



VULNERABILITY OF RURAL HOUSEHOLDS TO RISKS ASSOCIATED WITH QUARRY ACTIVITIES IN OYO STATE, NIGERIA

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ABSTRACT

Economic and environmental pressure are being exerted on rural communities and their households due to the increase in quarry activities that is being necessitated by increase in demand for crushed rock, gravel and sand in road and building construction. This study therefore examined the vulnerability of rural households to risks associated with quarry activities in Oyo state Nigeria. Multi-stage sampling procedure was used to select respondents in Oluyole Local Government Area. A total of 143 households were sampled from communities that were within five kilometre radius of quarry site in the area. Qualitative and quantitative data were collected for the study. Qualitative data collected were used to buttress discussion of the quantitative data, which was analysed using descriptive statistics, Pearson Product Moment Correlation and ANOVA at $p=0.05$. The mean age of the respondents was 42.5 years. More than half (61.5%) were male, while 83.2% were married and 44.8% and 2.8% had primary and tertiary education respectively. Majority (73.4%) of the respondents engaged in crop farming as their major livelihood activity. Quarry activities were perceived by 97.9%, of the respondents to have caused decrease in crop production due its effect on livelihoods and the environment. Thus majority (77.7%) of the respondents indicated high level of vulnerability of the residents to risks ensued by quarry activities. Diseases such as chronic cough, acute malaria, catarrh and shock due to blasting of rock were highly severe in the study area. Quarry activities in the area have led to migration of people from the communities for health and economic reasons. There is significant relationship between the educational level, household size of respondents and vulnerability to risks associated with quarry activities. Also, significant relationship exists between respondents' livelihood and their vulnerability to risks. Safety net should be provided for people in quarry activity areas across the country so as to reduce the negative effects of the activities on the livelihoods of the people, thereby reducing their vulnerability to associated risks.

Keywords: Quarry activities, vulnerability, risks, rural households

INTRODUCTION

Quarry activities are concerned with the extraction of non-fuel and non-metal minerals from rock (Ukpong, 2012). In Nigeria, there has been increasing demand for crushed rock, gravel and sand in the road and building construction sector in the recent times. This has invariably increased quarrying activities and exerted pressure on the host communities which are mostly rural, whose major economic activity is agriculture. In addition to the significant role being played by rural communities and their households in agricultural production, they are also major stakeholders in the extraction of rocks deposited in their localities. Madhumitha, Bezalel, Devakumar, Kaveri, and Rajagopal (2009) and Oguntoke, Aboaba and Gbadebo (2009) in their studies have established that exploitation of solid minerals comes with various associated hazards and conflicts over natural recourses, which as invariably generated concern in the development world.

Negative environmental effects of quarry activities include noise, dust, effects on fauna/flora/landscape and water resources. Quarry activities pollute air, water and soil, affect the health of people and animals, reduce crop yield and damage buildings (Madhumitha, *et al.* 2009). The destruction of infrastructure, erosion of livelihoods, damage to the integrity of ecosystems and architectural heritage, as well as injury, illness and death of people are some of the direct outcomes of

quarry activities in local communities (Oguntoke *et al.* 2009). Many of such effects are noticed directly on households' livelihoods and the environment in which they live. Thus, households are exposed to various associated risks. The exposure of rural households to risks associated with quarrying activities and operations brings about severe shocks that often cause welfare loss, consequently making such households vulnerable to 'secondary-risks' such as diseases and economic hardship. It has been well documented that people that experience shock try to manage uncertainty and welfare loss using a variety of *ex-ante* and *ex-post* risk management strategies (World Bank, 2000). But these strategies are of short-term positive effects, fragile and considered to be economically damaging. They also undermine developmental efforts and subject the affected individual household to spiral downturn of permanent poverty. Vulnerability, which is defined as the likelihood of a shock to cause a significant welfare loss (Okunmadewa, 2003), is a forward-looking and dynamic view of poverty (World Bank, 2003). The vulnerability of people in rural communities in the proximate of quarry operations, could therefore be explained in terms of the various degree of hazards exposed to, which in addition to the relative poverty situation in rural area, have long-term negative consequences on rural households. As a result rural households could invariably be subjected to become poor or poorer as the case may be due to the effects of quarry

activities on their livelihoods and environment. This study therefore examined the extent of respondents' vulnerability to the risks associated with quarry activities in the study area. The components of vulnerability considered in this study are exposure, sensitivity and resilience of rural households to risks that ensue from quarry activities.

