution, and psychological problems in children, patients, and elderly people are the top four problems or disadvantages. The operations were considered a health and safety hazard for both the quarry workers and residents. The study concluded that there

was no significant variation in the mining-related ailments that residents and quarry workers contracted, even though the quarry workers were more exposed to such diseases compared to the residents living nearby. The health-seeking behavior among quarry workers was also low.

The study concluded that stone and gravel quarrying activities in Gasorena-Keracha Qebele, mostly in places where blasting and intensive quarrying were taking place, In such incidences, cracks that were small in size progressed to huge cracks that endangered the lives of residents and their properties. It had led to cases of conflict between the quarry workers and surrounding communities, which also indicates a bad relationship. Quarrying activities in the study area were responsible for massive land degradation, as witnessed by numerous gullies caused by stone and gravel extraction. The coverage of the quarry has increased. It shows a high percentage of expansion in the study area. The area expansion of Quarry 2022 increased. Generally, forestry is the major land-use or land-cover purpose before given to construction materials manufacturers.

In mining of construction materials (quarrying) activities, the expansion and increase of quarrying do not only lead to the scarcity of agricultural lands; it also leads to a decrease in grazing land, land degradation, and climate change.

As mentioned in the problem justification, the study supports the idea that mining of construction materials or quarry operations has different adverse impacts on the environment, which leads to economic impacts for adjacent residents. Overexploitation and, generally, reduction of farmlands and grazing lands have indeed important implications for the environment concerned, particularly agriculture, which is often the main economic activity. Overexploitation and destruction of landscape and beauty at the study sites and their surroundings are the major environmental problems that need to be addressed. The environment is polluted with chemicals, smoke, and fumes from the mines and their supporting companies. The environmental pollution has affected on a whole farming in the study area. The results, as proven by the data analysis, indicate that mining for natural resources in the area has contributed to the loss of farming businesses, which has led to food insecurity in the area. This is because mining activities have taken up some of the rich lands that are used for farming.

The study concluded that awareness of socio-economic rules and regulations on the mining of construction materials was needed. The study concluded that while a small number of the quarry workers and surrounding communities were aware of some of these rules and regulations, their level of understanding of the requirements of these rules and regulations was generally poor. It was also concluded that the enforcement of the available environmental, social, and economical rules and regulations on stone and gravel quarrying was low, and there was a significant association between the level of awareness of environmental, social, and economical rules and regulations and the current environmental, social, and economical impacts of stone quarrying witnessed in the area.

### **5.3 Recommendations**

To address the socio-economic impacts of mining of construction materials activities (stone and gravel quarrying), the following under-listed recommendations are suggested:

- Due to its nature, mining of construction materials activities (stone and gravel quarrying) were exposed to accidents and deaths. Lack of awareness about safety measures against these accidents and health and safety hazards Therefore, through different stakeholders and the local communities, awareness campaigns and sensitization meetings may be organized periodically at the quarry. Quarries' need to be alerted about the impacts of their activities and encouraged to take measures to mitigate or reduce the negative impacts.
- The potential impacts of blasting must be declined by the companies. The use of alarms to alert inhabitants to blasting should be re-visited. It is a requirement of EPA guidelines that notice be given to communities living close to the quarries prior to blasting. Blasting vibration is not only causing damage to buildings but also negatively impacting other life activities. As the whole building vibrates, objects from the roof as well as particles from wall surfaces break away and fall off. Some of these particles are likely to fall into the food being taken.
- Around the quarry site, a shelterbelt should be planted to reduce the movement of dust from the stone crusher and to sequester the emitted carbon dioxide from it. Modern techniques should be adopted while quarrying to reduce dust pollution and health impacts. The quarry owner must spray water on the surfaces of roads at the

quarry site to reduce dust emission points. Compensation should be given to the local people who are vulnerable to the impacts, such as the actual loss of crops, livestock, and houses.

