

# Environmental Effect of Quarrying Activities in Oba-Ile, Akure, Ondo State, South-West Nigeria

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## Abstract

*With the accumulation of knowledge and increase in sophistication and machines, man has acquired the capacity to change the environment for his needs through his various activities one of which is quarrying. Quarrying activities cause significant effect on the local environment. This study was done to evaluate the effect of quarrying on the inhabitants of Oba-Ile, Akure, Ondo State. Questionnaire and one-on-one interview were conducted to understand the sufferings of the inhabitants due to the various activities involved in quarrying, which had led to various environmental pollution and its accompany effects.*

**Keywords:** Quarrying, Pollution, Environment, Effect.

## Introduction

Searching, locating and extracting materials used for construction activities pose some problems to the environment which normally result in the damaging of the immediate environment and atmosphere. Rock-quarrying and stone crushing is a global phenomenon, and has been the cause of concern everywhere in the world, including the advanced countries. Quarrying activity is a necessity that provides much of the materials used in traditional hard flooring, such as granite, limestone, marble, sandstone, slate and even just clay to make ceramic tiles. However, like many other man-made activities, quarrying activities cause significant impact on the environment (Okafor, 2006).

Explosives are employed in rock blasting to extract material for processing; this produces noise and air pollution. Also, it destroys the wildlife's natural habitat. Whilst a quarry is in use, the effects on the local environment are more than just the loss of wildlife's habitats and the obvious visual impact. A working quarry needs methods of transportation and this means that large amount of machinery and heavy traffic will be brought into the area causing an increase in local noise pollution and erosion. The vehicles and machineries release carbon II oxide (Co) due to incomplete combustion of fuel, also nitrogen oxide (Na) from petroleum.

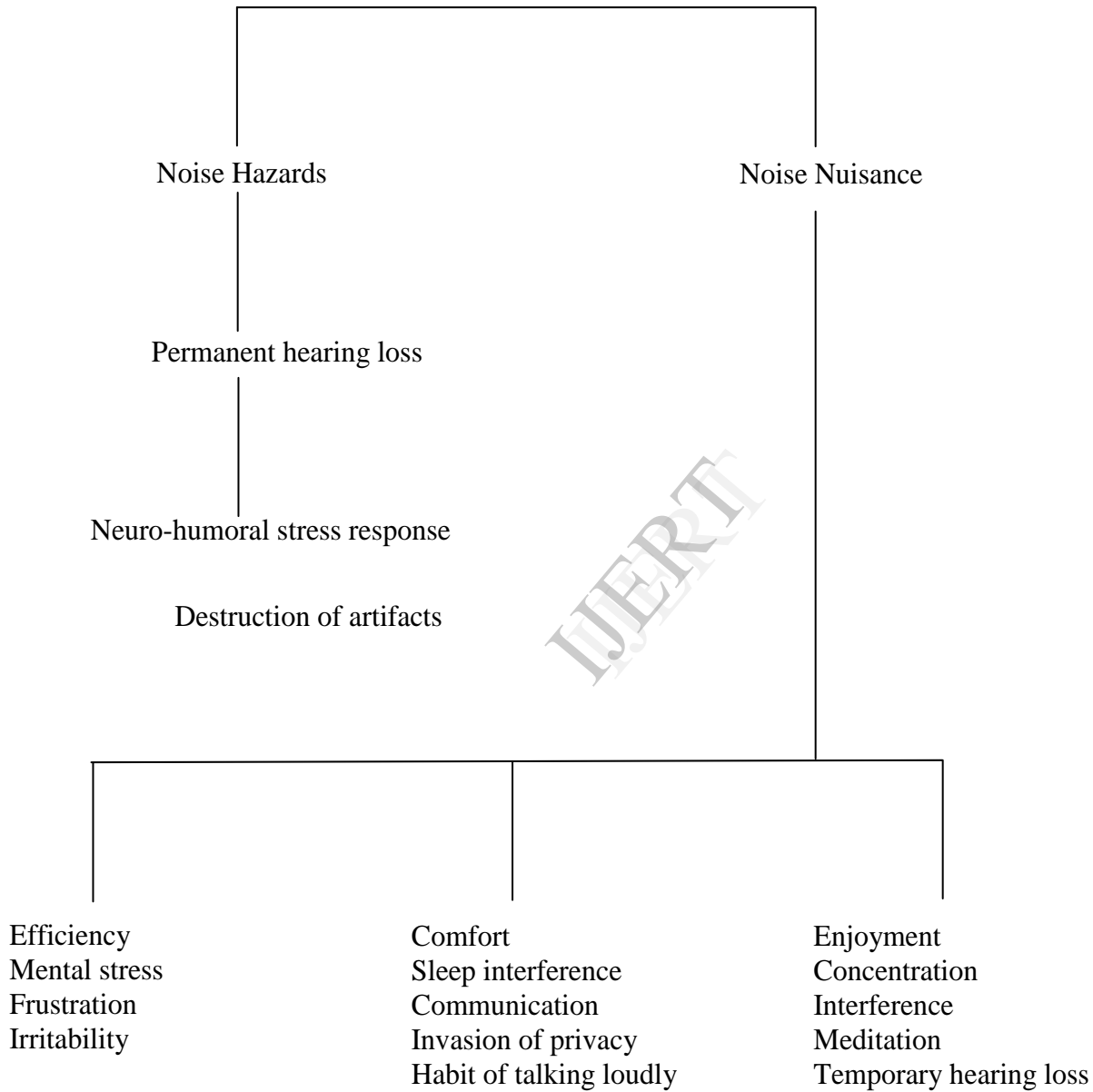
Table 1: Effects of Air-Pollutants on Human Health

