Assessment of Environmental Impacts of Quarry Operation in Ogun State, Nigeria

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Abstract - The study investigated the environmental effects of quarry operations in Abeokuta, Ogun state, while it specifically sought to identify corresponding environmental impacts posed in quarry operation and, assess the efforts towards minimizing environmental impacts of their operations. Primary data used for this study was obtained from 100 residents of the community and staffs of the company, randomly chosen and administered with structured questionnaires. Ninety one percent of the respondents noted that environmental problems like land degradation and pollution (including air, water and noise pollution) are associated with mining activities in their respective communities. Air pollution and noise pollution were found to have significant (p < 0.05). Long period (58.0%) of surface mining (71.7%) is prominent in the study area, while it posed some hazards to residents in the study area (84.0%). This includes (degradation of land and vegetation (72.0%), water pollution (44.0%), air pollution (44.0%) and noise pollution (56.0%). Noise and air pollution and governmental intervention in environmental degradation of Mining were found to have significant impact on host community as identified by staff of mine and residents. Efforts towards minimizing environmental impacts of quarrying include resettlement and compensation of affected communities. Environmental effects such as land degradation and pollution of various forms (air, ground vibration and noise) in the surrounding communities where the mining activities (quarry operations) are carried out are associated with surface mining activities. It is therefore recommended that government agencies overseeing mining operations revise environmental management policy to ensure that the environmental effects of mining activities are reduced to the barest minimum.

Keywords - Air pollution, environmental impacts, ground vibration, land degradation, noise pollution, water pollution

1 INTRODUCTION

Mining has been identified to comprise various activities involving the removal of minerals (Acheampong, 2004) (including quarrying), producing several raw materials (Mbendi, 2004) which have lots of environmental and health impacts. These have emanated from the methods of operation by the various mining firms bridging quarrying intermediation and underlying principles, its effects on the natural environment as well as the people in the surrounding communities (Scholtens and Van Wenveen, 2000; Shrock, 2002; Nyakeniiga, 2009). The health cost of mining operations sometimes outweighs the benefits gained. Costs on health hazards covers harmful dust and noise which is emitted during surface mining operations (Risk Assessment Workbook for Mines, 2009).

The gains from the sector in form of increased investment are being achieved at great environmental, health and social costs to the residence, recording series of public outcry against the mining companies. The private sector of an economy plays a major role in the development of most mining projects, these mining projects in turn creates income and generated revenues for the economy which is used in its development and growth. Since the private sector’s main goal is to maximize profit, the private sector is less concerned with the harm that it poses to the environment. But in spite of its economic benefits, mining activities in the study area have adverse and serious effect on land use and land cover. The study area vegetation cover had been cleared by quarry companies which have a sole purpose of extracting granite deposit, regardless of its environmental impacts and implication on land and its use.

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A quarry is a place from which dimension stone, rock, construction aggregate, riprap, sand, gravel, or slate has been excavated from the ground. A quarry is the same thing as an open-pit mine from which minerals are extracted (Wikipedia, 2016) while quarry operations involves not only extraction of material (rock) but also crushing and screening that makes the rocks suitable for use as construction materials, industrial materials, agricultural materials etc. So many quarries exist in this very nation and thus, generating substantial income and revenue to the economy and reducing poverty but its environmental impact are been neglected by the authorities responsible for the establishment of this quarries and also by quarry owners and operators.

There has been a considerable increase in mining activities, particularly quarry operations at Ajebo road, Obafemi - Owode Local Government Areas of Ogun State which has drastically reduced the standard and increased the cost of living of residents of the community. The quarry operation involves the drilling of the granite outcrop and blasting of the outcrop using explosives. The drilling operation requires the use of heavy machines which emits gases that are harmful to the environment; this is peculiar to mining activities generally in Nigeria (Risk Assessment Workbook for Mines, 2009; Odumo, et. al., 2011). In addition, explosives are used to blast the large rocks to aid excavation of the area where granite is extracted. The blasting operation produces air blast and the vibrations that affect the people within the surrounding communities’ a lot. The vibration and air blast produced causes buildings of the indigenes to have cracks and buildings that are very close to the quarries suffer much from breaking of glasses and other glass wares in their homes. Moreover, the resulting blasting operation in this area is sometimes
accompanied with incomplete detonation of the explosives which causes the release of some toxic gases to the atmosphere and hence pollutes the environment. Added to these events is the issue of flying rocks being experienced by the residents, when the rocks flies and travels beyond the expected and anticipated limit. Flying rock and failure to secure the blasting area dominate blasting-related accidents in mining. A thorough research into the current environmental impacts of Ajebo road, Obafemi – Owode Local Government area of Abeokuta, Ogun state is therefore necessary; through specific investigation into the various quarry operations and associated risks in the quarries, identifying corresponding environmental impacts posed in quarry operation and, assessing the efforts towards minimizing environmental impacts of their operations.

