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ASSESSING THE IMPLICATION OF SMALL-SCALE STONE QUARRYING ON THE ABOKOBI COMMUNITY

BY

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DECLARATION

I, **Wonder Madilo** hereby declare that except for references to other people's work which have been duly acknowledged, this thesis is the result of my own research carried out at the Institute of Statistical, Social and Economic Research (ISSER), University of Ghana under the supervision of Dr. Andrew Agyei-Holmes (ISSER).

This thesis has neither in whole nor in part been presented for another degree.

DATE 13th August, 2023

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DEDICATION

This project is dedicated to my lovely children Selikem, Seyram and Sedudzi Madilo.

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This project has been made successful with the support God. I am very grateful of His guidance and protection, love and the abundance grace granted me throughout the study.

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ABSTRACT

Stone quarrying is an economically important and widespread activity in Ghana and has existed since historical times. However, in spite of its remarkable contribution towards economic development, some adverse impacts have been noticed, especially where extraction is carried out without proper planning and use of modern technology and scientific methods. This study assessed the contribution of small-scale stone quarrying (SSQ) activity to people's livelihoods in the Abokobi community. Specifically, this study ascertained why people engage in SSQ, explored the constraints and coping strategies associated with SSQ, and assessed the effect of SSQ on people's livelihood and the community as an environment. A mixed-method approach was adopted to collect the data from 200 SSQ workers and 10 regulatory officials. The results show that engagement in SSQ at Abokobi was both poverty and market driven, constraints associated with SSQ are labour intensive, lack of protective gears against health hazards led to shocks (such as ill health and accidents), lack of money to purchase better extraction tools, etc. Coping strategies include regulatory interventions from the police, EPA, Mineral Commission and Municipal Assembly. The results also depict that the workers generate more income from the SSQ activities than other activities as at 2014 but it is no longer lucrative in 2022. Finally, the results reveal health problems and food security as environmental effects of SSQ. It is, therefore, recommended that the workers need to form an association to increase their possibility of loan acquisition from financial institutions to address their financial constraints, and the government should assist the workers through importation of better extraction tools at a subsidized cost.

CHAPTER ONE

INTRODUCTION

1.0 Background

Products from quarrying activities support the construction industry by serving as the source of materials (granite, limestone, marble, stones, slate and clay for making ceramic tiles) used for hard flooring. However, quarrying activities sometimes affects the environment negatively if not well-managed (Bewiadzi *et al.,* 2018). In particular, blasting of rocks with explosives in order to extract raw materials for processing gives rise to noise pollution, air pollution, damage to biodiversity and habitat destruction (Bewiadzi *et al.,* 2018). The most common quarrying activity in developing countries is the small-scale stone quarrying (SSQ) (Hentschel *et al.*, 2012).

SSQ carries the potential of destroying habitats and the species they support (Mabogunje, 2008). Some habitats may not be directly removed by excavation, but they can be indirectly affected and damaged by environmental impacts – such as changes to ground water or surface water that causes some habitats to dry out or others to become flooded (Baah-Ennumh *et al.*, 2019). For instance, noise pollution can have a significant impact on some species and affect their successful reproduction (Baah-Ennumh *et al.*, 2019). Nevertheless, with careful planning and management, it is possible to minimize the effect on biodiversity and in fact, if well-managed quarries can also provide a good opportunity to create new habitats for biodiversity or to restore existing but damaged ones (Tanko, 2013).

Furthermore, the both flora occupy an important position in the existence of life because of their ability to maintain a balance in the volume of Oxygen and Carbon dioxide which leads to the purification of the environment. They supply man with food, drugs, fibre, fuel, building and

other raw materials and serve as ornamentals. The plants, by their activities, influence and determine to a large extent, the type of fauna to be expected and any change in their composition may affect the animal life in terms of food, shelter, security and comfort. Such vegetation changes are the main concern of environmental botanists and ecologists in recent years who have advocated the careful and cautious approach to activities promoting such changes (Wang, 2013). Additionally, dust from quarry sites are reported to be responsible for vegetation injury and crop yield loss and thus become a threat to the survival of plants in industrial areas (Iqbal and Shafig, 2011; Wangela, 2019). Such dusts reduce plant cover, height and number of leaves.

Earlier researchers (for example Argall, 1978; Carman, 2009; Noestaller, 2009; 2009) in other developing countries noted the significant contribution of SSQ to the global economy. These scholars suggested that SSQ activities are part of the burgeoning informal or 'unorganised' sector of third world economies. The strong anti-quarrying movements led by pro-environment groups have generally focused on three main areas: the negative aspects of unregulated mineral extraction; not differentiating between small scale and large-scale quarrying and overlooking the question of livelihoods of the large numbers of people involved and their livelihoods in SSQ (Bhanumathi, 2009; Vagholikar *et al*., 2011).

Since SSQ comprised a significant part of the labour force in the informal income-generating activities, this study examines this area of work and livelihoods of SSQ workers, the regional focus being sub-Saharan Africa (Wangela, 2019). The patriarchal social structure of sub-Saharan African societies tends to obscure the contributions made by the SSQ workers in these mines, and the roles and livelihood concerns of SSQ workers. For instance, a study in Nigeria by Okafor (2012) reveals that SSQ cause significant impact on the environment and livelihoods, thus SSQ activities research must be community or country-based to provide tailored policy decisions.

Narrowing down to Ghana, a large number of lives depend on the incomes generated from SSQ activities, and community members perform a range of productive or an income-generating activity around these mines (Baah-Ennumh *et al.,* 2019). In Accra for instance, the land mass is already over-populated, commercial gravel extraction to supply aggregates to the construction industry has been on the increase in recent years. This has contributed largely to land degradation through the destruction of economically important trees, mostly indigenous in nature. This practice leaves behind bare soil and a large expanse of gullies which can collect water during rainy seasons. This can result not only in health–related problems for neighborhoods near these sites, but can cause negative impacts on the environment as well (Ahadzi *et al.,* 2020; Lohe and Ghosh, 2022).

A case in point is the Abokobi community in the Greater Accra Region. Most people in the Abokobi community engage in four main economic activities including commerce, agriculture, service provision and industry. However, SSQ is also quite popular. Gravel sites from the study in the Abokobi community are particularly attractive source of aggregates as they are relatively well sorted, easily accessible and cheap to extract (Sear and Archer, 2008). This negatively affects the environment, people's health and safety of the SSQ workers (Lohe and Ghosh, 2022; Moody and Panos, 2013). Though the community members might know the relevance of SSQ to livelihoods, they might not be fully aware of the unintended consequences of their SSQ activities on the environment, biodiversity and food security. Thus, this study was timely.

1.2 Problem Statement

Rural economies are not only based on agriculture but also non-farm activities which serve as a source of livelihood to rural households (Bryceson, 2012; Gordon and Craig, 2011). The rural population in Ghana relies on agriculture as the main source of income (Adjei, 2009). SSQ was recorded to be the second predominant non-farming activity aside farming in most rural areas in Ghana, particularly in farming communities (Baah-Ennumh *et al.*, 2019; Bewiadzi *et al.*, 2018). Thus, SSQ activities in the community help the operators to generate income to take care of their households (Bryceson, 2012). This goes a long way to prevent social vices such as thefts, etc. which are associated with lack and want.

There is a great concern for quarrying activities since they produce significant amounts of waste (Wang, 2013). Some types of quarries do not produce large amounts of permanent waste, such as stone and gravel quarries, whereas others will produce significant amounts of waste material such as clay and silt (Wang, 2013; Wangela, 2019). Interestingly, they are generally inert and non-hazardous, unlike the waste from many other processes. Nevertheless, there is still potential for damage to the environment particularly with water contamination (Salem, 2021). Plants are major components of the ecosystem – a complex interaction between the biotic and abiotic entities of the environment. The industry, unfortunately discharge dust that settles not only on land, plants and trees but also on surface waters used for drinking and other domestic chores by the community (Mendoza-García and Godínez-Alvarez, 2022).

Though the dust emission resulting from limestone quarrying is harmful to human health, there is scanty research on the implication of SSQ on livelihood, the health of the people living in these communities and the environment at large. Existing literature such as Baah-Ennumh *et al.* (2019) and Bewiadzi *et al.* (2018) in Ghana did not precisely focus on SSQ and livelihoods using a

community-based approach and comparative method to see if the situation changes overtime. SSQ can negatively affect the community but the effect can be controlled if proper measures are in place (Okafor, 2012). There is opportunity to protect and enhance the environment with the translocation of existing habitats or the creation of new ones (Wang, 2013). Yet there is unavailable empirical evidence in literature to provide roadmap to achieve the aforementioned. The research is timely to assess the implication of SSQ on people's livelihood and it related environmental issues in the Abokobi community where SSQ has overridden farming activities. The researcher observed that standard of living in the community was not reflective of their occupation and development was fast catching up where indigenes are also losing their farmlands. The findings of this research would be useful to environmental scientists, government and development partners in policy formulation.

1.3 Objectives of the Study

The study investigated how SSQ contribute to people's livelihood and its implications on their health in the Abokobi community between 2014 and 2022. Precisely, the study focused on the following objectives:

1. To find out why people engage in SSQ in the Abokobi community between 2014 and 2022.
2. To explore the constraints associated with SSQ in the Abokobi community between 2014 and 2022.
3. To ascertain the coping strategies to address the constraints associated with SSQ in the Abokobi community between 2014 and 2022.
4. To assess the effect of SSQ on people's livelihood and the community between 2014 and 2022.

5. To investigate the regulatory responses to the effect of SSQ in the Abokobi community between 2014 and 2022.

1.4 Research Questions

1. Why are people engaging in SSQ in the Abokobi community between 2014 and 2022?
2. What constraints limit SSQ and what coping strategies do the workers use between 2014 and 2022?
3. What livelihood outcomes have the workers attained from engaging in SSQ between 2014 and 2022?
4. What are the effects of SSQ on the Abokobi community between 2014 and 2022?
5. What are the regulatory responses to the effect of SSQ in the Abokobi community between 2014 and 2022?

1.5 Significance of the Study

SSQ's contribution to livelihoods in the Abokobi area has been ascertained between 2014 and 2022 which have not been considered in single research in the SSQ literature. Therefore, the findings provided empirical alternative solutions that would help improve SSQ business in Ghana. As a main source of income to the community compared to original farming, relevant regulations would be needed to coordinate their work and also prevent environment degradation. By investigating the phenomenon within a nine interval, the study proved that SSQ could no longer be a regular source of income to community members in 2022. This indicates that reliance on the first findings in 2014 alone may lead to policy gaps and unsustainable interventions.