The objectives of the study include to;

1. describe the livelihood activities of the respondents in the study area,
2. identify types of quarry activities operating in the study area,
3. identify the personal characteristics of respondents in the study area.
4. ascertain the extent of respondents' vulnerability to the risks associated with quarry activities across the study area in terms of exposure, sensitivity and resilience,

The hypotheses of the study, stated in null form, are as follows;

- there is no significant relationship between respondents personal characteristics and their vulnerability to risks associated with quarry activities.
- there is no significant relationship between respondents livelihood activities and their vulnerability to risks associated with quarry activities.

METHODOLOGY

The study was conducted in Oyo State, Southwest Nigeria. The State covers a total of 27,249 square kilometres of land mass and it comprises of 33 Local Government Areas. Oyo State is bounded in the south by Ogun State, in the north by Kwara State, in the East by Osun State, while in the west it is partly bounded by Ogun State and partly by the Republic of Benin. The landscape consists of old hard rocks and dome shaped hills. Agriculture is the predominant source of livelihood of people in Oyo State. Major food crops produced in the area include maize, cassava, yam, plantain and banana, while oil palm, cocoa, orange, mango and, cashew constitute cash crops in the state. Oyo State is endowed with solid minerals resources deposited in different parts of the state. Among the solid minerals found in the area are iron ore, gold, columbite, nickel, dolomite, tourmaline, tantalite, beryl, limestone and granite. Oluyole Local Government Area (LGA) was purposively selected, being the LGA with highest level of quarry activities in the state.

Quarry sites in Oluyole Local Government Area were identified, while the communities within five kilometres radius of identified quarry sites were randomly selected. Households in each of the

selected communities were identified, from which a total of 143 households were sampled proportionate to size of the identified communities, and household heads were interviewed. Focus Group Discussion (FGD) and structured questionnaire were used to collect qualitative and quantitative data for the study. Qualitative data collected were used to buttress discussion of the quantitative data, while quantitative data were analysed using descriptive statistics, Pearson Product Moment Correlation and ANOVA at $P \leq 0.05$

RESULTS AND DISCUSSION

Personal characteristics of respondents

- The result on Table 1 shows that 53.9% of the respondents were between the ages of 30 and 59 years. The mean value and standard deviation of respondents' age was 42.5 ± 1.35 years, which implies that more than half of the respondents were in their productive age. It is thus expected that livelihood activities of the people in the area should be high if there is a relative access to livelihood assets by the group of people that are in their active productive age. Such access in a way could enhance household's ability to mitigate the risks associated with quarry activities, thereby reducing the effects of quarry activities on the household vulnerability. However, in a situation where people's access to livelihood assets is denied or hindered in the face of development process and encroachment on people and household's livelihood assets such as farmland or river, there is likelihood of the affected individuals and households becoming poor or poorer, thus increasing households' vulnerability. As expressed by Shahbaz (2008) limited access to source of livelihood could increase level of defencelessness and exposure to shocks thereby increasing people's vulnerability to risks.

The result in Figure 1 shows that more than half (61.5%) of the respondents were male, while 38.5% were female. Among the female respondents were those that were household heads as a result of the death of the male household heads, while other female respondents were those that assumed the position of household head by virtue of the male household heads that have moved out of the community to establish farms elsewhere. Also, some have engaged in other livelihood activities aside farming due to the effects of quarry on their livelihood activities in the area. This was also revealed during FGDs in some of the sampled communities.