S/N	POLLUTANT	CHARACTERISTICS (IF ANY)	SOURCE	HEALTH EFFECTS
1.	Suspended particulate matter	Solid particles like dust, smoke and fumes; liquid particles like mist and fog	Dust storms; cigarette smoke; smoke from burning of garbage, fossil fuel; and fumes like those of zinc or lead, etc.	Effects on breathing and respiratory systems, aggravation of existing respiratory and cardiovascular diseases, alteration of body's defence systems against foreign materials, damage to lung tissues, carcinogenic effects, and premature mortality (still-births). Elderly people and children are most sensitive.
2.	Sulphur dioxide (SO <sub>2</sub> )	Colourless gas; taste threshold at about 0.3ppm; and odour threshold at about 0.5ppm	Combustion of oil, and coal in power stations or automobiles	Effects on breathing, respiratory illness, breakdown of lung defences, aggravation of existing respiratory and cardiovascular diseases and death. Asthmatics and those suffering from chronic lung and cardiovascular diseases are sensitive to SO <sub>2</sub> exposures. Elderly people and children are greatly affected. It may lead to photochemical smog in some areas by oxidising the hydrocarbons.
3.	Carbon monoxide gas (CO)	Colourless, tasteless, odourless gas at atmospheric concentrations	Incomplete combustion of coal and oil (diesel, petrol, etc.) fuels	The health threat of Co is maximum to those having cardiovascular disease, because it reduces oxygen delivery to organs and tissues. At elevated concentrations, CO impairs visual perception, manual dexterity, and