Furthermore, this study suggested the need for government and development policymakers to institute effective strategies to assist the stone quarry sector of economies, particularly developing economies and for academics interested in understanding the relevance of SSQ in

Ghana and Sub-Saharan Africa. Unlike existing literature, this study demonstrated the time factor of required policies since after nine years the situation changed significantly.

Finally, the study made immense contribution to the body of knowledge and provided a background for further studies in assessing the extent to which SSQ could affect people's livelihoods in other communities in Ghana and developing countries with similar situation. Ultimately, this knowledge would be useful for development students, learners, and researchers for further studies because the novelty of this study.

1.6 Scope and Limitations

The study was based on repeated cross-sectional primary data. The outcome of the study was limited by focusing on a restricted period of time (2008-2013 and 2013-2022). Again, by focusing on one community, the findings would have to be generalized in a context. Hence, future study would be necessary to affirm the phenomenon in other communities in different districts and regions.

The sample size determination was affected by the study time frame. It limited the researcher's chance of interviewing a larger number of respondents. So only those available and willing to participate were engaged and also based on the researcher's knowledge of the respondent involvement in the SSQ. Ample time perhaps is required to involve more participants from the community and state officers that deal directly with SSQ workers.

This study was also subject to some data-related limitations. First, all of the data was self-reported from officials of the EPA and community members who are involve in the SSQ activity hence there could be some subjective biases. They may not provide all the information regarding their activities, particularly the income they generate that relates to their livelihoods.

1.7 Organisation of the Study

The project is organized into five chapters. Chapter one covered the introduction which included the overview and rationale of the topic, problem statement, research objectives and questions, study's significance, scope, limitations and organization. Next, the chapter two discussed the literature review (theoretical and empirical reviews). Then chapter three described the methodology including the research design, study setting, instrumentation, data collection and analysis. Further, chapter four presented the results and discussion of same. Lastly, chapter five concluded the study by providing summary of findings, general conclusion and relevant recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presented the literature review. Specifically, the theoretical and empirical literatures relating to SSQ and its contribution to livelihoods of the people and its effect on the entire community were reviewed. The sustainable livelihoods framework and livelihoods approaches were reviewed as underpinning theories for the study. Subsequently, the concepts of key variables in the study objectives were reviewed together with how they improve or affect livelihoods and public health.

2.1 Theoretical Review

This aspect of the literature reviews involved discussion of the sustainable livelihoods framework as an underpinning theory. There were also reviews regarding SSQ in Ghana, and overview of Abokobi and its land tenure system.

2.1.1 Sustainable Livelihoods Framework

The sustainable livelihoods framework is a form of livelihoods analysis used by a growing number of research and applied development organizations, including the Department for International Development (DfID) of the United Kingdom (one of its most ardent supporters), the United Nations Development Program (UNDP), as well as non-governmental organizations (NGOs) such as CARE and Oxfam (DfID 2011; Carney *et al.* 2012).

It is primarily a conceptual framework for analyzing causes of poverty, peoples' access to resources and their diverse livelihoods activities, and relationship between relevant factors at

micro, intermediate, and macro levels (Bewiadzi *et al.*, 2018). It is also a framework for assessing and prioritizing interventions. The IFPRI/SPIA study is testing and adapting the sustainable livelihoods framework for use in agricultural research, with the aim of assisting agricultural researchers to conduct ex-post and ex-ante assessments of the impact of their interventions on poverty. To date, the vast majority of impact assessments in CGIAR centers have used conventional measures of poverty based on income and consumption data, and sometimes nutrition indicators.

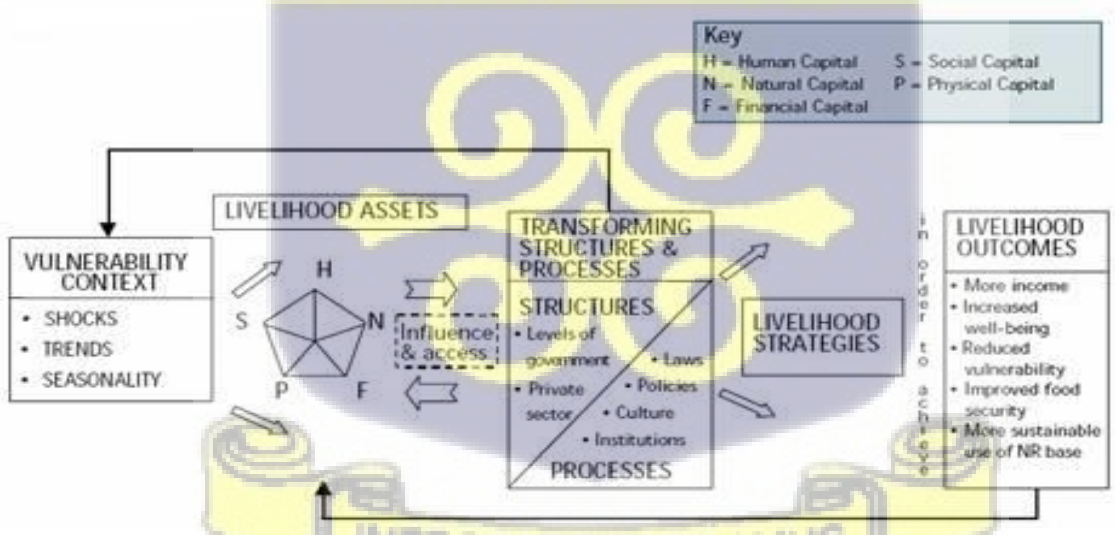
The sustainable livelihoods framework takes as a starting point an expanded definition of poverty that looks *beyond* the following: · conventional poverty measures based on income, consumption, or nutrition to *additional aspects of poverty and well-being,* e.g., access land, water, credit, or education, vulnerability to natural disasters, political rights, physical safety, and social relationships that provide economic security and social well-being; · "today's poor" to who is vulnerable or likely to be *"tomorrow's poor"*; · aggregated household or head counts to *the effects of social differentiation* by class, ethnic group, gender, and other locally-specific social differences; and · external standards to *self-perceptions by local communities* on who is poor and what poverty means, taking into account what people themselves value (Bewiadzi *et al.*, 2018; Narayan- Parker *et al.*, 2000).

One feature of this framework is that it looks at more aspects of people's lives than how many live on a purchasing power of $1.00 a day or how many households consume less than 2,000 calories per person per day. For example, participatory poverty assessments or case study research can identify the features by which people in rural areas themselves identify poor or well-off households.

A second key feature of the sustainable livelihoods framework is that it recognizes people themselves, whether poor or not, as actors with assets and capabilities who act in pursuit of their own livelihood goals. While this may seem obvious, in many cases the poor have been regarded as passive victims or recipients of government policies and external aid.

The overall conceptual framework for sustainable livelihoods is illustrated in Figure 1 (see, also, Carney 2008; DfID 2011). The framework is intended to be dynamic, recognizing changes due to both external fluctuations and the results of people's own actions. The starting point is the vulnerability context within which people operate. Attention is next given to the assets that people can draw upon for their livelihoods.

Figure 1—The sustainable livelihoods conceptual framework with agricultural Technologies



Source: Carney 2008; DfID 2011

Assets interact with policies, institutions, and processes to shape the choice of livelihood strategies. These, in turn, shape the livelihood outcomes, which are often the types of impact we are interested in. However, those outcomes are not necessarily the end point, as they feed back into the future asset base. The vulnerability context encompasses: ***Trends*** in population, resources, and economic indicators such as prices, governance, or even technology; ***Shocks*** such as changes in human or animal health, natural disasters, sudden economic changes, or conflict; and ***Seasonality*** in prices, agricultural production, employment opportunities, resource availability, or health.

Vulnerability here refers to things that are outside people's control. It is usually negative but it can also provide positive opportunities. It is not objective "risk" that matters, but people's subjective assessments of things that make them vulnerable. These matter because both perceived and actual vulnerability can influence people's decisions and hence their livelihood strategies. This is especially important for whether people are willing or interested in adopting agricultural technologies.

The **asset base** upon which people build their livelihoods includes a wider range of assets than are usually considered. Rather than looking only at land or other classic wealth indicators, the sustainable livelihoods framework suggests consideration of an asset portfolio of five different types of assets. ***Natural capital*** includes land, water, forests, marine resources, air quality, erosion protection, and biodiversity. ***Physical capital*** includes transportation, roads, buildings, shelter, water supply and sanitation, energy, technology, or communications. ***Financial capital*** includes savings (cash as well as liquid assets), credit (formal and informal), as well as inflows (state transfers and remittances). ***Human capital*** includes education, skills, knowledge, health, nutrition, and labor power. ***Social capital*** includes any networks that increase trust, ability to

work together, access to opportunities, reciprocity; informal safety nets; and membership in organizations. Though most versions of the sustainable livelihoods framework are limited to these five kinds of capital, some add political capital as a sixth type of asset, which can include, for example, citizenship, enfranchisement, and membership in political parties— all assets that can be key in obtaining or operationalizing rights over other assets.

Policies, institutions, and processes affect how people use their assets in pursuit of different livelihood strategies. This box on the diagram refers to both formal and informal institutions and organizations that shape livelihoods by influencing access to assets, livelihood strategies, vulnerability, and terms of exchange. They may occur at multiple levels, from the household to community, national, and even global levels. The public and private sectors, civil society, and community institutions may all be relevant considerations; laws as well as culture can also be included.

All of these influence people's **livelihood strategies**, i.e., the choices they employ in pursuit of income, security, well-being, and other productive and reproductive goals. As discussed above, what is important about the livelihood strategies approach is that it recognizes that households and individuals may pursue multiple strategies, sequentially or simultaneously. This means that, even in the context of agricultural research, we should not assume that someone is automatically a "farmer," or that people with other businesses are not involved in farming. Nor should we overlook even small livelihood strategies, because they can be very important, especially for the poor, who often pursue many livelihood strategies either to make up enough income or to provide a measure of security. The pursuit of multiple activities can have important implications for cash and labor availability at different times of the year, and for the relevance of specific development interventions for poverty reduction.