The result in Figure 1b shows that majority (83.2%), of the respondents were married, while 12.6% and 3.5% were widowed and single respectively. This implies that negative effects or otherwise of quarry activities on a family member could have direct or indirect consequences on other

members of the family in social or financial terms as a result of their marital status.

Table 1: Distribution of Respondents by Age

Age	Freq (%)	
< 30 years	2 (1.4)	
30 – 39 years	22 (15.4)	
40 – 49 years	34 (23.8)	
50 – 59 years	43 (30.1)	
60 – 69 years	29(20.3)	
70 and above	13(9.1)	
Total	143 (100.0)	
Mean		42.5
Std. var		1.351

Source: Field survey, 2015

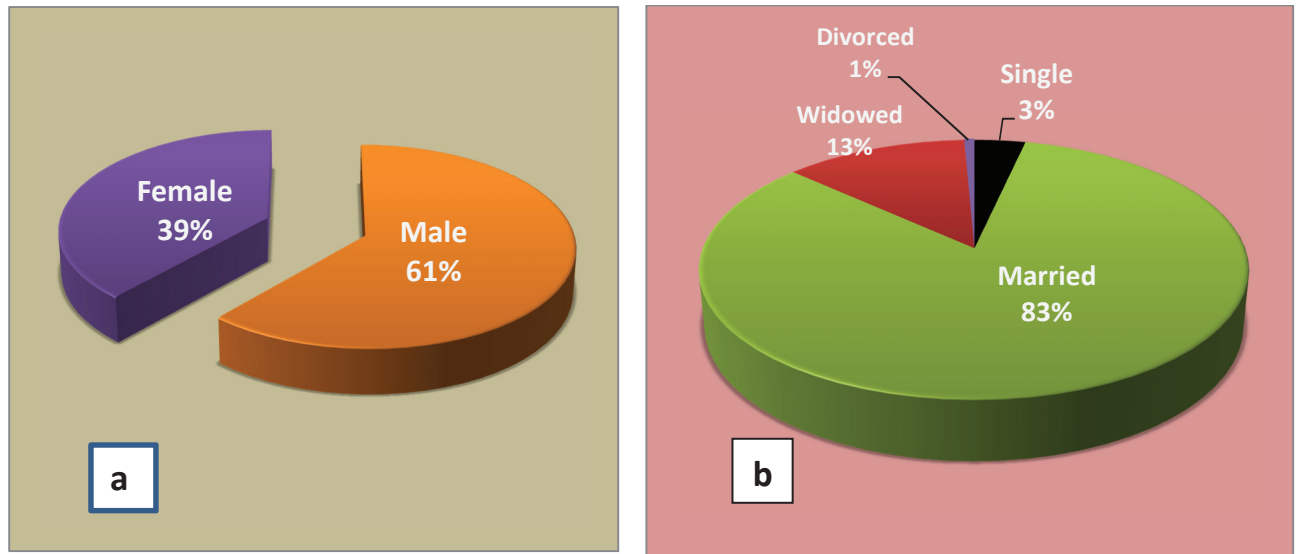


Figure 1: Distribution of Respondents by (a) Sex and (b) Marital Status

Educational level of respondents - The findings on Figure 3 reveal that a relatively large proportion (44.8%) of respondents had only primary education, while 33.5% had no formal education. Only 2.8% had tertiary education. This implies that the educational level of respondents is relatively low. This could have significant influence on the ability of the respondents to take advantage of innovations and opportunities in agricultural production as well as their capability to diversify their livelihood activities in the face of the effects of quarry activities in their area. According

to Phillip and Rayhan (2004), high level of illiteracy is a serious problem in improving the livelihoods of people, because those without formal education have limited opportunity of making use of improved production technologies. This assertion follows that the relative high level of poverty among rural households as admitted by Nishara, (2003), can be attributed to the low literacy level that characterises rural communities. This is because educational attainment has been considered as one of the indicators of household vulnerability index and poverty.