				mental ability. Under short term exposure, it causes drowsiness and headaches. It also leads to formation of photochemical smog in some areas.
4.	Nitrogen oxides (NO <sub>x</sub> )	NO is a reddish-brown highly reactive gas. Odour threshold is at about 0.2ppm.	High temperature combustion in automobiles (cars, etc.) and to some extent in thermal power stations.	NO plays a major role in tropospheric ozone formation. SO <sub>2</sub> irritates the lungs, causes bronchitis and pneumonia, and lowers resistance to respiratory infections. Asthmatics are most susceptible, and increases susceptibility to viral attacks. It also plays a major role in tropospheric ozone formation.
5.	Lead	Colourless vapour. Consumed through inhalations. Lead compounds may also be consumed with food.	The major source is leaded petrol used by cars. Ingestion and inhalation may also occur from food, water, soils or dust.	High lead exposures can cause seizures, mental retardation, and behavioural disorders. Foetuses, infants and children are especially susceptible to low doses, resulting in disorders of central nervous system. Lead uptakes may be a factor in high blood pressure and heart disease.
6.	Ozone (O <sub>3</sub> )	Colourless gas. Threshold odour is about 0.3ppm.	A secondary pollutant produced by photochemical pollution, being the largest constituent of photochemical smog along with PAN, etc.	Ozone reduces lung function, and is associated with coughing, sneezing, chest pain, and pulmonary congestion. It may affect all healthy people as well as the people with impaired respiratory systems.
7.	Carbon dioxide gas (CO <sub>2</sub> )	Colourless gas found in air	Combustion of coal, petrol and diesel	Increasing concentrations over the years cause green house effect, leading to global warming and climate changes.

Source: Garg (2009)

Table 2: Noise Effects on Human Beings



Source: Suresh (2005)

Air pollution generally and especially dust from quarry sites are known 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 Shafiq, 2001).

Anand (2006) noted that one of the biggest negative impacts of quarrying on the environment is the damage to biodiversity. Biodiversity essentially refers to the range of living species, including fish, insects, invertebrates, reptiles, birds, mammals, plants, fungi and even micro-organisms. The damage caused to plants by pollution include necrosis (dead areas on leaf structure) chlorosis (loss or reduction of chlorophyll leading to yellowing of leaf), epinasty (downward curvature of the leaf due to higher rate of growth on the upper surface), and abscission of leaves (premature fall) (Suresh, 2005). This will no doubt affect the physiological activities of the plants most especially those around the quarry sites such that as in photosynthesis and respiration. The implication of these is that some of the plants may have retarded growth, while others may be eliminated (Lameed and Ayodele, 2010).

Without doubt, the most contentious environmental impact experienced by residents living adjacent to quarries and surface mines are those produced by blasting. This has been confirmed not only anecdotally but also by surveys carried out by mineral planning authorities (William and Hugh, 2006). When an explosive charge is detonated in a short hole, there is a sudden release of stored energy in the form of an explosion of gas at high temperature and pressure. The effect of this sudden release of energy is to produce a high pressure pulse to the rock surface and generate a compressive strain pulse in the surrounding rock. This pulse travels radially from the borehole and decays in amplitude as it travels outwards (White and Robinson, 1995). The result of this is to produce crushed rock in the vicinity of the short hole. The majority of energy released will be exhausted in the breakage of rock, but a significant percentage is wasted. This wasted energy is dissipated away in the forms of noise, dust, heat and noxious gases together with ground vibration, air over-pressure and fly rock. Fly rock is a serious concern due to the implications of rock matter being projected from the quarry site. Also, the use of powered machinery to transport the materials as well as possibly processing plants to crush and grade the minerals to required sizes all contribute even more noise to the environment (Lameed and Ayodele, 2010).

Any change in the environment which contributes to its deterioration is called pollution. This change in the physical, chemical or biological characteristics of our physical environment (air, water and land) is undesirable and harms human life, other living organisms and cultural assets