Livelihood outcomes encompass many of the types of impact of interest for the study of the impact of agricultural research on poverty. Potential outcomes include conventional indicators such as income, food security, and sustainable use of natural resources (Mendoza-García and Godínez-Alvarez, 2022). Outcomes can also include a strengthened asset base, reduced vulnerability, and improvements in other aspects of well-being such as health, self-esteem, sense of control, and even maintenance of cultural assets, and thus have a feedback effect on the vulnerability status and asset base. The sustainable livelihoods framework draws on a number of theoretical and conceptual approaches to development thinking; in this sense it is more a holistic and synthetic framework than an entirely new set of concepts. What the framework does is provide a method for thinking about the multiple and interactive influences on livelihoods without overlooking important explanatory factors.

In this respect, it provides a "checklist" (Ashley and Carney 2012) of issues to be considered in designing research initiatives or program evaluations. Not everything on the checklist can be included in one study, so prioritization is necessary. The framework provides the advantage of allowing researchers to understand the parameters of the "big picture," and then narrow the scope of the study to what can have the highest impact or what is most relevant to the important stakeholders (including researchers). The framework may guide researchers to consider and prioritize less visible factors and local priorities that may or may not revolve around production and consumption or even physical or financial resources, but could instead relate to education, safety, or legal rights.

The framework may also identify issues that are highly salient in explaining livelihood impacts, but are either (1) too far outside of the domain of the research to be a focus of study, e.g., vulnerability to domestic violence in the context of a study of agricultural research; or (2) while

relevant to the study, are impossible to include, e.g., a high level of political violence that is either too sensitive or dangerous to address. In these cases, the framework can help make explicit what is *not* included, but may still be important to understanding chains of causality or important constraints on the ability of a technological intervention to affect livelihoods. Use of the sustainable livelihoods framework involves acknowledging complexities that can be hard to manage in a study.

Rather than shy away from this complexity, use of the framework implies a willingness to acknowledge that livelihoods—and the process of affecting them—are complex. It also implies making an effort to achieve the most comprehensive understanding of these issues possible.

The framework requires researchers to think holistically, not just about certain types of assets such as land and credit, but also about the potential interaction of five or six kinds of assets, and the complementarities between assets and their sequencing. For example, membership in a social group (social capital) may be necessary for access to rights (political capital) and land (natural capital), which is necessary for access to credit (financial capital), which, in turn, is needed to purchase inputs to take advantage of a new technology. This understanding may lead to a different choice of intervention.

The framework can also provide a structure for thinking about conflicts between livelihood objectives, e.g., whether increased production might conflict with human capital development or protection of the natural resource base, or whether income maximization through increased cash crop production might increase vulnerability of SSQ Workers through decreased production of crops used for small enterprises.

2.1.2 Small Stones Quarrying in Ghana

Stones are a type of sediment produced by the mechanical and chemical breakdown of rocks. Once disaggregated from the original source rock, it is then eroded and transported by wind and water, often ending up at the deposits of rivers or lakes as stone dunes, or ultimately as sediments in the sea (Wangela, 2019). The composition of stone is largely dependent on the source material. It ranges between the following minerals: calcite, feldspar, galena, graphite, hematite, magnetite, muscovite-mica, pyrite, quartz and talc (Salem, 2021).

In areas where there is no good source of sedimentary materials from mountains and volcanoes, stone is often entirely composed of organic material i.e., shell fragments, coral and the tests (skeletons) of small planktonic organisms (Salem, 2021). The texture of sediment is largely determined by the transportation process. The three important parameters used to assess the texture of sediment are size, rounding and sorting. The size connotation for classifying stone is in the range of 0.6 mm and 2.0 mm. This is further subdivided into very coarse, coarse, medium and fine. In practical terms, very fine stone is about the smallest grain size one can see with the naked eye.

Stone quarrying is a type of open-cast quarrying that provides materials for the construction sector in Ghana (Baah-Ennumh *et al.,* 2019). Its contribution to Ghana's industrial output has increased from 17.4% in 2012 to 20.8% in 2013. The activity of stone quarrying, carrying and transporting stone, and has resulted in a number of physical, socio-economic and environmental problems including land use and land ownership conflicts, damage to feeder roads and use of child labour (Mensah, 2013)**.**

A research work carried out by Action Aid Ghana in 2012, revealed that stone is one of the basic raw materials in the construction industry and essential in every developing nation. Large quantities of stone are employed every day in the nation's infrastructural development, and there is no substitute for it. Accra being the nation's capital, increasing urbanization, coupled with rapid population growth has created an acute demand for housing and consequently for stone. The government's infrastructural development has been mainly rehabilitation of existing infrastructure and construction of new ones. The developments are in the areas of roads, drains, culverts, bridges, school buildings, hospital buildings, public buildings and physical upgrading of cities and regional capitals.

These works require substantial quantity of stone. In addition to the Government's infrastructural development works, residential accommodation, especially in the urban areas, is one of the acute problems that the nation is encountering. The capital city of Ghana, Accra, being the centre of industrial, commercial and academic activities, experience high influx of people, in pursuit of jobs and education. This has created acute demand for residential accommodation, and hence demands for stone, which is a basic component in concrete mixture.

Ghana consumes an average of 2.4 million tons of cement per annum, and 40% or 960,000 tons of this is consumed in Greater Accra alone. Based on the average cement to stone ratio of 1:4 by weight in a concrete mixture, this implies that Accra alone consumes about 3.84 million tons of stone per annum. This huge quantity of stone is sourced from Abokobi and surrounding communities. During the last two decades, Accra used to source for its stone requirements from the beach resulting in rapid degradation of the coastline. This presented some grave environmentalists; stone quarrying from the beaches of Accra was abolished. Also, beach stone was known to be corrosive due to the salty sea water and not suitable for construction where iron

rods are involved. Thus, stone winners turned onto the nearby farmlands in the Abokobi community and the depletion has been very rapid since. It is expected that a substantial percentage of the total stone consumption of 3.8 million tons per annum in Accra is sourced from the Abokobi and its surrounding communities.

2.1.3 Overview of Abokobi Community and its Land Tenure System

Abokobi is a suburb of Accra. It is the district capital of the Ga East Municipal Assembly which was created in 2009 following government decentralization and local government reform policy. Regarding political boundary, Abokobi community is found in the Abokobi-Madina Constituency. It is believed the settlement was found in 1854 by missionaries of the "Basler Missionsgesellschaft", a Basel Mission for Christian refugees who left Osu. The main occupation of the community members was farming and gradually SSQ took over.

Land as a factor for agricultural production is under siege from the estate development sector either for physical structures or for stone quarrying or stone quarrying. Land sizes for production are small and over exploited without any meaningful soil conservation and improvement practices. Chiefs are the custodians of land and hold them in trust for their subjects. However, direct ownership is in the hands of clan or family heads. Anyone in the lineage could inherit from the grandparent/parents. Land could be owned either by direct purchase or lease. Share cropping tenure arrangement for a period of one farming season is also common operation of land. Land sale is one of the quickest ways of making money and the major cause of conflict is land ownership.

2.2 Empirical Review

This aspect of the literature review dealt with related studies on the subject matter. It highlighted and elaborated what earlier researchers found regarding SSQ and its contribution to people's livelihoods and also its effect on public health and the entire environment.

2.2.1 Small Stone Quarrying in the Informal Sector

According to Ghana's Population and Housing census data, in terms of employment status, 70.8% of females (7 years +) are self-employed with no employees and only about 5% are employed with employees. A further 9.3% of them are employees, while unpaid family workers make up about 10% of the SSQ. Whiles there is a preponderance of employment in agriculture and allied fields, economically active SSQ who are employed are less likely to be in formal employment than their male counterpart. Only 4.3% of SSQ is found in public sector employment whiles 5.8% are in private formal employment. A majority of them (85%) are in the private informal sector. Female participation rates in Ghana's formal sector are generally low (GSS, 2012). The GLSS4 shows that only about 6.2% of females are formally employed in both the public (3.3%) and private (2.9%) sectors. This markedly contrasted with that of men, which shows formal sector employment of 22.8%.

Furthermore, SSQ in formal sector employment are mostly concentrated in the lower ranks and/or non managerial positions and thus their voices are not heard at the decision-making levels. This assertion is supported by the 2010 census data, which puts the number of SSQ workers in managerial and administrative positions at 0.2 percent (9,543 persons).

On the contrary, more SSQ workers are found in the informal sector than men. Out of the 93.8% of SSQ workers in informal sector employment, 48.7% of them are in agriculture related self-

employment while 45.1% are in non agricultural private informal and self-employment. While the informal sector gives SSQ workers the flexibility they need to juggle their multiple roles as workers, the remuneration is highly unstable and therefore their earnings vary from period to period. Also they lack social security since the informal sector is not well structured to lend itself to the social security contributions and benefits. Thus, those found in the in-formal sector retire without any social security thus leaving the burden of caring for them on the family and the society at large. To this end SSQ workers are more vulnerable since they dominate the informal sector (GSS-GLSS4, 2012).

Furthermore, SSQ's work in the informal sector is basically at the subsistence level and thus their income is relatively low compared to their male counterparts in the same sector In terms of employment status, 70.8% of females (7 years +) are self-employed with no employees and only about 5% are employed with employees. A further 9.3% of them are employees, while unpaid family workers make up about 10% of the SSQ workers. Whiles there is a preponderance of employment in agriculture and allied fields, economically active SSQ workers who are employed are less likely to be in formal employment than their male counterpart.

According to the 2010 census data, only 4.3% of SSQ workers are found in public sector employment whiles 5.8% are in private formal employment. A majority of them (85%) are in the private informal sector. SSQ workers participation rates in Ghana's formal sector are generally low. While the informal sector gives SSQ workers the flexibility they need to juggle their multiple roles as workers, wives and mothers, the remuneration is highly unstable and therefore their earnings vary from period to period. Also they lack social security since the informal sector is not well structured to lend itself to the social security contributions and benefits.

Thus, those found in the informal sector retire without any social security thus leaving the burden of caring for them on the family and the society at large. To this end SSQ workers are more vulnerable since they dominate the informal sector. Furthermore, SSQ workers' work in the informal sector is basically at the subsistence level and thus their income is relatively low compared to their male counterparts in the same sector. One of the many economic ways to sustain their livelihood is to engage in some income generating activities through setting some small scale enterprises. As Tendler and Amorim (2012) pointed out, successful stories of SMEs growth tend to be derived from demand. This can start from one sector and spillovers to other 20 sectors through cooperation and linkages. This might result in an increase in employment generating capabilities of SMEs (Tendler and Amorim, 2012).

2.2.2 Causes of Small Stone Quarrying

Socio economic factors are the main reason why people mine stone for sale. Mensah (2013) explained these factors as follows.