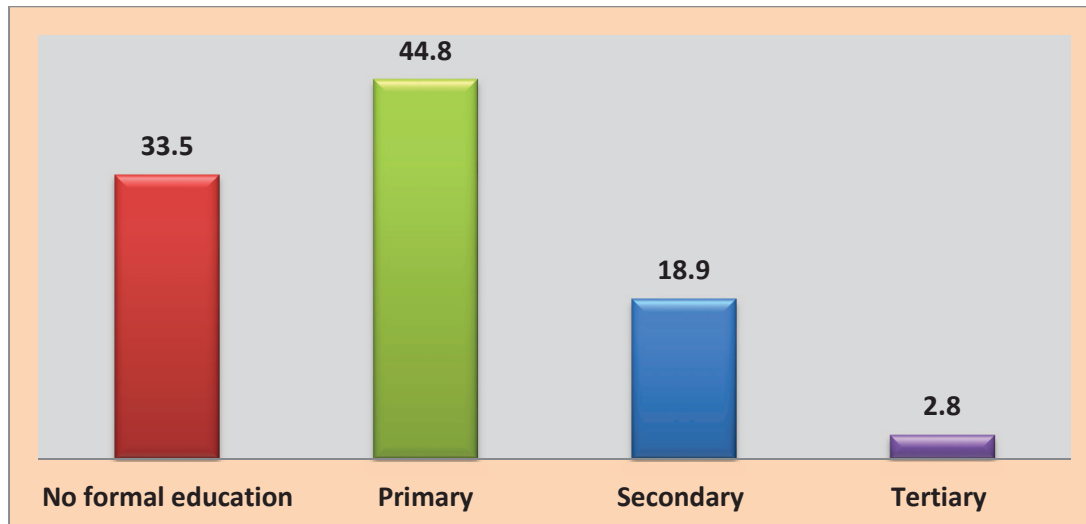


Figure 3: Educational level of Respondents

Livelihood activities engaged in by respondents

The findings on Table 3 show that majority (73.4%) of the respondents were engaged in crop farming as their major livelihood activity across the sampled communities, while 23.1%, and 8.4% of the respondents engaged in processing of farm produce and marketing of farm produce respectively. This implies that majority of the people in the study area engaged in agriculture related livelihood activities. Among other activities engaged in by the respondents in the study area were hunting (7.0%), livestock rearing (4.2%) and fishing (3.5%) activities while only 2.1% were engaged as quarry labourers. This implies that the effects of quarry activities on the environment and land resources upon which agricultural production is based will invariably have serious deleterious effects on larger categories of people engaging in agricultural related activities as their major source of livelihoods. The findings also imply that quarry activities do not provide the expected employment opportunities to rural household members of communities where quarry companies were located. It was revealed during FGDs in some sampled communities in the LGA that some local persons that were employed at the commencement of the quarry operation in the area were later laid

off by the quarry authority without genuine reasons for such action. As explained by a discussant

“our expectation was high at the commencement of quarry operations in this area, with the hope that some members of communities in this area will be employed as quarry workers, having the idea that quarry activities will definitely affect our farming activities”.

The discussant went further that;

“the effects of quarry activities have reduced farming activities and the earnings from it. We see this situation as an important reason for the quarry company to engage our people in quarry operations where they can be earning some living to manage the effects of quarry activities on our livelihoods in this area”.

A female respondent during the FGD admitted that

“if those that were engaged by the quarry company were not laid off, it would have contributed to the quality of life of some households in this area, and their employment would have been considered as part of benefits to be derived by the local community from quarry operators”.

Table 2: Distribution of respondents by Livelihood activities

*Livelihood activities	Freq / %
Crop farming	105 (73.4)
Livestock rearing	6 (4.2)
Processing of farm produce	33 (23.1)
Fishing	9 (3.5)
Marketing of farm produce	12 (8.4)
Hunting	10 (7.0)
Hired labour	5 (3.5)
Gathering of non-timber forest product	3 (2.1)
Artisans	3 (2.1)
Quarry labourer	3 (2.1)

*Livelihood activities	Freq / %
Transporters	6 (4.2)

Source: Field survey, 2015

Respondents' perceived effects of quarry activities on their vulnerability to risks associated with quarry activities.

