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ENVIRONMENTAL IMPACTS ASSESSMENT OF QUARRY SITE WITHIN RESIDENTIAL NEIGHBOURHOOD OF ARAB ROAD KUBWA, ABUJA

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Abstract

The study take cognizance of the necessary prevailing impact of those activities of the identified industrial company within the study area on buildings and health of residents situated within. The study identified those industries which are quarry sites (ZERBERCED). To carry out the study, a well-structured 300 questionnaires were issued out to the household within the study area, in which 260 was able to be retrieved for the study, and also recognizance survey was conducted with the use of photograph and as well interview, further environmental study variables were obtained through several instruments such as gas meter and water sample test, as well as geospatial study through Geographical Information System (GIS). In the cause of the study, we discovered that the quarry sites was very close to the residential houses, the distance observed was less than 50meters afar and 1.1km from Kubwa relocation market, the activities of the industries has caused serious damages on the roads, even the structure of many residential houses do experience crack as a result of the blast or explosion, this triggered noise pollution and dust within the neighbourhood 67Decibel (dB), higher than permissible level for residential which is approved to be between 30dB to 50dB for such type of neighbourhood. Ground water testing reveal permissive level of acidic but biochemical oxygen demand (BOD) value and nitrate value are high in the study area (0.08 mg/l and 73mg/1) which are injurious to health. But another finding is that these effect has not really affected the value of the properties negatively within the study location, in which as a result of constant electricity many people prefer to move in to the neighbourhood having high demand within the property market. It is therefore concluded that the structure of the property within the study area is being affected by the activities of the industries but the value is increasing even with the negative effect on the water body and direct impact on health. The study therefore recommend that immediate review of activities of the quarry should be carried out and also the land use of the study area should be review to safeguard the wellbeing of the residential properties and the people.

Key words: Environmental Impact Assessment, Industrial site, Quarry, Residential Properties, Neighbourhoods, Property value.

Introduction

Industrial uses which differ fundamentally from other land uses, are urban magnet and indeed a feature, which bring about changes in the state and position of cities in terms of their economic and socio-cultural structures (Bashorun, 2003; De Vor & De Groot 2009). Industrial activities propel the period of economic and social changes that transform agrarian society to an industrial society (Adekoya, 2002; David, 2015). This changes result into urbanization. In economic perspective, industrial activities is designed in the production of goods through the factory system by converting raw material into finished goods (Kinnard & Geckler, 2003; De Vor & De Groot, 2009). The industrial revolution marks a major turning point in human history. As a consequence almost every aspect of our daily life was influenced by the outcome of industrial revolution.

Essentially, industrial land uses are located at the outskirt of the town so as to minimize the incidence of environmental hazard (Lawal 2000; Ojo & Guntimehin, 2017). According to the author, this environmental hazard ranges from air pollution, noise pollution, aesthetical pollution, psychological effects and lot more Under land uses planning, residential accommodation that would provide the more needed shelter is also zones respectively. But with the passage of time the industrial properties which is to be at the outskirt of the town, gradually comes to the part of the city center which accommodate residential and other complementary land uses (Eguare, 2004). Location factor has significant effect on landed property values (Ogunmakin, 2005). The effect of location on urban land use may arise from a number of sources that may include exposure to advance environmental factors like traffic noise, fumes and vibration, perceived level of environmental security and neighbourhood amenity. The impacts of any factory such as quarry industry, extend beyond its boundary fence and these impacts may be beneficial or harmful to the surrounding community. In which quarry industry is regarded as highly important in any fast growing nations as it produce is hugely influence in the manufacturing, construction and building, as it influence the paste of economic development (De Vor & De Groot 2009; Ibrahim et al 2019).

In regards to the location of industries within residential neighborhood issues that relates to the impact of such industrial activities has been of utmost concern to stakeholders and property developers in such environment (Jimoh, 2002). Their agitation is bounded by the fact that under the circumstances of environmental impact assessment (EIA), industrial activities within a neighborhood is known to produce negative effects or impact to residential environment (Ajanaku, 2001). This negative impact has been observed to include air pollution and noise pollution

especially in quarry site (Ibrahim et al.,
2019; Ajanaku 2001; Louw et al., 2004).
The study therefore contribute to planning argument and debate by expanding on the implications of the presence of quarry sites on its direct neighbourhood. And the aim is to measure the negative externalities receiving from industrial sites within the study area.
The aim of the study is to assess the effect of industrial activities on residential properties within Arab road, Kubwa, Abuja. In doing that, one of the focus objective is to assess the level of damages on the residential properties caused by industrial activities in the study area, also to assess and measure the level of noise pollutions within the neighbourhood with consideration of the distance from the site, and lastly examine the socioeconomic problems associated with the siting of such industrial activities within the study area.