Lack of adequate employment: The writer seems to believe that unemployment and underemployment compel people to become stone carriers loaders and tally clerks in order to make ends meet. The agricultural sector is not lucrative due to high input costs high, high risk and inefficient traditional methods of production. Fertilizers and seedlings are expensive provides an alternative means of survival with relatively few entry barriers.

High Profit Accruing to Stone Contractors: Another factor that promotes uncontrollable stone quarrying is the high profit accruing to stone contractors. Compared to the national minimum daily wage rate of US$ 1.22 in 2008, a contractor made minimum net profit of US $ 55.47 per day white a stone carrier and loader made a daily net income of US $ 1.54 and US $ 2.16 respectively. The high profit margin to contractors may explained by the high demand for stone

(Mensah, 2013). Since 2008, the relative importance of stone quarrying was increased in Ghana while the contribution to industrial sector of manufacturing has declined (ISSER, 2009) .Today, the growing urban population has accelerated the construction of houses and business premises on lands that were hitherto unoccupied.

Low Environmental Concern: According to Mensah, 2013, more than 55% respondent did not care about the chain of consequent hazards caused by stone quarrying on other natural resources such as plants and animals. Keating (2009) noted that "many people do not understand the close ties between human activities and the environment because they have inaccurate or insufficient information".

High Community Desire for Development Projects: Due to limited amenities rural dwellers have taken it upon themselves to underrate development projects including the provision of electricity, potable water and basic school and health facilities –to modernize their communities. Stone quarrying is a major source of funding for such projects (Mensah, 2013).

2.2.3 Implications of Small Stone Quarry on Livelihoods

SSQ is classified as a small-scale enterprise (SME) business which has the potential like any other SMEs to contribute significantly to socio-economic development, particularly at rural level. For instance, Abaka and Mayer (2009) observed that the small enterprises are major creators of employment due to their labour-intensive technologies, and they are the vehicles to bring development to the rural areas. In a recent study, Franks *et al.* (2020) reported that SSQ contributes significantly to livelihoods, with a huge and undeniable impact on poverty reduction and economic development at all scales. They, however, noted that SSQ known for persistent challenges related to the environment, public health among others (Franks *et al.*, 2020).

The activities of SSQ as acknowledged among small enterprises contribute significantly to employment generation and development in rural Ghana. This admission was made by Dr. Kwabena Duffuor, then governor of Bank of Ghana during the launching of a new financial package titled "Smile" in 1997 that "*As long as we neglect the small business sector we will always have problem of unemployment as well as underdeveloped nontraditional sector and we shall always remain a dependent economy and vision 2020 will remain a dream".* Subsequently, successive governments of Ghana have recognised the need to develop the small and micro enterprises to promote development, particularly at the rural level (Bhasin and Akpalu, 2011).

For decades, increasing attention has been paid, in both the academic and policy community, to the importance of micro, small and medium enterprises (MSMEs). Arguments have been made for their relationship with growth, employment, innovation, competition, and poverty reduction, though strong evidence of causal relationships remains elusive (IFC/WORLD BANK, 2012:15).

It has been reported that SSQ activities provide income to households to feed and cater for their families (Hentschel *et al.*, 2012). Many rural folks have to engage in SSQ as alternative income generation work instead of farming which is the predominant occupation in most rural communities (Bewiadzi *et al.*, 2018). Undoubtedly, SSQ is relevant not to just households but development agents such as real estate developers and the state. Many community members would prefer to engage in SSQ since it is not capital intensive and does not require sowing and harvesting seasons like farming activities. Thus, SSQ is a lucrative business for many communities (Bewiadzi *et al.*, 2018; Hentschel *et al.*, 2012).

The study of Action Aid in 2011 revealed that SSQ had not given any positive impact on indirect employment even though it had created direct employments that provide income to households.

The study further noted that there is reduction in the cost of stone. Howbeit, the difference in cost of stone was only slight and this did not make any significant positive impact. Moreover, the majority of residents did not have the means to put up houses, and any such reduction in cost of stone would not benefit them much. Regarding compensation for lands, it was ascertained that farmers did not receive any compensation for their farmlands, and those who received said it was insignificant as compared to what they had lost. In a nut shell, the residents claimed that SSQ activities in their communities had had very negative effect on their livelihoods (Action Aid, 2011).

2.2.4 Effects of Small Stone Quarrying on the Environment

The research work of Action Aid revealed that depletion of farmlands was very serious in their communities. Some of the communities claimed there were no farmlands at all and farmers had to depend on other neighboring communities for farmlands. Destruction of mature soils will limit the extent and development of some vegetative communities (Mendoza-García and Godínez-Alvarez, 2022). In terms of food security, the findings of Action Aid suggested that the availability of food in SSQ communities, particularly in Accra would be marginalized if SSQ should be allowed indiscriminately. A recent report by the Ghanaian News Agency has cited stone quarrying as a contributing factor to falling production in the Ga East Munipality (www.bsholding.com).

Residents in SSQ communities also claimed that the stone carting trucks and caterpillars disturbed a lot, especially in the night as SSQ activities go on throughout the night, thus giving them sleepless nights through noise making. Similarly, residents living along the roads where the said carting trucks pass suffered a lot from dust pollution, resulting in various diseases (Ahadzi *et al.*, 2020; Lohe and Ghosh, 2022). Overall, the residents submitted that stone quarrying activities

had had very bad impact on the communities (Action Aid, 2011). Therefore, most residents called for banning of stone quarrying activities in their communities (Nunoo and Evans, 2013).

2.2.5 Constraints and Coping Strategies associated with Small Stone Quarrying

The quarry industry is a challenging workplace because it poses severe risks to the occupational health and safety of the operators (Lohe and Ghosh, 2022). Major challenges of the SSQ activities are the occupational risks such as fatal accidents, physical injuries, and work related illnesses (e.g., respiratory diseases such as silicosis and tuberculosis due to inhalation of dust) (Lohe and Ghosh, 2022). From the perspective of developing countries, especially low-middle-income countries, Carvalho Sousa *et al.* (2020) observed that SSQ operators are exposed to various forms of hazards, which have negative consequences on their wellbeing. The SSQ activities pollute the environment, creating adverse health implications for people who work in such areas (Ahadzi *et al.*, 2020). According to Carvalho Sousa *et al.* (2020), active transmission of tuberculosis occurs among SSQ workers. Other scholars also disclosed that SSQ operators are frequently exposed to dust which causes general body ache (Pathak and Dkhar, 2010), chronic obstructive pulmonary disease (Blanc *et al.*, 2009), hearing impairment as a result of exposure to excessive noise (Gyamfi *et al.*, 2016), eye injuries (Ezisi, 2019), and musculoskeletal disorders (Njaka *et al.*, 2021). Additionally, poor working environmental conditions around crusher unit are the reason behind the poor state of health of the workers engaged in the SSQ activities (Gangopadhyay *et al.*, 2004). The socio-economic conditions of the SSQ operators are miserable and precarious. They live and work in a risky and unhygienic environment; as a result, they are more likely to be killed in accidents at any time (Lohe and Ghosh, 2022).

A survey on occupational safety, hazards and related health problems among the SSQ operators of India suggests that none of them is using any personal protective equipment. Again, first aid boxes and ambulance facilities are not available at the site or nearby areas (Jobin *et al.* 2017). These constraints or challenges can be addressed by providing themselves personal protective equipment, getting first aid boxes, relying on each on for financial supports among others (Ahadzi *et al.*, 2020). There is also the need for a national safety and health policy tailored for SSQ operators (Ahadzi *et al.*, 2020).

Summary

This chapter provided a discussion on SSQ's contribution to livelihoods, public health and the community wellbeing. The chapter also discussed the sustainable livelihoods approaches and framework as underpinning theories of the study. The concept of SSQ in Ghana was reviewed together with empirical survey on the percentage of SSQ activities in the informal sector of Ghana. An overview of Abokobi and its land tenure system was also discussed. The causes of SSQ, constraints and contributions to livelihoods were reviewed. Finally, the effect of SSQ on communities and the environment as a whole were also reviewed. This chapter informed the research methodology such as the design and approach necessary to achieve the study objectives.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

In this chapter, the researcher provided information on the study setting, research design and approach, population and sampling, research instruments, and design of instrument and data collection procedures. It also highlighted the validity and reliability of the study's instruments and how the data were analyzed.

3.1 The Study Setting

Abokobi is a suburb of Accra and also the district capital of the Ga East Municipal Assembly created in 2009 following government decentralization and local government reform policy. Regarding political boundary, Abokobi community is found in the Madina Constituency. It is believed the community was found in "1854 by missionaries of the Basler Missionsgesellschaft, a Basel Mission for Christian refugees who left Osu". The main occupation of the community members was farming and gradually SSQ took over. Due to the SSQ activities and peri-urban development, the community literally lost its farmlands.

3.2 Research Design

In terms of purpose, this dissertation is a descriptive research. Descriptive research provides a detailed picture of events, people, or circumstances (Saunders *et al.*, 2016; Siedlecki, 2020). Descriptive research helps to describe a phenomenon and conclusions. It is mostly suitable to answer research questions such as "what", "how" and "why" (Bickman and Rog, 1998; Hilton, 2018). Given that this study aim to understand SSQ activities in the community and how and why some residents engage in that activity, this design is considered most appropriate.

Regarding the approach, a mixed-method was employed. A mixed-method approach allows the researcher to address the inherent weaknesses of a single approach. In order to provide in-depth multi-faceted findings, the mixed-method is most appropriate (Saunders *et al.*, 2016). It allows the researcher(s) to use both quantitative and qualitative approaches. A quantitative study uses numeric data and employs statistical tools to measure the objectives. A quantitative study is conducted to assess a social phenomenon using composed variables, measured with numbers, and analysed with statistical tools (Babbie and Mouton, 2002; Hilton, 2018). The quantitative approach was used to survey the SSQ operators using a questionnaire. On the other hand, a qualitative study is an approach that explores and tries to understand specific to general meaning of human problems (Creswell, 2014). This approach is useful to show detailed descriptions of complex phenomena, tracking unique or unexpected events, illuminating the experience and interpretation of events by actors with widely varying stakes and roles, giving voice to those whose views are rarely heard, conducting preliminary investigations to develop theories and generate and even test hypotheses, and moving toward explanations (Bradley *et al.*, 2007). The qualitative approach was employed to interview non-literate SSQ operators and officers from EPA and Mineral Commission.