Respondents' perceptions of their vulnerability to risks that ensue from quarry activities are shown on Table 4. Respondents' vulnerability in the study area was considered in terms of their exposure, sensitivity and resilience (the adaptive capacity to cope with or mitigate the effects) as well as the health risks associated with quarry activities. Across all the sampled communities, majority of the respondents agreed to virtually all the statements that bordered on their exposure, sensitivity and resilience to the effects of quarry activities.

The result shows that 97.9%, of the respondents agreed that there has been decrease in crop production as a result of quarry activities. This has invariably affected people's income and hence their purchasing power of basic necessities has reduced. Also 96.3% agreed that lack of monitoring of quarry activities by relevant agencies has contributed to the extent of the effects of quarry activities in the study area. Respondents were of the opinion that proper monitoring and regulation of quarry activities by government regulatory agencies would have reduced the effects on people's livelihoods and the environment in the study area. In the same vein, majority (94.4%) of respondents agreed that proximity of communities to quarry site could be a serious factor for exposure of people to risks associated with quarry activities in the area, thereby making them vulnerable to such risks.

Also, in terms of sensitivity of respondents to the effects of quarry in the study area, 73.5% of the respondents disagreed that they could still make reasonable income from their livelihood activities, while 72.9% also disagreed that they could live

comfortably in terms of consumption and welfare, in spite of the effects of quarry activities in the area. Meanwhile, 74.7% and 84.5% agreed that the rate at which quarry activities were being carried out and the low financial capacity of the people in the area respectively, could increase the degree to which people were affected by quarry activities in the area. The implication of this is that there is high degree of effect of quarry activities on people's lives, with less ability on the part of the people to cope with the effects. Thus, it could be said that their vulnerability to effects of quarry activities is high. Corroborating this finding, Shahbaz (2008) in his assertion states that lack of access to livelihood assets by rural people may have serious impact on their level of vulnerability to risks, because limited access to source of livelihood could increase level of defencelessness and exposure to shocks and stress.

The trucks generate heavy dust particles that affect people, plants and animals in the area. Exposure of people, plant and animal to the persistent dust particulates has had serious implications on their vulnerability. Flyrock (the rock fragment propelled beyond the blast area by the force of an explosion) as explained by respondents in the study area has been one of the incidents in quarry operations that often cause injuries to people and damage properties. According to Mohamad, Armaghani and Motaghedi (2013), flyrock has been the cause of most injuries and damages to properties in quarry and surface mining activities. At Lamulo, and Orile-Koka communities in the LGA, flyrock was reported to have caused injuries to some residents of the communities, while houses have also being damaged by flyrock as shown in Plate 1



Plate 1: An inhabited house whose dilapidation was caused by flyrock and vibration at Lamulo village, located few meters from a quarry site in Oluyole LGA. Oyo State

The inference could be drawn from this finding that people living in quarry activity areas are prone to various environmental and health risks, coupled with lack of good health facilities and services in the rural areas. People are thereby vulnerable to adverse health hazards of quarry

operations. Accessibility of people to good health facilities and services in environmentally vulnerable and prone areas should therefore be of concern to respective governments, organisations and individuals in the face of developmental process.