Study Area

The study area in this research work is Abuja metropolis which is the Federal Capital Territory of Nigeria. Abuja is located north-central region of the country, where it surrounding neighbours are Kogi, Benue, Niger and Nassarawa states. Abuja has a landmass of 7,315km^2. The coordinate of Abuja is $9^0$4'35" N and $7^0$23'54" E. Elevation of 840m. While the site for the study (Kubwa) is located within the coordinates of Lat $9^0$9'40", long $7^0$18'36"
Population of Abuja according to census 2006, is 776,298, and according to the United Nations, Abuja grew by 139.7% between 2000 and 2010, making it fastest growing city in the world, and projected to be about 1,860,786 people in 2016. Abuja has 6 area council operating under the Federal Capital Territory Authority; Abaji, Bwari, Kwali, Kuje, Gwagwalada, Abuja Municipal Area Council (AMAC).
The traditional settlers of Abuja are Gwari, Gbagi, Bassa and some minority groups. In which the occupation of many of these settlers is farming. But government has carried out harmonization process in which the location has been absorb by federal government. In view of this, Kubwa axis was later developed as government residential area, where staff quarters, estate and mass housing are located for workers of both public institutions and private organizations.
The study area Arab road Kubwa, fall within one of the area council which is called Bwari area council. Kubwa is a satellite town or community under Abuja, where government impact has been registered with several housing scheme like Phase1, Phase 2 site1, Phase 2 site 2, Phase 3 and Phase 4, and several other quarters then being built for civil servants, with adequate infrastructure. But as the population grows and monetization programme during President Obasanjo, many civil servants bought those unit, and level of migration also cause huge demand for accommodation around the study area as a result of infrastructures and it self-sufficiency in-term of facilities proximities to social needs, which make private individual and private investors to speed up to housing investment in the study. Then the growth of Kubwa now extended to Behazhin, Bazahgho, Chikankwere and to the south is Dutse where there is Kubwa Extension (F01 Layout by Federal Capital Development Authority).

Scope of the study

The study focus on the environmental variables which connect with the livability of residents of the study area; such as water test, noise level and the air pollutions as elements that impact on residential properties even man. The physical evidence through crack and heavy truck impact on road. The study area is only the quarry site within the neighbourhood which is the **ZERBERCED.** The distance within the residents and quarry site and the level of noise and the air pollutant variables are considered.

LITERATURE REVIEW

Industrial activities such as quarry sites and block industries has been activities that generate product for man's development of the desire structures and road. But it peculiar hazard when sited within residential neighbourhoods has been reviewed by many to be of high magnitude. The concern about the activities of industrial production is range among many risks, in which health risks is important. And the adverse effect diminish with distance away from the site, in which the health risk become minimal as residents are far from the industrial sites (De Vor & De Groot, 2009; Akinwamide & Idris 2018).

Social Economics Impact of Industrial Activities

Akinwamide & Idris (2018) agreed to the need for the product from quarry site which has tremendously increased as a result of the increase in population. Their study further reflect a significant relationship existing between the level of environmental pollution and satisfaction with the quarry site. This study is in the same direction with the view of De Vor & De Groot (2009) which notice influx of residents within industrial sites regardless of the risks.

The socio – physical, psycho – economic and related factors occasioned by the dynamics of major activities would inject massive complexity into the location needs for housing. Apart from strict structural and design considerations (i.e room sizes, shapes, finishes, amenities etc), environmental factors property values, (Afolayan, 2006).

Ihlanfeldt & Taylor (2004), carried out a study, examining the impact of hazardous waste sites on property values and found out the loss in value of all properties within the industrial sites neighbourhood, not just residential properties are up to 85% of it initial full value. Some studies has recognized and utilized a hedonic price framework to estimate the effect of nearby hazardous waste site and the perceived risk associated with them on property values, found that these characteristics also lower property values (Baby, 2003; Parikh et al., 1994; Abu 2006). Property value is also a reflection of purchasing power which has to do with socio economics of the people. The environment sometimes is injected with complexity of features and create unstable figure on the residential property value. The people around the neighbourhood begin to develop interest in the related job available within the environment which is industrial productions (Louw & Bontekoning 2007). In handling this social adjustment, there is need for proper planning and arrangement.