From the strategy perspective, this study adopted a repeated cross-sectional study design. Given that the researcher collected the data at two different timeframes (i.e., 2014 and 2022) where some of the participants in the 2014 data collection exercise were not available to participate in the 2022 data collection exercise, this design is suitable. The purpose of this design is to enable the research analysis the SSQ activities over a period of time to ascertain whether there are changes between 2014 and 2022. Additionally, this design used a case study method since it

focused on only Abokobi community. Thus, only SSQ operators in Abokobi community were chosen to assess.

3.3 Population

The target population comprised of community members who are engaged in SSQ business for their livelihood in the Abokobi community. The officers of EPA and Mineral Commission.

3.4 Sample Size and Sampling Technique

Using Patton (2002) criteria for sample size determination under a non-probability study, two hundred and ten (210) respondents were chosen for this study. According to Patton (2002), the selection of sample size does not follow any procedure under non-probability study. Rather, it is based on the research objectives and questions. At least, the researcher should ensure a minimum of 100 respondents and the larger the sample the higher the reliability. This recommendation was endorsed by Saunders *et al.* (2009) and Saunders *et al.* (2016), and widely applied in social science studies (such as Hilton *et al.*, 2021; Hilton *et al.*, 2022; Martins, 2023; Puni *et al.*, 2020, etc). It follows that the determination of the sample size is based on the researcher's ability to identify reasonable number to work with but it must large enough to represents the target population. The researcher has no prior number of the population. The 210 respondents consisted of 200 community members were involved in SSQ business, 5 from EPA and 5 from the Mineral Commission. This sample size was in both 2014 and 2022.

The study used homogenous purposive sampling technique to choose participants as they have similar characteristics. This technique was adopted because it is the appropriate sampling method that allows a researcher(s) to select prepared, available and willing participants to take part in the

data gathering process. This technique was used for the selection of the respondents from the two target groups (i.e., SSQ operators and EPA and Mineral Commission officers).

3.5 Instrumentation

This study employed a questionnaire and an interview schedule to collect the data. The instruments were developed to solicit the following information: respondents' demographic characteristics, stone quarrying and why people engage in it, stone quarrying and farming activities; constraints of SSQ, coping strategies to address quarrying constraints, effect of SSQ on the environment, and effect of SSQ on people's livelihood in the community. The instruments are discussed in details in the following sub-sections. The questionnaire was administered to SSQ operators who were literates. The interview schedule is of two sets. Set A was a structured interview schedule which contained the same details as the questionnaire but was administered to the non-literate SSQ operators since the researcher had to read and interpret it for the respondents and mark their responses. Set B was a semi-structured interview guide and it was administered to the EPA and Mineral Commission officers.

3.5.1 Questionnaire

The questionnaire was designed on based on the literature reviewed. It comprised of seven sections. Section I collected data on the respondents' demographic factors. Section II collected data on SSQ and why people engage in it. The third section collected data on stone quarrying and farming activities. The section IV collected data on the constraints of SSQ. The fifth section collected data on the coping strategies to address quarrying constraints. The sixth section gathered data on SSQ's effect on the environment. The final section gathered data on how SSQ affect people's livelihood in the community. Each section carried appropriate response options (see Appendix A).

Open and closed ended questionnaire was used. The researcher explained the purpose of the project to the participants and assured them of their anonymity and the confidentiality of information provided. Additionally, detailed instructions on how to complete the questionnaire and returned was provided. Stakeholders in the community helped in the administration of the questionnaire and also assisted the researcher to explain to the respondents the questions and what was required of them. By keeping the items simple, providing clear instructions and assuring confidentiality of information, the probability of obtaining biased responses was reduced (Martins, 2023).

3.5.2 Interview guide

Both structured and semi-structured interview guides were employed for the interview. The structured guide contained the same information as the questionnaire. The semi-structured guide was employed to gather the qualitative data. The researcher prepared a list of questions with flexibility for the participants to express themselves free and also for the researcher to ask follow up questions. This guide was based on relevant literature related to the study objectives. To prepare this guide, the researcher combed the literature for information on the contribution of SSQ to people's livelihood in the community and the effect on the environment. However, some questions were not found in the researcher's literature review, but follow-up questions were asked due to the respondents' answers.

3.5.3 Validity and Reliability

Validity is a test to ensure that an item measures or describes what it is supposed to measure or describe (Thomas, 2006). Validity refers to a test that shows that a measurement accurately reflects the concepts it is proposed to measure (Barbie, 2010). In this case, the themes on which the questionnaire was developed from the objectives stated for the study.

To validate the instrument, the researcher presented a draft copy of questionnaire designed to his supervisor for his evaluation of the items based on the variables of the study. The prepared questionnaire was presented to experts outside the University of Ghana. These experts served as jurors for vetting and assessing the face validity of the instrument. Their comments and suggestions were taken into consideration to refine the final instrument.

However, reliability has to do with the quality of measurement procedure that depicts that the same data would be obtained in a repeated observation of the same phenomenon (Barbbie, 2010). Reliability also confirms whether a test produces consistent results given the same conditions (Kirk and Miller, 2012). To affirm the reliability of the instrument, there was a pilot test conducted a sub-community in the Abokobi area which major SSQ activities were not carried out compared the epicenter, Seseme. A pilot test is the most effective strategy to minimize problems in the actual conduct of the study (Mujis, 2009). The results of the pilot test helped in the restructuring of the questionnaire.

3.5.4 Pilot Testing

Pilot testing was conducted for the following purposes:

1. To restructure some of the items on the pre-test questionnaire
2. To select items for the final instrument
3. To determine the reliability of the final instrument
4. To determine the estimated time required to complete a questionnaire.

Twenty-five people were used for the pilot test. This was made up of fifteen females and ten males. Before the questionnaires were administered, the study's essence was made known to the participants. Participants were encouraged to do independent work. During the exercise, the start

and completion times were recorded as well as the submission time. It was realized that, most participants completed within an hour. This was an indication that an average of 10 minutes was required to complete and submit the questionnaire.

3.6 Data Collection Methods/Procedure

The researcher employed survey and interview data collection methods. The literate SSQ operators were surveyed using a questionnaire (discussed above) while the non-literate SSQ operators and EPA and Mineral Commission officers were interviewed using interview guide (discussed above).

The researcher visited the study setting to survey and to interview the selected participants. The researcher was assisted by the secretary of SSQ Association who introduced him to the participants to establish a rapport before the data collection. The data gathering process lasted for two weeks. The questions were translated into local dilates for participants to answer before later converted into English. The data collection took place in 2014 and 2022. The same sample size was used in each year but with new respondents [in some cases] who still fell within the sample frame. After nine years of collecting the first data in 2014, some of the SSQ respondents quit the business and some EPA and the Mineral Commission officials are also transferred. Howbeit, the researcher strived to engage the new participants with the same level of exposure to the SSQ activities in the community.

3.7 Data Analysis

The collected data were cleaned and coded before the actual analysis (Hilton, 2018). The data cleaning helped to obtain the valid responses but the coding speed up the data entering process

and actual analysis. Regarding the survey or quantitative data, the researcher used SPSS version 25 to conduct descriptive statistics analyses, which were reported in the chapter four.

The interview data were analysed thematically. The researcher attentively examined the transcribed data to familiarise himself with it. Next, codes were generated to detect and differentiate key features of the transcribed data (Clarke *et al.*, 2015). Subsequently, the researcher moved up one level of abstraction, from coding to theme development (Clarke *et al.*, 2015). Afterwards, themes were detected via parallels and trends in the answers (Kusi, 2012). These themes were altered and polished further. The analysis was then conducted using the readjusted themes.

3.8 Ethical Consideration

Ethical consideration is vital in every study hence the researcher took the following steps to ensure that ethical issues were addressed. First, the researcher obtained permission from the authorities of EPA and Mineral Commission, and the leadership of the SSQ operations. Secondly the researcher explained the purpose of the study to the respondents and sought their consent, and only those who were enthusiastic and accessible to partake were used. The respondents were also instructed on how to complete the questionnaires but, most importantly, they were assured of confidentiality of the information they provided as well as nondisclosure of their identity. The data collected would also be destroyed once the study is approved.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter entailed the presentation of results and interpretation, and discussion of same. To investigate how SSQ contribute to people's livelihood and its implications on their health in the Abokobi community, the researcher administered a structured interview to the community members who were engaged in the SSQ and state officials who directly regulate the SSQ activities. In all, two hundred (200) community members were surveyed while ten (10) officials were interviewed in both years. Regarding the quantitative data, the researcher used SPSS application to carry out descriptive statistics analysis while the qualitative data were analyzed thematically. The subsequent sections under this chapter presented in details the findings and discussions of the results pursuant to previous findings reviewed in chapter two of this work. The respondents' demographic information were also presented and interpreted.

4.1 Demographic Characteristics

This section of the chapter captured the bio information of the participants (that is, gender, age, marital status, educational background and family size). The results were presented in Table 4.1 and their interpretations were given.

Table 4.1 Respondents' demographic information

Variables	Frequency (*n* = 200)	%	Frequency (*n* = 200)	%
	2014		2022	
Gender				
Male	165	82.5	176	88
Female	35	17.5	24	12
Age				
21-30	55	27.5	38	19
31-40	125	62.5	136	68
41-50	10	5	26	13
51-60	10	5	0	0
Marital status				
Single	15	7.5	9	4.5
Married	50	25	78	39
Divorced	25	12.5	16	8
Widower	72	36	68	34
Separated	38	19	29	14.5
Educational level				
No education	54	27	32	16
Primary	120	60	124	62
JHS	21	10.5	38	19
SHS/vocational/technical	5	2.5	6	3
Family size				
1-3	17	8.5	33	16.5
4-6	86	43	92	46
7-9	65	32.5	46	23
10 and above	32	16	29	14.5

Source: Survey Data, 2014/2022

Table 4.1 showed that out of 200 community members surveyed in 2014, 165 were males representing 82.5% of the respondents, and the remaining 35% were females representing 17.5%. In 2022, still more males (88%) participated in the survey than females (12%).This finding

contradicts Amar-Klemesu and Maxwell's (2008) finding that more than 60% of SSQ workers in Greater Accra are men. Similarly, Habitat International (2012) reported that more females involve themselves in SSQ business than men, which is inconsistent with the present finding. Though the National Population and Housing Census in 2010 indicated that there were more females than males, this did not translate into their engagement in SSQ business. The change in this trend may be as a result of the invasion of estate development and stone quarrying which attract more male labourers than female labourers. The differences in the results could also be due to the diversion from farming, which was patronized by women, to stone quarrying and hence the upsurge in the male engagement in the SSQ.