2 RESEARCH METHODOLOGY

2.1 STUDY AREA
The study area is Ajebo, Obafemi – Owode Local Government, Abeokuta, Ogun State, Nigeria. It has its coordinate as 6°57’N 3°30’E and it has an area of 1,410 km² (wikipedia, 2016). The area is dominated by local indigenes who are mostly farmers and petty traders. Over the past years, quarry companies in this region have increased tremendously due to the abundance of granite deposit present in the area. The granite deposit in this area mostly as an outcrop and hence there is usually no need to strip the overburden.

2.2 SAMPLING TECHNIQUES
Simple random sampling was employed in selecting 100 respondents (50 staffs of the quarry and 50 non – staff residents of the communities for this study, while they were administered with structured questionnaires by well trained enumerators. Data collected covers mining operations, environmental impacts and attempts at reducing the effect of the environmental impact.

2.3 DATA ANALYSIS
The responses provided by the respondents via the questionnaire were organized using descriptive statistics such as frequency distributions tables, bar charts and inferential statistics such as chi - square etc.

3 RESULTS AND DISCUSSION
Most (60.0%) of respondents have been living in the study area for more than 10 years. This study revealed that respondents have full awareness of surface mining (94.0%, staff; 66.0% non - staff residents) activities in the study area (92.0%). Respondents believed that quarry activities have effects on the natural environment (84.0%, non-staff residents; 98.0%, staff). Degradation of land and vegetation (72.0%, non-staff residents; 70%, staffs), noise pollution (56.0%, non-staff residents; 88%, staffs), Air pollution (44.0%, non-staff residents; 70%, staffs) and water pollution (44.0%, non-staff residents; 66%, staffs) were identified effects of the surface mining in the study area. The use of toxic materials (72.0%) and long period of mining (72.0%) were identified causes of land degradation and pollution while there have been some attempts by the government or company to reduce these environmental impact of mining (34.0%, non-staff residents; 74 %, staffs).

Table 1: Mining Operations and Environmental Impact

|                        | Residents Freq. (%) | Staff Freq. (%) |
|------------------------|---------------------|-----------------|
| Ever aware of mining here? |                      |                 |
| Yes                    | 46 (92.0)           | -               |
| No                     | 4 (8.0)             | -               |
| Method of extraction   |                      |                 |
| Surface mining         | 33 (66.0)           | 47 (94.0)       |
| Dredging               | 2 (4.0)             | -               |
| I don’t know           | 11 (22.0)           | 3 (6.0)         |
| Operational methods have effect on natural environment | | |
| Yes                    | 42 (84.0)           | 49 (98.0)       |
| No                     | 4 (8.0)             | 1 (2.0)         |
| What effects?          |                      |                 |
| Land degradation       | 36 (72.0)           | 35 (70.0)       |
| Water pollution        | 22 (44.0)           | 33 (66.0)       |
| Air pollution          | 22 (44.0)           | 35 (70.0)       |
| Noise pollution        | 28 (56.0)           | 44 (88.0)       |
| Land degradation causes? |                  |                 |
| Presence of tailing dams | 14 (28.0)     | -               |
| Use of toxic materials | 36 (72.0)           | -               |
| Use of heavy machines  | 21 (42.0)           | -               |
| Long period of mining  | 35 (70.0)           | -               |
| Identified causes any pollution? | | |
| Presence of tailing dams | 19 (38.0)     | -               |
| Use of toxic materials | 22 (44.0)           | -               |
| Use of heavy machines  | 15 (30.0)           | -               |
| Long period of mining  | 29 (58.0)           | -               |
| Governmental or company attempts to reduce Impact? | | |
| Yes                    | 17 (34.0)           | 37 (74.0)       |
| No                     | 24 (48.0)           | 11 (22.0)       |
| If yes, what measures are taken? (multiple selection) | | |
| Re - forestation        | 3 (6.0)             | 20 (40.0)       |
| Resettlement of communities | 10 (20.0) | 28 (56.0)       |
| Providing alternative source of drinking water | 9 (18.0) | 30 (60.0) |
| Compensation to affected communities | 10 (20.0) | 22 (44.0) |
| Reviewing or varying methods of operation | 6 (12.0) | 23 (46.0) |
| Others                 | -                   | 2 (4.0)         |
| Efforts satisfactory and effective? | | |
| Yes                    | 13 (26.0)           | 35 (70.0)       |
| No                     | 4 (8.0)             | 3 (6.0)         |
Air pollution, noise pollution and interventions from both government and Quarry Companies were noted in this study to have significant effect on environment and host communities around quarry sites as shown on Table 2 above.