- The field and questionnaire data revealed that, due to a lack of safety and protective gear while at work, worker protection at work is not assured and is at risk. During the process, employees are exposed to severe workplace dangers and illnesses as a result of a lack of safety equipment. Company management should make conscious attempts to provide the necessary protective devices to their workers. Staff must also be trained about the various preventive measures and workplace safety procedures that can be used to avoid such injuries and diseases.
- Mining of construction materials activities (stone and gravel quarrying) quarry sites are now within residential areas, and proper land use planning should be directed and measures should be taken to close and relocate some of the active quarry sites. The site should be properly rehabilitated.
- Lack of awareness and enforcement are the key barriers that slowed and aggravated the socio-economic impacts of mining of construction materials activities (stone and gravel quarrying) in the study area. As a result, the concerned body should implement a concrete awareness-building campaign for quarry owners, quarry employees, and the public. Stakeholders in the quarrying industry should work together to increase awareness of socio-economic impact, mitigation, and mining law compliance.
- The quarry development should have a buffer zone for stone and gravel extraction 700m and for hard core 500-900m is limited zone of operation. The effectiveness of distance as a means of control varies with topography and local environmental sensitivity.
- The study further recommends that the Ministry of Mining draft an adequate county mining policy framework to ensure control of quarrying activities carried out on a small scale so that the negative impacts of these operations are minimized.
- The study recommends the establishment and implementation of a policy framework on stakeholder education and sensitization by the Ministry of Mining so that the existing gaps regarding the awareness and understanding of the various requirements

stipulated in various socio-economic rules and regulations can be made clear to small-scale quarry workers and surrounding communities. The officials posted at the county level should conduct surveys to determine the knowledge and awareness gaps so that proper strategies to educate, sensitize, and create awareness of socio-economic rules and regulations on stone, gravel, and hard core quarrying among these groups of people can be formulated.

- Local communities should directly benefit from the mining of construction materials (stone and gravel quarrying) operations opened in their areas through participation in the quarrying activities and the selection of sites for the quarrying and restoration programs. This could improve their socio-economic livelihoods and also enhance their commitments towards reclamation of abandoned quarry.
- Cheha Wereda and Gurage Zone Mine and Energy Departments should fulfill their responsibilities by implementing the country's decree and directive that a quarry site given to a producer following the law should not be operated for more than 10 years.
- The study recommends mining of construction materials activities (stone, hard core, and gravel quarrying). Measures will be taken to improve the socioeconomic conditions of the area. Local people will be employed on a priority basis as per their skills and the direct and indirect development of the society. As a part of corporate social responsibility, the project proponent agrees to provide free of charge for social projects such as roads, electricity, water, schools, clinics in the area, and medical facilities to the workers employed at the site.
- There should be collaborations leading to good policies for managing the resources of the area among the various stakeholders. The Mine Department, Environmental Protection Agency, small-scale and large-scale miners, and the various bodies associated with mining should be involved in the collaboration at every stage. It would also help to reduce the tension over the encroachment of farmlands.

#### **5.4 Suggestions for Further Research**

The study recommends: a study to investigate the individual and institutional factors influencing awareness of and compliance with the various socio-economic rules and

regulations in as far as small-scale mining of construction materials activities (stone, hard core, and gravel quarrying) is concerned. A comprehensive study to explore the effectiveness of planning and controlling mining of construction materials activities (stone, hard core, and gravel quarrying) operations in Gurage Zone, Cheha Wereda, is also necessary. A study to examine the challenges faced by quarry workers and communities in mitigating the adverse effects of mining of construction materials activities (stone, hard core, and gravel quarrying) in Cheha and elsewhere in Wereda, where small-scale stone quarrying operations are being carried out in the zone, can also be undertaken.

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## APPENDICES

Wolkite University College of Social Science and Humanities Department Of  
Governance and Development Studies

Questionnaire for local community and quarry workers

Dear Sir/ Madam

This questioner is prepared to assess the Social and Economic Impacts of Mining of Construction Materials: The Case of Cheha Woreda in Gurage Zone, Central Ethiopia. The information is specifically for study purpose and is highly confidential. Your positive response is highly appreciated.

a) Date of Interview.....

b) Respondents number.....