Furthermore, it can be observed from the Table 4.1 that majority of the respondents are in the age range of 31-40 years representing 62.5% and 68% of the respondents for 2014 and 2022 respectively. This agrees with the results obtained in the 2000 national population and housing census, indicating that the communities are economically less developed. Also the high number of respondents ranging between ages 21-30 must be as result of the influx of the stone wining activities. The 5% of elderly signifies low life expectancy.

Additionally, Table 4.1 shows that 25% of the respondents are married in 2014 and 39% is recorded for 2022 with only 7.5% and 4.5% who are single in 2014 and 2022 respectively. Further, 12.5% of the respondents are divorced and 36% are widows or widowers. The remaining 19% of the respondents are separated. If follows that majority of the respondents are widows or widowers, followed by those who are married. This may be as result of the nature of the socio-economic activities in the community.

Again, Table 4.1 depicts that majority of the respondents had formal education but with different levels of educational backgrounds in both 2014 and 2022. It can be deduced from the Table 4.1

that out of the 200 SSQ workers surveyed, 60% (2014) and 62% (2022) had primary education with 10.5% (2014) and 2.5% (2014) attending JHS and Secondary/Vocational/Technical/Commercial School respectively. In 2022, 19% and 3% attended JHS and Secondary/Vocational/Technical/Commercial School respectively. About 27% respondents have not had formal education. The high proportion of respondents with primary level of educational background might be due to poverty. However, the high level of literacy is in line with a survey the Ministry of Education which used the Criterion Reference Test as a bench mark.

Lastly, it can be noticed that majority of the respondents have a family size ranging from 4-6 which forms 43% of the participants. This is in disagreement with the work carried out by the national population and housing census in 2000. Of the entire respondents only 16% has a family size of 10 or more.

Regarding the interview results, 10 participants took part. 6 of the participants are males while 4 are females. They were aware of SSQ business and interacted with the workers on several occasions. They have been working with their respective institutions for over 10 years. It follows that they were in the position to provide the right information during the interview exercise.

4.2 Why People Engage in SSQ activities in the Abokobi community

To understand the underlying causes why people take part in SSQ business as a livelihood, the study sought to explore the intensity of SSQ activity taking place in the community, what contributed to the SSQ activity, and whether there is ready market for the stone. The results are presented in the Table 4.2 and Table 4.3 below. Meanwhile, all the respondents indicated that

there is ready market for the SSQ business, which inspired them to engage in that activity other than any occupation in the community.

Table 4.2 Perceived intensity of the stone quarrying activities

Response	Frequency	Percent	Frequency	Percent
	2014		2022	
High	136	68	68	34
Moderate	49	24.5	92	46
Low	15	7.5	40	20
Column Total	200	100	200	100

Source: Field Survey, 2014/2022

In 2014, the perception of the respondents shows that SSQ activities are highly intensive but the intensity reduced from 68% in 2014 to 34% in 2022, indicating that it is moderately intensive in 2022 (Table 4.2). About 68% acknowledged that SSQ activities are intensive, with 24.5% and 7.5% of the respondents saying that the SSQ activities are moderate and low respectively. This agrees with the statement that, stone quarrying is very lucrative which may largely account for its intensity as of 2014, but it is less lucrative after nine years hence the drop in the intensity level. Despite the devastating nature of stone quarrying which the respondents complained of, it is severe because people care less about their environment. This agrees with what was reported by Mensah (2013). The finding further confirms that many people do not understand the close ties between human activities and the environment because they have inaccurate or insufficient information (Keating, 2009).

Table 4.3 Main factors contributing to stone quarrying

Factors	Frequency	Percent	Frequency	Percent
	2014		2022	
Lucrative	166	83	55	27.5
Land not fertile	10	5	20	10
Increase in estates development	22	11	120	60
Poor weather pattern	2	1	5	2.5
Column Total	200	100		

Source: Field Survey 2014/2022

Table 4.3 above reveals that there was ready market for stone and the business was highly lucrative as of 2014. However, the increase in estate development has a significant influence on the rate of SSQ in 2022. This shows that the ready market for stone work together with its lucrative nature was the main contributing factors for the SSQ in the Abokobi community nine years ago but not SSQ activity is largely driven by real estate development. A research work carried out by Ofori-Parku, (2009) observed that people give out their farmlands for SSQ because of the huge amount of money they received, whether for SSQ or real estate development.

4.2 Perceived relevance of stone quarrying to farming in terms of food security

As part of objective one, the researcher further sought to ascertain the perceived threat of stone quarrying to farming and food security in the community. In 2014, 61.5% of the respondents noted that farming is more relevant in securing food than SSQ with only 38.5% saying otherwise (Table 4.4). There is no significant change in the responses nine years after. The outcome of this result may be due to the devastating effects of SSQ on their environment and the fact that it is

actually making it difficult for them to farm, resulting in food insecurity. The rest of the findings are summarized in Table 4.4 below.

Table 4.4 Perceived relevance of stone quarrying to farming

Items	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Is stone quarrying easier than farming?				
Yes	109	54.5	120	60
No	91	45.5	80	40
Is stone quarrying more lucrative than farming?				
Yes	155	77.5	122	61
No	45	22.5	78	39
Is stone quarrying having effect on the availability of land for farming?				
Yes	111	55.5	82	41
No	89	44.5	118	59
Do you believe in food security?				
Yes	178	89	182	91
No	22	11	18	9
If yes, which of the above is relevance in terms of securing food?				
Stone quarrying	77	38.5	68	34
Farming	123	61.5	132	66

Source: Field Survey, 2014/2022

The interview results indicated that community members had been actively engaging in stone quarrying business for decades. An officer submitted that: *"We know they have been doing this business for some time now; at least, for more than 10 years".* This quote means that the SSQ operators have been in this activity for long and the EPA and Mineral Commission officers are

equally aware. It presupposes that SSQ is an occupation to the citizens in the community just as farming or trade activities. It is identified that the major motivating factors for SSQ in the community are lucrativeness and the desire to generate regular income to cater for their households. Another officer noted that: "*Most of these stone quarrying workers are in that business because it is probably lucrative. You know some also want regular income compared to farming which is seasonal".* These findings are consistent with the survey results obtained from the SSQ workers.

4.3 Constraints associated with SSQ

The second research objective aimed at exploring the constraints associated with in the Abokobi community. The survey and interview indicated the following as constraints associated with SSQ: labour intensive, lack of protective gears against health hazards led to shocks (such as ill health and accidents), lack of money to purchase better extraction tools, rainy season, stiff competition from those using machines and lack of market in recent times. These constraints are consistent with the empirical observations by Lohe and Ghosh (2022) who identified major challenges SSQ activities to include occupational risks such as fatal accidents, physical injuries, and work related illnesses (e.g., respiratory diseases such as silicosis and tuberculosis due to inhalation of dust). This study's findings also confirms Carvalho Sousa *et al.*'s (2020) work in low-middle-income countries that revealed that SSQ operators are exposed to various forms of hazards, which have negative consequences on their wellbeing. It follows that aside the economic gains, SSQ activities can also pose adverse socio-economic conditions that make the SSQ operators very miserable and precarious.

4.4 Coping Strategies to address Constraints associated with SSQ

The third research objective aimed at investigating the coping strategies to address the constraints associated with the SSQ in the Abokobi community. In terms of the financial constraints, the interview results show that the SSQ operators rely on their co-workers for financial and moral supports. Additionally, this study identified social capital as a coping strategy that the SSQ operators use to mitigate the effects of shocks that affected either their lives as well as their livelihood. The reliance on claims such as food, implements, cash, debts or credit collection from relatives and friends was significant during economic and human shocks. Alternatively, during periods of reduced quarrying activities especially the rain season, the SSQ operators engage in other income generating activities such as agriculture or trade. Due to the reduced time in the rainy season, the SSQ operators strived to produce a variety of stones to suit different needs of the customers. These coping strategies agree with earlier findings that SSQ operators must provide themselves personal protective equipment, getting first aid boxes, relying on each on for financial supports among others (Ahadzi *et al.*, 2020).

4.5 The effect of SSQ on People's Livelihood in the Community

Another objective of the study is to find out the effect of SSQ on the people's livelihood in the community. To do this, the researcher investigated the benefits the SSQ workers derive from the quarrying business, whether the benefits they derive from the quarrying business were better than other activities, the effects of the SSQ activities on farming and production of food, and the effect on their livelihood. According to the respondents, the main benefit of the SSQ is financial. They noted that they generate more income from the SSQ activities than other activities (Table 4.5). The overall positive effect is that the SSQ is very beneficial to them as at 2014. For

instance, in 2014, 71% of the respondents said it was very beneficial, 17% and 10% said it was beneficial and somewhat beneficial respectively, while only 2% said it was not beneficial (Table 4.5). Howbeit, a follow up after 9 years in 2022 indicates that the SSQ is no longer beneficial (represented by 49%) and only 10% of the respondents believed that it is still very beneficial. This could be due to the fact that the business is not lucrative anymore as they lost market for it. Many workers had to resort to other activities such as construction related works and commercial driving.

Table 4.5 Benefits of Stone Quarrying compared to Other Activities

Items	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Not beneficial	4	2	98	49
Somewhat beneficial	20	10	46	23
Beneficial	34	17	36	18
Very beneficial	142	71	20	10

Source: Field Survey, 2014/2022

Table 4.6 Effects of Stone Quarrying on the Livelihood of the People

Factors	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Stone quarrying will lead to hunger	134	67	106	53
Renders farmers jobless	43	21.5	45	22.5
Results in poverty among residents	20	10	38	19
Increase in cost of living	1	0.5	6	3
Lead to diseases	2	1	5	2.5

Source: Field Survey, 2014/2022

Table 4.6 displays the various effects of SSQ on the livelihoods of residents. It reveals that majority of respondents representing 67% (2014) and 53% (2022) believed stone quarrying will

lead to hunger. 21.5% (2014) and 22.5% (2022) of participants complained that it results in rural urban drift with most people responding that it renders farmers jobless. Some of the communities claimed there were no farmlands at all and farmers had to depend on other neighboring communities for farmlands. 10% (2014) and 19% (2022) of participants said it results in poverty among residents. Only 1% (2014) and 2.5% (2022) of the respondents indicated that SSQ activity may lead to malaria and respiratory diseases. The pits dug during stone quarrying may serve as breeding place for mosquitoes and dust from stone may result in the above disease respectively. Meanwhile 0.5% (2014) and 3% (2022) stressed that the activity will bring about increase in cost of living. This point buttresses the issue of hunger raised by majority of respondents. Despite all the negative and positive effects raised it can be concluded that stone quarrying could in the long term lead to food insecurity. It follows that, nine years after, some of earlier respondents surveyed in 2022 reaffirmed the above negative effects of SSQ on their livelihoods even though the business is no longer lucrative and only few people engage in it. They further indicated that the SSQ business has gone down because of peri-urban development and stiffer competition from those who use machines and also sell the white stones.