Local authorities are the one saddle with the responsibilities of providing, allocating and designing land for residential and even industries. This allocation for industrial sites and residential has been observed in some studies to have been exhausted in many location leading to encroachment into some other land use (De Vor & De Groot, (2009); Louw & Bontekoning,

(2007)). This occur mostly where there is urbanization process and increase in rural urban migration. The demand for industrial site by performing firm becomes increasing (Louw & Bontekoning 2007). Green areas or open space begin to be under pressure, then there is a gradual diminishing of remoteness of residents and other land use to industrial sites. Also the increase state of demand for abode or housing make development as well to be sporadic and move towards industrial zones (Ibrahim et al., 2019; Ibrahim, 2010). This later justify principle of complementarity, as many who work in those industries prefer to resides closeby to enjoy accessibility and limited travel distance.

Essential feature of economic growth in any developing countries is industrialization in which it activities reshaping the socioeconomic variables of it environment and the people (Ojo & Guntimenhin, 2017; Shiru, 2011).

Impact of Air and Noise Pollution on Residential Properties

Industrial activities have brought several kind of pollutions to environment. Some activities that generate noise to residential neighbourhood include recreational activities, religious activities, operation of power generating and most importantly industrial activities which sets and incompatible uses of land uses. These activities have been found in numerous studies to abate high sound levels of noise which are injurious to urban dwellers. Disruption of sleep (Elmenhorst et al., 2019; Kim et al., 2012), interruption of speech (Jin & Nelson, 2010), as well as health related problems including cardiovascular disease like hypertension (Münzel et al., 2014).One of the adverse effect of industrial activities has been identified to be pollution. Pollution has several components which are detrimental to residential environment, with huge reflection on the value accrued to such location. Components of pollution which are highly peculiar are noise and air pollution. Quarrying activities and rock extraction generally cause several environmental effects on the surrounding areas. The alteration of landscape due to activities like excavation, drilling or blasting, in particular, often generates a visual impact on the receptors set in the surroundings (Degan *et al.,* 2014; Akinwamide & Idris, 2018; Emma et al., 2021).

As populations and industries expand, noise is an increasingly important issue for real estate analysts. So also gas flaying or gas emission which brings several dangerous components which are hazardous to environment and man. Homes nearby industrial properties experience some diminution in property market values. Diminution in value is the difference between the before and after market values of properties that have been damaged or taken (Randall, 2001). Noise is unwanted sound. By that definition, the sound emanating from industrial machines, plants and generators, etc. is considered noise to most people. The real estate professional needs to assess the markets perceptions towards noise, knowing that those perceptions are then translated into sales prices when the properties are sold and other indications of market values (De Vor & De Groot, 2009; Randall, 2001).There are only three ways to mitigate noise: quiet the source, put more distance between the source of the noise and the receptor, and build or create a barrier to the noise (Ogunmakin, 2005; Randall, 2001).It is often impossible for home owners to have control over quieting the source of industrial noise located close to them, and it is equally impractical to move their house further from the industries.

Fernando (2000), in his research on Impact of Air Pollution on Property Values in Bogota, Columbia highlighted that air pollution, leads to social costs because fewer availabilities of clean air deteriorates human health and has negative impact on species and physical goods (landed properties). According to the study, air quality from an economic point of view is a public goods that embodies both positive and negative externalities. The study try to determine the marginal willingness to pay for a cleaner air among housing owners in Bogota, Columbia. He examined air pollution impact on housing values. It is therefore agreed and highlighted that there is huge effect that industrial activities has on environmental quality, health and social quality of man (Bello, 2005; Cropper, et al., 1997).

In United States, there has been threshold and permissible noise level which given by the Department of Housing and Urban Development [HUD], in which the approved standards indicated that: 49 dB—clearly acceptable, 65 dB—normally acceptable, and 76 dB—clearly unacceptable. Further on this, the threshold in Japan is to be 50 dB. Meanwhile in developing country like India, the implemented threshold is 55 dB limit that is allow. But in Nigeria, residential neighbourhoods fall in the category of "clearly unacceptable" zone of the United State (Egbenta et al., 2021; Oyedepo 2012). That is why it is discovered that there is no legal framework on which noise can be abated in Nigeria and her citizenry are yet to understand in details the effects of noise pollution on the environment (Oyedepo, 2012).