Table 2: Environmental Effect of Mining Operation

|                        | Respondents | Chi-square | p-value |
|------------------------|-------------|------------|---------|
| Land degradation       |             |            |         |
| Yes                    | 36          | 35         | 3.038   | 0.081 |
| No                     | 6           | 13         |         |       |
| Water pollution        |             |            |         |
| Yes                    | 22          | 33         | 2.526   | 0.112 |
| No                     | 20          | 15         |         |       |
| Air pollution *        |             |            |         |
| Yes                    | 22          | 35         | 4.068   | 0.044 |
| No                     | 20          | 13         |         |       |
| Noise pollution *      |             |            |         |
| Yes                    | 28          | 43         | 7.064   | 0.008 |
| No                     | 14          | 5          |         |       |
| Other effects          |             |            |         |
| Yes                    | 0           | 1          | 0.885   | 0.347 |
| No                     | 42          | 47         |         |       |
| Any governmental or company attempts to reduce Impact? * |             |            | 11.758   | 0.001 |
| Yes                    | 17          | 37         |         |       |
| No                     | 24          | 11         |         |       |

Table 3: Attempts at Reducing Environmental Effect of Mining Operation

|                        | Respondents | Chi-square | p-value |
|------------------------|-------------|------------|---------|
| Re - forestation *     |             |            |         |
| Yes                    | 3           | 20         | 6.314   | 0.012 |
| No                     | 14          | 17         |         |       |
| Resettlement of affected communities |     |            |         |
| Yes                    | 10          | 28         | 1.587   | 0.208 |
| No                     | 7           | 9          |         |       |
| Providing alternative source of drinking water * |             |            |         |
| Yes                    | 9           | 30         | 4.598   | 0.032 |
| No                     | 8           | 7          |         |       |
| Compensation to affected communities |         |            |         |
| Yes                    | 10          | 22         | 0.002   | 0.965 |
| No                     | 7           | 15         |         |       |
| Reviewing or varying methods of operation |         |            |         |
| Yes                    | 6           | 23         | 3.382   | 0.066 |
| No                     | 11          | 14         |         |       |

* Significant attempt at reducing environmental impact at 5%

Of all the attempts made towards relieving host communities of the environmental impact of quarry activities in the study area, provision of alternative source of drinking water was observed to be most significant intervention. This relates to the domestic need of the communities, as they need water to run household duties.

4 CONCLUSION

As much as we do acknowledge the economic benefits of mining activities in Nigeria, there is the need also to recognize the environmental hazards that come with it in order to find ways of dealing with them. This study revealed quarry activities have various effects on the natural environment which includes degradation of land and vegetation, noise pollution, air pollution and water pollution were identified as significant (p < 0.05) effects of the surface mining in the study area. The use of toxic materials and long period of mining were identified causes of land degradation and pollution while there have been some attempts by the government or company to reduce these environmental impact of mining.

Provision of alternative source of drinking water was noted to be the most significant (p < 0.05) intervention received by the host community over environmental hazards (water pollution) posed by the companies. Stringent and rigorous efforts at re-forestation, resettlement of affected communities and other measures aimed at restoring back degraded lands to its original state after mining activities should be intensified by the mining companies.
5 RECOMMENDATION

Government agencies responsible for mining activities should revise its environmental management policy to ensure that the environmental effects of mining activities are reduced to the barest minimum, while adequate compensation is paid to host communities whose livelihood is affected by the mining operations of the quarry companies.

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