4.6 The Effects of SSQ on the Community

Lastly, the researcher assessed the effect of the SSQ activity on the community as an environment. Here, the respondents were asked to confirm whether they were aware of the effect of the SSQ activity on the community or environment. The effects were assessed relative to health problems and food security. Table 4.7 below presents the effect of SSQ activity on the community regarding environmental issues such as air pollution, noise, creating pits and making the soil infertile. Table 4.8 relates to effect of SSQ on farm and food production.

Table 4.7 Effects of Stone Quarrying on the Environment

Factors	Frequency (n = 200)	Percent	Frequency (n = 200)	Percent
	2014		2022	
Air population	127	63.5	98	49
Noise	20	10	42	21
Create pits	41	20.5	45	22.5
Make soil not fertile	12	6	15	7.5

Source: Field Survey, 2014/2022

Table 4.7 above shows the effects of SSQ on the environment according to the respondents. Majority of the respondents representing 63.5% (2014) and 49% (2022) complained that air pollution is the main environmental defect that comes out of stone quarrying. About 10% (2014) and 21% (2022) said noise and 20.5% (2014) and 22.5% (2022) of the participants said it create pits as an effect of stone quarrying has on the environment, while 6% (2014) and 7.5% (2022) indicated that it renders that soil infertile.

Regarding farming and food production, Table 4.8 depicts that 59.5% (2014) and 49% (2022) of the respondents claim that SSQ leads to food shortage. 8.5% (2014) and 14% (2022) related the issue as the cause of loses of soil fertility with about 18% (2014) and 16% (2022) saying that the act may result in the reduction on availability of fertile land for farming. About 14% (2014) and 21% (2022) also said that the SSQ ultimately leads to an increase in food price. It can be inferred from all the above findings that SSQ has reduced farming activities and therefore a steady continuous reduction in food production. The current 2022 survey reveals that SSQ activity in the community has gone down compared to nine years ago. The respondents submitted that the reduction in available farmlands was mainly due to development activities.

Table 4.8 Effects of Stone Quarrying on Farm and Food Production

Factors	Frequency (n = 200)	Percent	Frequency (n = 200)	Percent
	2014		2022	
Food shortage	119	59.5	98	49
Loses of soil fertility	17	8.5	28	14
Reduction in available farmlands	36	18	32	16
Increase in food prices	28	14	42	21

Source: Field Survey, 2014/2022

4.7 Regulatory response to SSQ effects

Regarding the regulatory response to SSQ effects, Table 4.9 shows that 67% (2014) and 76% (2022) of the respondents are not aware of any regulatory body controlling stone quarrying activity in the community while 33% (2014) and 24% (2022) claimed they are aware of such bodies. The large number of respondents claiming they are unaware of such existing bodies may be as a result of poor monitoring by the bodies which was mentioned in the case of the Community Empowerment for Land use Accountability (CEfLA), in Tolon-Kumbungu, in the Northern Region. The slight differences in the results may be attributable to the fact not all the exact respondents in the 2014 survey took part in the 2022 survey. Regardless, it is obvious that the respondents in both surveys are not aware of the existence of regulatory bodies to regulate the activities of the SSQ workers in the Abokobi community.

Table 4.9 Existence of regulatory bodies to regulate the activities of stone winners

Response	Frequency (n = 200)	Percent	Frequency (n = 200)	Percent
	2014		2022	
Yes	66	33	48	24
No	134	67	152	76

Source: Field Survey, 2014/2022

Table 4.10 reveals that 60.5% (2014) and 62.5% (2022) of respondents were of the view that the police are the main regulatory body with 16.5% (2014) and 12% (2022) of the respondents noting that the EPA is responsible. Additionally, 1% (2014) and 0.5% (2022) of the respondents believed is the responsibility of the Minerals Commission. Meanwhile 22% (2014) and 25% (2022) said the municipal assembly is responsible. The police happen to be the main regulatory body because they are most frequently seen in the pits.

Table 4.10 Stone quarrying regulatory bodies in the study area

Items	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Police	121	60.5	125	62.5
EPA	33	16.5	24	12
Mineral Commission	2	1	1	0.5
Municipal Assembly	44	22	50	25

Source: Field Survey, 2014/2022

Table 4.11 below shows that 28% (2014) and 18% (2022) of the respondents believed that regulatory bodies ensure proper contractual documentation while just 10% (2014) and 6.5% (2022) claimed that they regulates the depth at which stone quarrying activities take place. 59% (2014) and 69.5% (2022) believed that the police arrest and persecute contractors without permit while 3% (2014) and 6% (2022) also believed that the regulatory bodies ensure payment of reclamation fees upfront. This amount serves as a guarantee for reclamation and when contractors default the amount is given to the land owners.

Table 4.11 Interventions made by the regulatory bodies

Items	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Ensure proper contractual documentation	56	28	36	18
Regulates the depth at which stone quarrying activity occur	20	10	13	6.5
Arrest and prosecute contractors without permit	118	59	139	69.5
Ensure payment of reclamation fees upfront	6	3	12	6

Source: Field Survey, 2014/2022

Table 4.12 depicts that majority of the respondents, 34.5% (2014) and 33% (2022) were of the view that the intensiveness of the actions taken by regulatory bodies is moderate and 28% (2014) and 26% (2022) said is intensive. In 2014, 25% and 12.5% of the participants believed that the actions taken by regulatory bodies to control stone wining activity is not intensive and less than a week respectively. Similar results (30% and 11% respectively) are obtained in 2022. This may account to the rate at which farmlands are being destroyed by land contractors. These results are corroborated by the interview results.

Table 4.12 Intensity of the stone quarrying regulations

Level intensity	Frequency (*n* = 200)	Percent	Frequency (*n* = 200)	Percent
	2014		2022	
Intensive	56	28	52	26
Moderate	69	34.5	66	33
Not intensive	50	25	60	30
Less than a week	25	12.5	22	11

Source: Field Survey, 2014/2022

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This final chapter concluded the study by providing summary of findings, general conclusion and relevant recommendations.

5.1 Summary of the Findings

This study primarily assessed the contribution of SSQ activity to people's livelihoods, with reference to Abokobi community, a suburb of Accra. This study answered the following questions: why are people engaging in SSQ in the Abokobi community between 2014 and 2022?; what constraints limit SSQ and what coping strategies do the workers use between 2014 and 2022?; what livelihood outcomes have the workers attained from engaging in SSQ between 2014 and 2022?; and what are the effects of SSQ on the Abokobi community between 2014 and 2022? The study findings are summarized as follows.

First, the findings revealed that engagement in SSQ at Abokobi was both poverty and market driven. The demand for commercial and residential premises as a result of increased urban population, coupled with investment in infrastructural facilities due to political stability contributed to the market for construction materials. Poverty, as identified by the stone workers was mainly associated with them lack of income to meet individual and household needs. In 2014, there was ready market for the SSQ business, which inspired them to engage in that activity other than any occupation in the community. They considered SSQ very lucrative as of 2014 and that was the main contributing factor for engaging in the SSQ business. However, after nine years, the workers indicated that the business was no longer lucrative as there was not ready

market. In 2022, the main factor driving the SSQ activity in the community is real estate development. The researcher also discovered that SSQ activity was perceived the most relevant to farming in the community as of 2014 but that perception has reduced in 2022.

Addressing the second question, the researcher investigated the constraints of the business, and whether there were regulatory bodies intervening in the quarrying issues and the names of such bodies, any recent intervention undertaken by such bodies, and how intensive are the interventions. The survey and interview in both 2014 and 2022 indicated the following as constraints associated with SSQ: labour intensive, lack of protective gears against health hazards led to shocks (such as ill health and accidents), lack of money to purchase better extraction tools, rainy season, stiff competition from those using machines and lack of market in recent times. Regarding the strategies, regulatory interventions were inquired of and the results showed that the police are the main regulatory body followed by the EPA, Municipal Assembly and Mineral Commission. The results further indicated that the interventions made by these regulatory bodies were mainly arrest and prosecute contractors without permit, and ensuring proper contractual documentation. The intensity of the interventions was largely moderate in both 2014 and 2022. In terms of the financial constraints, the workers relied on their co-workers for financial and moral supports. Additionally, this study revealed the importance of social capital as a coping strategy that the stone workers used to mitigate the effects of shocks that affected either their lives as well as their livelihood. The reliance on claims such as food, implements, cash, debts or credit collection from relatives and friends was significant during economic and human shocks. Alternatively during periods of reduced quarrying activities especially the rain season; the workers engaged in other income generating activities such as agriculture or trade. Due to their

reduced time in the rainy season the workers strived to produce a variety of stones to suit different needs of the customers.

Furthermore, to address the third question, the researcher assessed the effect of SSQ on the people's livelihood in the community by investigating the benefits the SSQ workers derive from the quarrying business. The results depicted that the workers generate more income from the SSQ activities than other activities as at 2014. This enabled them to provide for their households sufficiently. However, by 2022, the SSQ business was not lucrative as they lost market for their products. Many of the SSQ workers now resorted to construction related works and commercial driving. Both 2014 and 2022 data showed that stone quarrying would lead to hunger, render farmers jobless and result in poverty among residents in the long-run.

Lastly, the researcher assessed the effect of the SSQ activity on the community as an environment. The effects were assessed relative to health problems and food security. The results indicated that SSQ activity leads air population, noise, create pits and make soil not fertile. However, air population and pits creation were rated higher in both 2014 and 2022. Regarding farming and food production, majority of the respondents in 2014 and 2022 indicated that SSQ activity would lead to food shortage. Nevertheless, the results of 2014 survey revealed that SSQ activity would least contribute to loss of soil fertility followed by increase in food prices but in 2022 the results showed that SSQ activity contributes more to increase in food prices than loss of soil fertility. Finally, the respondents submitted that the reduction in available farmlands was mainly due to development activities.