It has been argued that noise generating from urban traffic has huge economic effect and reduce the values of properties (Papi & Halleman, 2004; Burgess & Macpherson, 2016)

The noise level of block industries and Saw mill industries around the neighbourhoods has been of huge magnitude if to be measure on decibel.

Impact of Industrial Sites on Residential Property Values

In the work of De Vor & De Groot (2009), on the impact of Industrial sites on Residential Property Values, explained that, Industrial sites caused several negative externalities, such as traffic noise disturbance, congestion, and obstruction of view. In order to quantify the negative effects stemming from industrial sites, the study estimate – using a hedonic pricing model – the impact of distance to industrial sites on residential property values. They use data on houses sold in the Randstad region and the province of NoordBrabant (both located in the Netherlands) in the year 2005, together with data on characteristics of a substantial number of industrial sites in the same regions and period. The results reveal that the distance to an industrial site has a statistically significant negative effect on the value of residential properties. However, the effect is largely localized within a relatively short distance from the nearest industrial site. Furthermore, the study obtained statistical evidence for substantial localized price differentials, which vary according to the size of an industrial site.

Cohen & Coughlin (2008) carried out a research on "the effects of airport noise and proximity on housing prices" in which the result revealed that properties sited close to noisy areas which record about 70dB to75dB were sold for 20.8% less than those residential properties sited in less noisy areas that is less than 65dB. The result confirmed the previous study done by Walters (1975) in which focused on train noise exposure and its relative effect on property value in Memphis, Tennessee area. In which was done in centring on the direction and certain time of

the day. The method used was hedonic pricing model based on the premises that the value of each individual property is a function of its characteristics. The study therefore reveal that rail road crossing has brought noise pollution which has a significant impact on residential property values, but commercial properties differs. This therefore is an indication that commercial property values are not significantly affected by noise pollution in the study area.

RESEARCH METHODOLOGY

The study made use of primary and secondary data. The data are collected from related existing journal, textbook, magazine and other past works to the study, while the data are obtained from field survey questionnaires, focus group discussion with the stakeholders or residents of the neighbourhood, some gas meter (noise meter), water sample especially ground water obtained for the study to see the consumption purity of the water supply in the area and GPS. The study made use of 300 questionnaires to the residence within the neighbourhood while 260 respondents return the questionnaires which is 87% of the administered questionnaires and it's reasonable. The data obtained in the questionnaires are ranked using Linkert scale which later analyzed using cross tabulation, frequency table. Also data where obtained from the noise meter to ascertain the noise level within the site and around the site and it surroundings.

FINDINGS

The study outcome is quite shocking which reveals after a careful analysis. The study revealed that industrial pollution doesn't affect or influence residential property value in the study area, what influences it value has been the following, in ranking order; Electricity, Accessibility to major road or express, proximity to market place, Good or quality housing and Social class.
Furthermore, the study revealed that the type of industrial activities in the study area include the following, Quarry sites, sawmill and block molding respectively. The implication of this is that the industrial operation in the study area is a comprehensive one which obviously has tremendous impact on residential property, especially the Quarry sites causing crack and damages on the nearby buildings during blasting of stones. It is discovered that the neighborhood has reported this unpalatable occurrence to the Federal Capital Authority but because of some specific interest, nothing has been done to that effect.

Table 1: Distance of residential properties * Noise pollution Crosstabulation

			Noise pollution					Total
			Low	Very low	Undecided	High	Very high	
Distance of residential properties	0-0.5km	Count	2	4	0	14	28	48
		% within Distance of residential properties	4.2%	8.3%	0.0%	29.2%	58.3%	100.0%
	0.5-1km	Count	0	0	0	45	32	77
		% within Distance of	0.0%	0.0%	0.0%	58.4%	41.6%	100.0%

		residential properties						
	1km-1.5km	Count	0	1	8	9	16	34
		% within Distance of residential properties	0.0%	2.9%	23.5%	26.5%	47.1%	100.0%
	1.5-2km	Count	5	20	8	7	0	40
		% within Distance of residential properties	12.5%	50%	20%	17.5%	0.0%	100.0%
	2-2.5km	Count	8	15	3	6	3	35
		% within Distance of residential properties	22.8%	42.9%	8.6%	17.1%	8.6%	100.0%
	2.5-3km	Count	1	8	15	2	0	26
		% within Distance of residential properties	3.8%	30.8%	57.7%	7.7%	0.0%	100.0%
Total		Count	24	48	34	75	79	260
		% within Distance of residential properties	9.2%	18.5%	13.1%	28.8%	30.4%	100.0%