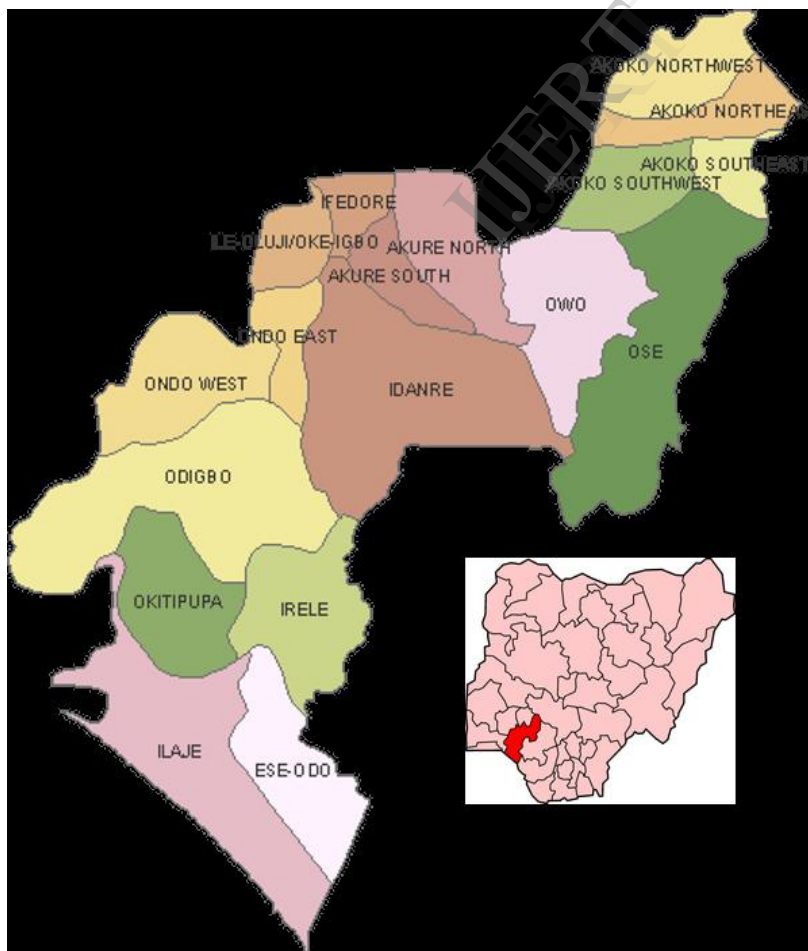
(Suresh, 2005). The resulting impact of all these on the immediate local environment has been so massive with far-reaching consequences that the very existence of life may be threatened.

Therefore, this study will assess the impacts and vulnerability of pollutions and the attendant environmental effects associated with quarrying activities emanating from three quarry sites located along Akure-Owo Road, Oba-Ile, in Ondo State, Nigeria.

### Study Sites

Stoneworks, RCC and JCC Quarries are located along Akure-Owo Road in a locality called Oba-Ile, in Akure North Local Government Area of Ondo State, Nigeria. The study was carried out in-between the months of February to November, 2012 which fell within the dry and rainy seasons. The project sites generally fall within the rain forest zone or the lowland forest zone of Nigeria (Keay, 1959; Onochie, 1975).

Map of Nigeria Showing Ondo State



Source: [www.google.com](http://www.google.com)

A traditional market popularly called ‘*Shasha*’ is located close to these quarries. The market is about few metres beside JCC Quarry and adjacent to Stoneworks Quarry, while RCC Quarry is located about 500m behind the market. Various forms of farm and animal products, i.e. tomatoes, onions, peppers, vegetables, cattle meat, etc. in large quantities mostly from the Northern part of the country are brought daily to this market for sale. Other commercial activities involving people from different part of the State go on in this market everyday. Residential houses and churches are located some few metres to these quarry sites.

### **Materials and Methods**

The methodology used for this research work involved the use of number of articles and books. Copies of a formed questionnaire were administered to provide adequate information on the socio-economic status of the local environment. One-on-one discussion method was also employed to have better information with respect to the one given in the questionnaire copies. The author acknowledges all the authors of various materials used for the study as listed in the references.

### **Results and Discussion**

A total of 250 copies of the formed questionnaire were administered to the residents and shop/stall owners in the market area during the research period. Only 236 of these were recovered back. The results were collated and thereafter summarised into the following.