5.2 Conclusions

This study generally investigated the contribution of SSQ activity to people's livelihoods, with reference to Abokobi community, a suburb of Accra. Specifically, this study aimed to: ascertain why people engage in SSQ, explore the constraints and coping strategies associated with SSQ, assess the effect of SSQ on people's livelihood and the community as an environment. The following can be deduced findings of this study.

First and foremost, the findings demonstrate that SSQ workers through their activities were able to support their households without any external intervention. This displayed an aspect of self-sufficiency, or self-reliance which is also a salient feature in relation to sustainability. In fact during the interviews women SSQ workers pointed that their engagement in SSQ had minimized the reliance on their spouses since they were able to meet their practical gender needs (also referred to as the household needs in this study). Therefore, in an effort to enhance the livelihoods of the rural people, other livelihood strategies such as small scale mineral extraction in addition to agriculture need to be developed. Amidst the natural and economic shocks that affect agricultural productivity, such activities can be used as used as a coping strategy by the and hence support rural households. Therefore, objective one is achieved as the findings clearly show the motivation behind the SSQ business in the community as the researcher sought to ascertain.

Furthermore, SSQ improves the capabilities of the rural poor and the migrant population. In addition to increased well-being, the workers were able to be adequately nourished, improve their health and lead a life without shame. Actually as noticed by the workers, they were not embarrassed by the activities they were engaged in at the quarry. It can also be suggested that, enhancement of the workers' capability enabled them to cope with stress, and shocks making

them able to find and make use of livelihood opportunities. To add, SSQ enhances the growth of other livelihoods both in the community and in the stone workers' home town. Because such activities are fast profit yielding, they can be used as a basis to enhance rural development, since they promote infrastructural development. This can be referred to as social equity or social sustainability in relation to the Sustainable Livelihoods Approach. These findings address the fourth objective (i.e., the effect of SSQ activities on the livelihood of the operators) that the researcher sought to achieve.

Again, in order to ensure to ensure sustainable development, there is need to recognize informal activities such as stone quarrying by policy makers and NGOs. This is relation to reducing shocks that affect the livelihoods as well as those engaged in them. In the same way, environmental sustainability should be given a high priority in an effort to preserve finite resources for the future generations. There is need to ensure that mining operations are conducted in such a way that the broader scale benefits to society are openly acknowledged and that concerted efforts are made to ensure that these benefits can be sustained even when mining activities have stopped.

Finally, findings from this study show that SSQ contributes positively to livelihoods of rural dwellers. However, these benefits are rather minimal because of the several constraints encountered. It is even not as lucrative as it was as of 2014. In view of this, the importance of small-scale stone extraction needs to be recognised by policy makers in relation to individual, household and community benefits. The realisation of these benefits will enhance sustainable development in the exploitation of this non-renewable natural resource.

5.3 Recommendations

To begin with, there is need to encourage value added products which fetch more money to strengthen the local or regional market. Recognizing the importance of SSQ activity will help address the needs of the workers and provision of necessary assistance. Legalizing the activities is one of the strategies to reduce environmental degradation.

It is also recommended that the workers need to form an association to increase their possibility of loan acquisition from financial institutions to address their financial constraints. Through the association, it will be easier to mobilise funds, organise awareness and sensitization programmes for the workers. From the rules that govern the association, it will be easier to implement safety measures so as to reduce on health hazards that constrain the activities of the workers.

Additionally, the researcher believes under an association, the workers can deal directly with the clients to avoid exploitation by middlemen. Through the association, workers can be trained how to invest their earnings in other income generating projects such as poultry and livestock rearing. These will be sources of income to the workers even after stone quarrying completely depleted. It is worth mentioning that the association, will not only help them to solve internal problems that are common at the quarry but the association will also make it easy for them to present these constraints to concerned authorities for external intervention.

Another important recommendation is that any financial assistance from the government or an NGO should be channeled through the proposed Stone Workers' Association. More financial assistance could be accessed from micro-credit institutions helping the workers to save their earnings with high interest rates. With this at hand, the workers could invest in other forms of

capital such a land, livestock or buildings which in the long run can serve as collateral in acquiring bigger loans in the future.

Furthermore, the government can assist the workers through importation of better extraction tools at a subsidised cost. Through concerned ministries, the government should support research at tertiary institutions to provide simple, cost effective and sustainable mining technology. This will not only be for the students' academic achievement as they practically apply theoretical knowledge; but it will also boost SSQ enterprises at the local level.

In addition, formal or semiformal training should be provided to the workers through extension workers from the Ministry of Energy and Minerals or alternatively as part of development assistance by NGOs. Due to the informal nature of SSQ, accidents and deaths are under reported or not reported at all. Lack of awareness about safety measures against these accidents and preventable diseases coupled with poor tools jeopardise the workers' lives and likewise their livelihood. Through different ministries and the local communities, awareness campaigns and sensitization meetings may be organized periodically at the quarry.

Further, SSQ is undoubtedly environmentally degrading. However, being a source of income, measures can be taken to reclaim the destroyed land. One of the measures could involve filling in the unproductive pits with soil so as to make the useful for other uses in future. Alternatively, the workers can be encouraged to plant fast maturing trees in order to preserve the species that take a long time to reach maturity.

In a nutshell, policy changes will have to start from the national level through amending the national policy to include and recognize informal small scale mining. Changes will then trickle down to districts and lower levels. Of course, the whole process requires prior consultation and

participation by the responsible stakeholders so that the pleas and aspirations of the affected parties are included. In other words, there is need for a bottom – up approach.

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Appendix A

QUESTIONNAIRE

ASSESS THE CONTRIBUTION OF SMALL SCALE QUARRYING TOWARDS THE LIVELIHOOD OF THE PEOPLE IN THE GA EAST MUNICIPALITY IN GHANA

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Sex

(i) Male [ ]

(ii) Female [ ]

2. How old are you?

(i) Under 20 [ ]

(ii) 20-30 [ ]

(iii) 31-40 [ ]

(iv) 41-50 [ ]

(v) 51 and above [ ]

3. Marital status

(i) Single [ ]

(ii) Married [ ]

(iii) Divorced [ ]

(iv) Widow(er) [ ]

(v) Separated [ ]

4. Family size:

(i) 1-3 [ ]

(ii) 4-6 [ ]

(iii) 7-9 [ ]

(v) 10 and over [ ]

5. What is your highest level of education?

(i) Primary [ ]

(ii) JSS [ ]

(iii) Secondary/Vocational/Technical [ ]

(iv) Tertiary [ ]

(v) No Formal Education [ ]

SECTION B: STONE QUARRYING AND WHY ENGAGE IN IT

6. How intensive stone quarrying activity taking place in your community?

(i) High [ ]

(ii) Moderate [ ]

(iii) Low [ ]

7. What has contributed to the stone quarrying activity?

(i) Lucrative [ ]

(ii) Land not fertile [ ]

(iii) Due to increase in estate development [ ]

(iv) Poor weather pattern [ ]

9. Is there ready market for stone?

(i) Yes [ ]

(ii) No [ ]

SECTION C: STONE QUARRYING AND FARMING

10. Is stone quarrying easier than farming?

(i) Yes [ ]

(ii) No [ ]

11. Is stone quarrying more lucrative than farming?

(i) Yes [ ]

(ii) No [ ]

12. Is stone quarrying having effect on the availability of land for farming?

(i) Yes [ ]

(ii) No [ ]

13. Do you believe in food security?

(i) Yes [ ]

(ii) No [ ]

14. If yes, which of the above is relevance in terms of securing food?

(i) Stone quarrying [ ]

(ii) Farming [ ]

SECTION D: CONSTRAINTS OF SMALL SCALE STONE QUARRYING

15. List any specific problem(s) you have in dealing with regulatory bodies?

……
……
……

SECTION E: COPING STRATEGIES TO ADDRESS QUARRYING CONSTRAINTS

16. Are there regulatory bodies intervening in the quarrying issues?

(i) Yes [ ]

(ii) No [ ]

17. If yes, name such bodies

……
……
……

18. Can you mention any of such recent intervention undertaken by such bodies?

……
……
……

19. How intensive is the intervention?

(i) Very intensive [ ]

(ii) Moderately intensive [ ]

(iv) Not intensive [ ]

SECTION F: EFFECTS OF STONE QUARRYING ON THE ENVIRONMENT

20. Are you aware of the effect of the activities of stone quarrying on the environment?

(i) Yes [ ]

(ii) No [ ]

21. If yes, what are the effects?

……
……
……

SECTION G: EFFECTS OF STONE QUARRYING ON LIVELIHOOD

22. What are benefits you derive from the quarrying business?

……
……
……

23. Are the benefits you derive from the quarrying business better than other activities?

(i) Not beneficial [ ]

(ii) Somehow beneficial [ ]

(iii) Beneficial [ ]

(iv) Very Beneficial [ ]

24. Are you aware of the effects of the activities of stone quarrying on farming and production of food?

(i) Yes [ ]

(ii) No [ ]

25. If yes, what are the effects?

……
……
……

26. Are you aware of the effects of stone quarrying on the livelihood of the people in the community?

(i) Yes [ ]

(ii) No [ ]

If yes, what are the effects?

……
……
……

INTERVIEW GUIDE

Introduction

To start, the researcher will do self-introduction and describe the purpose of the study to the participants and assured them of confidentiality and anonymity of information being provided. The nature of the interview will also be described to the participants. Additionally, the researcher will ask the participants to kindly introduce themselves by mentioning their names, age, educational level and the number of years they have engaged in stone quarrying.

Who, Why and Duration of engaging in Stone Quarrying

1) For how long has stone quarrying been done in Ga-East Municipality?

2) Why do people join stone quarrying in spite of other economic activities?

3) Who are mainly involved in the stone quarrying industry and where do they come from?

Constraints of Stone Quarrying

4) What problems are faced by small scale quarrying?

Coping Strategies

5) Are there any mitigation measures put in place to reduce these problems?

6) Are there any government/NGO initiatives to improve the industry in terms of:

a) Awareness/ Sensitization

b) Funds

c) Any other

Effect of Stone Quarrying on the Environment

7) What are the effects of stone quarrying on the environment?

Effect of Stone Quarrying on the Livelihood

8) How has stone quarrying enhanced the different assets at?

a) The stone quarry workers /households:

(i) Natural assets

(ii) Physical capital

(iii) Human capital

(iv) Social Capital

b) Community:

(i) Natural assets

(ii) Physical capital

(iii) Human capital

(iv) Other economic activities in the area