Field survey, 2022

This table reveals that 58% of the respondents within the distance of 0km - 0.5km residents away from one industrial activities or the other, experience a very high level of noise pollution from the industrial activities, And 57% of the respondents within the distance of 2.5km – 3km are undecided, maybe the fear of the treat from the quarry company made them not to be involved, because there have been report of series of treat using police by the quarry company.

Table 2: Distance of residential properties * Air pollution Crosstabulation

			Air pollution					Total
			Low	Very low	Undecided	High	Very high	
Distance of residential properties	0-0.5km	Count	5	1	2	13	19	40
		% within Distance of residential properties	12.5%	2.5%	5.0%	32.5%	47.5%	100.0%
	0.5-1km	Count	2	3	18	45	9	77
		% within Distance of	2.6%	3.9%	23.4%	58.4%	11.7%	100.0%

		residential properties						
	1km-1.5km	Count	1	4	19	8	2	34
		% within Distance of residential properties	2.9%	11.8%	55.9%	23.5%	5.9%	100.0%
	1.5-2km	Count	1	14	11	0	2	28
		% within Distance of residential properties	3.6%	50.0%	39.3%	0.0%	7.1%	100.0%
	2-2.5km	Count	9	19	3	5	2	38
		% within Distance of residential properties	23.7%	50%	7.9%	13.2%	5.2%	100.0%
	2.5-3km	Count	10	22	10	1	0	43
		% within Distance of residential properties	23.3%	51.1%	23.3%	2.3%	0.0%	100.0%
Total		Count	28	63	63	72	34	260
		% within Distance of residential properties	10.8%	24.2%	24.2%	27.7%	13.1%	100.0%

Field survey 2022

This table revealed that 47.5% of the respondent within the distance of 0km- 0.5km residents away from industrial activities experience a very high level of air pollution from the industrial activities especially dust from the quarry sites to the neighbouring houses, And 51% of the respondents within the distance of 2.5km – 3km residents experience a low level of air pollution from the industrial activities.



Fig 1: Residential property sharing fence with the quarry site



Fig 2: Inside the Quarry site in Arab road Kubwa

Table 3: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Distance of residential properties * Water pollution	260	100.0%	0	0.0%	260	100.0%

The study discovered a very high decibel level of noise within the quarry site and it neighbourhood (i.e 85dB within and 67dB around the residential neighbourhood) which are far ahead of the permissible level of noise by Federal of Environment and Federal Ministry of Mines and Steel, which agree with United Nation to be within 30dB to 50dB for high density neighbourhood.

There is a close-by market known as Kubwa relocation market, measured to be about 1.1km from the quarry site, the level of the pollution noise and air has impacted on the activities in this market.

The blasting as well has caused several crack on the residential property of the people within the neighbourhoods.

Table 4: The noise level from field survey.