Respondents type 1. local community 2. employees

### **Section A: Socio-demographic information**

1. Gender      a) Male                      b) Female

2. Age      a) 18 - 24      b) 25 - 31              c) 32 - 38              d) 39 – 45

            e) 46 - 52                      f ) 53+

3. Educational background: a) Cannot read and write    b) Read and write    c) Primary  
d) Secondary    e) first degree and above

4. Marital status    a) Single    b) Married    c) Divorced    d) Widowed

5. Which activity or activities are you involved in the quarry? (for employees only)  
a. Digging or excavating b. Crushing/ breaking / stone and gravel c. Blasting d. Heating  
e. Grinding f. Wedging g. disposal of waste rock h. Load crushed stone and gravel on the truck

i. Others (speci -----

6. House Hold Size: a) 1 - 2 b) 3 - 4 c) 5 - 6 d) 7 - 8 e) 9+

7. HH Income / month a) < 1000 b) 1001 to 2500 c) 2501 to 4000 d) 4001 to 5500

e) > 5501

**Section B: Social impacts of Production of Construction Materials activities**

8. Do you think mining of Construction Materials activities operation in this area a health and safety hazard to the employees and the surrounding community? a. yes b. no

9. Has any member (s) of your household or quarry employee suffered illnesses associated with quarrying operations? a. yes b. no

10. If yes in 9, how many times on average have the household member (s) sought for treatment for ailment related to mining of Construction Materials activities in this area for the past year? a. Ones b. 2 to 3 times c. More than 3 times

11. If yes in 9, which of the following ailment (s ) were they treated for ?

a. Fatal accidents

b. Headache fever

c. Eye problems

d. Skin irritation

e. Chest problems

f. Hearing problems

g. Allergy

h. Respiratory infection (e.g.coughs, pneumonia)

i. Physical injuries requiring medical treatment

j. Others (specify) -----

12. Which of the following protective clothing/gear do you wear while at work? (for employees only) a. Gloves b. Helmet c. Boots d. Overalls Dust Mask Dustcoat e. Earplugs f. Goggles g. None Other (why).....

(specify) .....

13. Has there been any displacement of communities due to the mining of Construction Materials activities around this area? a. yes b. no

14. If yes in 1, explain your answer -----

15. To what extent has the Mining of Construction Materials (quarrying) activities supported the provision of social amenities e.g. clinics, borholes for batterment of the society in this area? a. Not at all b. Small extent c. Moderate extent d. Large extent

16. On average, how many cases have been reported in relation to development of cracks in the buildings of surrounding communities in this area?

a. None b. a few c. Many d. Very Many

17. In your opinion, what is the general magnitude of cracks for the reported cases and their impacts on lives and properties in these communities?

-----

18. Has there been any cases of tension or conflict between quarries and the surrounding communities in this area? a. yes b. no

19. If yes, what are the main causes of the conflicts ?-----

-----

20. What is the relationship between quarries and local residents in the area? a) Very good b) good c) bad d) Very bad e) No certain

Give reason to support your answer in (20) above?

.....

21. How can you describe socially the impact of the methods used in Mining of Construction Materials (quarrying) activities here? a. Do not have any impact b. Little impact c. Distractive d. very distractive

22. Show how you agree with the following statements using the responses listed below by ticking the appropriate one.

a. Strongly agree b. Agree c. somewhat agree d. Not agree e. Strongly disagree

disadvantage	Strongly agree	Agree	somewhat agree/undecided/	Not agree	Strongly disagree
change in social norms, culture and customs					
psychological problem on children, patient and aged people					
Dust pollutin					
damage to buildings and other house hold property,					
Noise pollution and vibration					
Source of breeding grounds for mosquitoes and spread of diseases					
Impact on school enrolment (children involved in quarrying activities)					

23. What other disadvantages to the community as a result of quarrying have you observed in this area? -----

**Section C: Economical impacts of Production of Construction Materials activities**

24. What is your economic activity? (For local Community only) a) Agriculture b) government employs c) Private Sector employs d) Own business e) quarry labor f) Mixed labor in agriculture and quarry g) Mixed labor in agriculture and small business e) none

25. If you know this quarry area, what was the land cover before given to Construction Materials manufacturers? a. All covered by forest b. partially covered with forest c. It was bare land

Other land cover (please State) -----

26. What was the land use purpose of this quarry area before given to Construction Materials manufacturers? a. for forestry b. for agriculture c. grazing land d. For fruits and vegetables

Other land use (please State) -----

27. Can Mining of Construction Materials (quarrying) activities create a reliable and alternative job opportunity for communities in this area? a. Yes b. No

28. If yes how? -----  
-----

29. If no, why?-----  
-----

30. The activities of Mining Construction Materials (quarrying) activities are contributing to the scarcity of agricultural lands. a. Strongly agree b. agree c. strongly disagree