Table 3: Respondents perceived effects of quarry activities on their vulnerability to risks associated with quarry activities

Statements Exposure	Degree SA	A	U	D	SD	WMS	*Rank
Farm lands were directly affected by quarry activities resulting in decrease in production.	293 (87.2)	36 (10.7)	0 (0.0)	7 (2.1)	0 (0.0)	4.83	1 st
Lack of adequate monitoring of quarry activities by relevant government agencies exposes people to advert effects of quarry activities.	239 (71.1)	78 (25.2)	8 (2.4)	9 (2.7)	2 (0.6)	4.62	2 nd
Lack of access to financial credit facilities could aggravates the effects of quarry activities on people.	187 (55.7)	120 (35.7)	17 (5.1)	12 (3.6)	0 (0.0)	4.42	4 th
Large house size could contribute to inability of people to adequately manage the ensued financial problem associated with the effects of quarry activities.	130 (38.7)	114 (33.9)	72 (21.4)	13 (3.9)	7 (2.1)	4.03	10 th
Relative low income from livelihood activities in this area could aggravates the effect of quarry activities on the people.	127 (37.7)	161 (47.9)	33 (9.8)	14 (4.2)	1 (0.3)	4.13	8 th
Lack of adequate livelihood assets could worsen the effects of quarry activities on households	158 (47.0)	156 (46.4)	15 (4.5)	3 (0.9)	4 (1.2)	4.34	5 th
Proximity to quarry site contribute to the severity of the effect of its activities on households.	219 (65.2)	98 (29.2)	7 (2.1)	5 (1.5)	2 (0.6)	4.52	3 rd
Sensitivity							
Low financial capacity of household head could make it difficult to cope with the effects of quarry activities on livelihood outcomes.	143 (42.6)	141 (41.9)	21 (6.3)	14 (4.2)	17 (5.0)	3.84	15 th
Adequate knowledge of environmental regulations could help in curbing the environmental effect of quarry activities.	89 (26.4)	103 (30.6)	22 (6.5)	39 (11.6)	83 (24.7)	4.11	9 th
I could still make reasonable income from my livelihood activity in spite of quarry activities in this area.	30 (8.9)	19 (5.7)	40 (11.9)	122 (36.3)	125 (37.1)	2.09	21 st
My family could still live relatively comfort in terms of consumption and welfare, despite the effects of quarry activities.	17 (5.1)	38 (11.3)	36 (10.7)	155 (46.1)	90 (26.8)	2.21	20 th
The rate at which quarry activities are being carried out could increase its effects on livelihoods and reduce the capability to recover the effects.	160 (47.6)	91 (27.1)	22 (6.5)	57 (17.0)	6 (1.8)	4.02	11 th
Resilience (adaptive capacity)							
I have engaged in other livelihood activities in order to cope with the effect of quarry activities.	82 (24.4)	152 (45.2)	10 (3.0)	32 (9.5)	60 (17.8)	4.18	7 th
My family consumption has reduced to cope with financial shortfall resulting from effects of quarry activities	76 (22.6)	163 (48.5)	31 (9.2)	43 (12.8)	23 (6.8)	3.76	16 th
My children education was affected due to lack of financial capability.	104 (31.0)	23 (6.8)	47 (14.0)	95 (28.3)	66 (19.6)	3.22	19 th



Statements Exposure	Degree						WMS	*Rank
	SA	A	U	D	SD			
I have to trek long distance to establish another farm that is free from quarry pollution.	87 (25.8)	94 24.9	26 (7.7)	73 (21.7)	56 (16.6)		3.93	13 th
Sending children to stay with relations in other community/city could help to reduce family expenses in order to manage the effects of quarry activities.	60 (17.9)	61 (18.1)	44 (13.1)	120 (35.6)	51 (15.2)		3.47	18 th
Lack of good health care facilities in this area has caused people to travel long distance to seek medical attention for diseases associated with quarry activities.	117 (34.7)	103 (30.6)	10 (3.0)	77 (22.9)	29 (8.6)		4.22	6 th
Due to non-availability / poor health facilities, people have taken to traditional method of treatment.	87 (26.4)	91 (27.0)	7 (2.1)	98 (29.1)	53 (15.7)		3.97	12 th
Forming a pressure group in order to ensure compliance with environmental regulations with respect to quarry activities could reduce the effects of quarry activities.	65 (19.3)	79 (23.5)	61 (18.2)	53 (15.7)	78 (23.2)		3.88	14 th
Reduction in hired labourer could reduce farm expenses in order to manage low income resulting from the effect of quarry operation on livelihood.	62 (18.4)	61 (18.2)	62 (18.4)	95 (28.2)	56 (15.2)		3.50	17 th