#### **Suspended Solids (dust)**

Table 3 below shows the summary of what the residents and market people around the quarry environment experienced pertaining to suspended solids/dust especially during dry/harmattan periods. From the table, 51% of the people (of which some are drivers) confessed to low visibility caused by suspended dust in the atmosphere, while 16% of market people around this place complained that dust from the quarries settling on their perishable products like tomatoes, pepper, etc. causes a lot of damages and reduce their values. Another 16% of the people experienced health related issues caused by dust such as sneezing, catarrh, cough, etc. 8% and 7% experienced damages to their vegetation/plants and surface water respectively.

Table 3: Suspended Solids (Dust)

EFFECT	FREQUENCY	PERCENTAGE (%)	CUMULATIVE
Vegetation/plant injury	20	8.5	8.5
Damage to farm/market products	39	16.5	25.0
Visual disturbances	121	51.3	76.3
Surface water/domestic chores damage	18	7.6	83.9
Health related	38	16.1	100
TOTAL	236	100	

### Blasting/Vibration

The summary of effects of blasting/vibration is given by Table 4 below. 76% and 14% of the people in this area experience sudden fear and discomfort respectively whenever blasting of rocks take place, while 3% of the residents believed that the vibration accompanying the blasting process is responsible for the cracks in their buildings. 5% say that they have sustained minor injury as a result of flying rocks during blasting.

Table 4: Blasting/Vibration

EFFECT	FREQUENCY	PERCENTAGE (%)	CUMULATIVE
Sudden fear	181	76.7	76.7
Cracks in building	08	3.4	80.1
Discomfort	35	14.8	94.9
Fly rock	12	5.1	100
TOTAL	236	100	

### Associated Noise

The noise associated with quarrying activities will no doubt have some effects on the inhabitants around this area. Table 5 below gives the summary of findings on some of these effects on people. 80% of people around these quarries especially market people experience hearing discomfort during conversation as they always need to raise their voices above normal before they can be heard due to noise emanating from the quarry sites during stone crushing, blasting, loading and movement of heavy equipment/vehicles. 25% complained of sleeping difficulty as a result of noise from these quarries.



Table 5: Associated Noise

EFFECT	FREQUENCY	PERCENTAGE (%)	CUMULATIVE
Hearing discomfort	205	86.9	86.9
Sleep interference	25	10.6	97.5
Others	06	2.5	100
TOTAL	236	100	

### Identified Problems in the Study Areas

The major source of air pollution in this area is the dust from quarrying sites, and one of the obvious local effects of dust particles in the atmosphere is a reduction in visibility especially during the dry hamattan periods. In addition to this, the air pollutants have been quickly spoiling the fabric and leather dresses worn by human beings, along with causing skin damages on their exposed body parts (Garg, 2009).

Plants and vegetation around the local environment were seen covered with whitish dust emanating from the quarrying sites, and this may eventually affect/disturb the processes of photosynthesis leading to low plant production or eventual death of these vegetations. Another major problem is the noise generated by several activities involved in the quarrying processes, even though noise pollution is not fatal to human life, yet its importance cannot be overlooked because repeated exposure to noise reduces the sleeping hours and productivity or efficiency of human beings. It affects the peace of mind and invades the privacy of a human being.

### Conclusion and Recommendations

Progress in technology and use of technology and search for economic development has resulted in creating negative impacts to the local environment. While quarries can cause significant impact to the environment, with right planning and management, many of the negative effects can be minimised or controlled. Therefore, the following measures should be taken into consideration in order to reduce or eliminate the negative effects of quarries in our local environments.

1. Designing, fabricating and using quieter machines to replace the noisy ones.
2. Using silencers to control noise from automobiles, ducts, exhausts and convey systems with ends opening into the atmosphere.

3. Using rubber blanket or tarpaulin to cover the back of lorries transporting the quarry products.
4. Introduction of controlled blasting operations, to minimise hazards from flying rocks.
5. Establishment of dust control mechanisms at the unit level.
6. Wet scrubbers (collectors) should be used to control particulate pollutants.
7. Necessary legislation should be put in place by the government to regulate quarry activities.

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