31. Show how you agree with the following statements using the responses listed below by ticking the appropriate one.

a. Strongly agree b. Agree c. somewhat agree d. Not agree e. Strongly disagree

disadvantage	Strongly agree	Agree	somewhat agree	Not agree	Strongly disagree
Over exploitation					
Deaths (people and animals)					
Reduction of farm lands and grazing lands					
Destruction of landscape and beauty					
Many living things have lost their homes (habitats) due to rock removal, noise and dust deposition.					
Loss of vegetation and deforestation					
run-off from the quarry enter the river and pollute the water					

32. Explain if there are any other economic impacts on the local community due to quarrying activities. others, mention .....

**Section D: Awareness of Socio-economical Rules and Regulation on Mining of Construction Materials activities**

33. Are you aware of any Socio-economical Rules and Regulation regarding Mining of Construction Materials activities ? a. yes b. no

34. If yes in 33, rate your level of understanding comprehension of the current Socio – economical Rules and Regulation regarding Mining of Construction Materials activities?

- a. poor      b. average      c. good      d. excellent

35. Indicate whether you are aware of the following statements relating to Socio – economical Rules and Regulation on Mining of Construction Materials activities?

Statement	Not Aware	Aware
1. ESIA Environmental and Social impact assessment should be performed prior to quarrying begins in a given place .		
2. All quarry sites must be fenced.		
3. Depleted quarries should be rehabilitated by the quarry owners.		
4. All persons working at the quarry sites should be provided with protective gear and first aid kits.		
5. Quarrying operation should be done 500 m away from homes. (optimum buffer Zone between the quarry area and the local resident)		
6. Warning signs should be erected at the entry point of each quarry site.		
7. protect citizens' health, safety, and environment from serious actual or threatened environmental harm.		
8. Dusty roads should be watered regularly to reduce dust Quarry work		

36. do you think Mining of Construction Materials activities (quarrying ) in this area is done according to the relevant Socio –economical Rules and Regulation ? a. yes b. no

Explain your answer -----

37. Suggest the measures to enhance awareness levels of relevant Socio –economical Rules and Regulations relating to Mining of Construction Materials activities (quarrying) among surrounding communities and quarry workers? -----

**Section E: Mitigation Measures**

38. What are the current measures being used currently to Mitigate the negative impacts of Mining of Construction Materials activities (quarrying) on the Socio –economic and environment in this area? a. Not efficient at all b. Somehow effective c. Very effective

Explain your answer in 38 -----

39. In your opinion, what measures ought to be undertaken to efficiently deal with the environmental challenges associated with Mining of Construction Materials activities (quarrying) in this area? -----

## **2. Key Informant Interview**

### **Interview for Zone Water mine and Energy Department expertise and Woreda administrators**

- Do you have any regulations governing the establishment of quarries and rehabilitation of existing quarries ?
- Do the the benefits generated from Mining of Construction Materials activities (quarrying ) operations supersede the negative impacts on social and economy ?
- What measure should be taken in order to minimize the impacts of Mining of Construction Materials activities (quarrying) in Gasorena-keracha?
- .How do the quarry sites selected?
- Is there under take EIA before the quarry sites selected
- How do the local communities participate in the site selection?
- Is the community or quarry owners aware of the existing social and economical rules and regulations governing Mining of Construction Materials activities (quarrying )

### **Interview for kebeles development agents, kebele administrators , health extension workers and community elders**

- Are the quarry operations in Gasorena-keracha sub location a threat to humans, animals and environment ?
- Do the the benefits generated from Mining of Construction Materials activities (quarrying) operations supersede the negative impacts on social and economy?

- Do you have any complaints from the residential neighborhood?
- What measure should be taken in order to minimize the impacts of Mining of Construction Materials activities (quarrying) in Gasorena-keracha ?
- How do the local communities participate in the site selection?
- How residents and workers deal with impacts of the pollution

**Checklist for Focus Group Discussion**

- When this quarry site was given to the manufacturers, did the local resident community discuss it?
- Are there any risks caused by the location of the Mining of Construction Materials activities (quarrying ) operations in your area?
- Are there any problems caused to the community due to this quarry site ?
- When the manufacturer company received a production permit, did it carry out the development promised to the society?