Source: Field survey, 2015

Level of vulnerability of respondents

The result shows the level of vulnerability with percentage of respondents whose scores were below and above the mean value of 84.6. The result reveals that majority (77.7%) of the respondents indicated high level of vulnerability with scores above mean value, while 22.3% below the mean value indicated low vulnerability level as far as

effects of quarry activities is concerned. This implies that the residents of communities in the study area were highly vulnerable to the associated risks that ensued from quarry activities. The result can further be explained that the people in the study area perceived themselves to be highly exposed to adverse effects of quarry operation with less resilience to cope or manage the effects.

Table 4: Level of vulnerability of respondents

Level vulnerability	Range of score	Freq	%
Low	56 - 84	75	22.3
High	85 - 105	261	77.7
Minimum score	56.00		
Maximum score	105.00		
Mean score	84.6		
Std dev	11.0		

Source: Field survey, 2015

Perceived Health risks associated with quarry activity

The result on Table 5 shows that there was a high level of severity of most of the diseases associated with quarry operations as indicated by respondents in their responses to questions on severity of quarry related diseases in the area. Diseases such as chronic cough, acute malaria, catarrh and shock due to blasting of rock were said to be highly severe as indicated by 60.0%, 67.4%, 64.6% and 64.0% of respondents respectively in the communities. Also, more than half of the respondents comprising 63.0%, 61.8%, and 64.25% indicated that malaise (a general feeling of discomfort, illness, or unease), nasal infection and

hearing impairment respectively were highly severe.

It was gathered during FGD conducted in the sampled communities that air pollution arising from stone dust emitted by crushing of rock and haulage of quarry products is a major problem for the inhabitants of communities near quarry sites. In three particular communities in Oluyole LGA namely; Aba Bale-Ajogbobi, Dale and Akilapa located along the road leading to multiple quarry sites, discussants lamented that diseases affecting people in the area were attributed to persistent exposure to polluted air from dust generated by quarry trucks. Regrettably, people of these communities admitted that many lives have been

lost due to air pollution related diseases leading to respiratory diseases as a result of inhalation of dust. Corroborating the findings of this study, Madhavan and Raj (2005) report that the dust particles emitted into the air during periods of clearing of vegetation, blasting, loading and haulage of quarry products by heavy trucks impair visibility and cause cardiovascular diseases such as silicosis, tuberculosis and bronchitis which could lead to pulmonary fibrosis and premature death of the people within the vicinity of quarry operations from time to time.

It was observed that in many of the sampled communities, there was no primary health or maternity centers providing health services to

people in the area. During FGDs in the sampled communities, discussants explained lack of health facilities as a major challenge with respect to series of health problems associated with quarry activities in their area. Non-availability of health facilities and services in those communities made people stay off their livelihood activities for many days longer than necessary when they take ill. While some people have to travel long distance to access treatment for their ailment, others have resulted to making use of herbs and local concoction to treat their ailments. By implication people in the study area were vulnerable to health risks associated with quarry activities.

Table 5: Perceived Health risks associated with quarry activity

Types of disease in the community that may be associated with quarry activities	Level of severity in the community				
	Less severe	Moderately severe	Highly severe	WMS	*Rank
Chronic cough	5 (1.5)	128 (44.0)	202 (60.0)	2.02	3 rd
Acute malaria	17 (5.1)	86 (25.5)	227 (67.4)	1.45	6 th
Catarrh	8 (2.4)	104 (31.0)	217 (64.6)	2.58	1 st
Sinusitis – (allergies & chemical or particulate irritation of the sinuses).	68 (20.2)	75 (22.3)	50 (14.9)	0.29	15 th
Gastro-intestinal infection	71 (21.1)	98 (29.2)	59 (17.6)	1.14	9 th
Fungal dermatitis – (chronic, itching, inflammatory skin disease associated with asthma)	6 (1.8)	91 (27.1)	181 (53.8)	0.12	16 th
Malaise (a general feeling of discomfort, illness, or unease)	15 (4.5)	76 (22.6)	212 (63.0)	0.96	10 th
Hypertension	11 (3.3)	53 (15.8)	151 (44.9)	1.70	5 th
Silicosis	6 (1.8)	73 (21.7)	25 (7.5)	0.68	13 th
Nasal infection	25 (7.4)	92 (27.3)	208 (61.8)	1.38	7 th
Shock	15 (3.9)	81 (24.1)	215 (64.0)	2.45	2 nd
Hearing impairment	9 (2.7)	105 (31.3)	216 (64.2)	1.71	4 th
Asthma	16 (4.8)	65 (19.3)	58 (17.2)	0.76	12 th
Pharyngitis-which may be cause by smoke or dust pollution (inflammation of the pharynx)	14 (4.2)	52 (6.5)	44 (13.1)	0.77	11 th
Diarrhoea	15 (4.5)	19 (5.7)	73 (21.7)	0.33	14 th
Eye problem due to dust particle	8 (2.4)	101 (30.0)	227 (67.4)	1.35	8 th

Source: Field survey 2015

Test of Hypotheses

Ho₁: There is no significant relationship between respondents’ personal characteristics and their vulnerability to risks associated with quarry activities.

The result on Table 6 shows that there is significant relationship between the educational level, household size of respondents and vulnerability to

risks associated with quarry activities. This implies that the level of education attained by individual respondents could be a factor in the extent to which an individual could manage or cope with the effects of quarry activities, while household size could be a differential factor among households with respect to the level at which household’s livelihoods were affected by quarry activities in the area.

Table 6: Analysis of relationship between respondents’ personal characteristics and vulnerability to risks associated with quarry activities

Variable	χ^2	Df	p-value	Decision
Age	0.004	6	0.10	NS
Sex	0.510	3	0.70	NS



Variable	χ^2	Df	p-value	Decision
Marital	1.570	3	0.65	NS
Educational level	0.270	4	0.009	S
Household size	19.0	6	0.004	S

H₀2: There is no significant relationship between respondents' livelihood activities and their vulnerability to risks associated with quarry activities.

The result Table 7 shows that there was a significant relationship between respondents' livelihood and their vulnerability to risks. This implies that effects of quarry activities on

livelihoods of people in the area exposed them to various risks associated with quarry activities. The degree of exposure and sensitivity of people's livelihoods coupled their resilience to cope/manage the effects resulted in high level of people's vulnerability to risks associated with quarry operations in the study area.

Table 7: Analysis of relationship between respondents' livelihood activities and vulnerability to risks associated with quarry activities

Variable	χ^2	df	p-value	Decision
Livelihood activities	-0.03	1	0.001	Sig.

Conclusion and Recommendations

Quarry activities have negative effects on the livelihoods of respondents in the study area. The effects have resulted in low crop yield and income of respondents. The level of respondents vulnerability to risks associated with quarry activities was high. Respondents were exposed to various health, economic and social risks due to quarry activities in the study area. Respondents' livelihoods were highly sensitive to the effects of quarry activities in the area with respect to the rate at which people's livelihoods were exposed to the effects, and the resilience of the affected individuals to manage, cope and/or recover from the accumulated negative impact of the effects. Empirically, significant relationship exists, though negative between the respondents' livelihood activities and their vulnerability to risks associated with quarry activities in the study area.

Based on the findings of this study, it is therefore recommended that;

- Socio-economic and environmental impact baseline study should be extensively carried out and the report adequately analyzed and the recommendations strictly adhered to, so as to identified the short and long term effects and impacts of quarry activities on the environment and people living in the area of the quarry activities.
- Safety net should be provided for people in quarry activity areas across the country so as to reduce the negative effects of the activities on the livelihoods of the people.

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