Noise level	Measurement (dB)
Within the quarry site	85
500m-1km	67
1km above	65

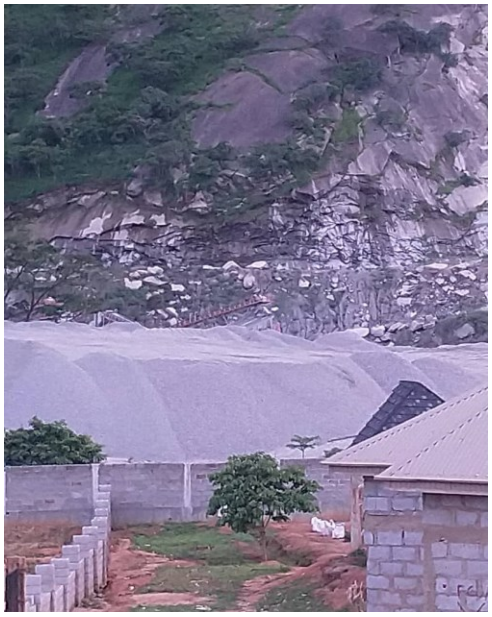


Fig 3: Quarry products; granite & stone dust



Fig 4: Crack on the wall of a building as a result of blast

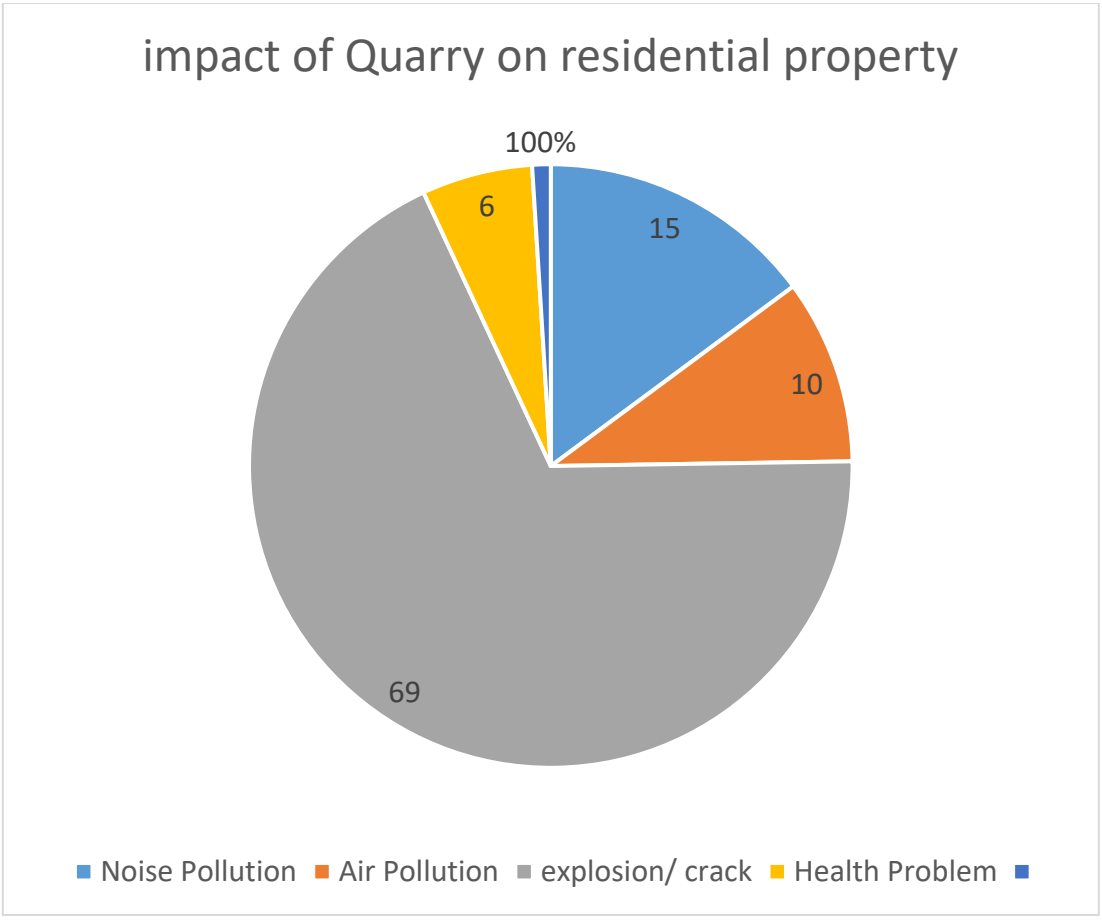


Fig 5: The impact of Quarry on Residential Property

From the figure above, the majority of the respondent (i.e 69%) agreed that the important impact of the industrial activities in the study area is crack on the real estate properties which is generated as a result of blasting of rock within the industrial site and causing tremor or explosion that has huge effect on the surface. Noise pollution record 15% behind crack while air pollution is agreed to be third follow by other related health challenges.

Water Sample

Only one groundwater source was available for sampling in the study area during the wet season. The water sample is clear and odourless and almost all parameters measured were within acceptable FMEnv levels except for pH, BOD and Nitrate with elevated levels indicating some level of contamination. The pH value of 3.90 recorded indicates that the water is highly acidic and well below the recommended threshold for drinking water as prescribed by the FMEnv. Thus the water may not be fit for drinking. The acidity of the groundwater is consistent with the result of soil analysis which revealed that the soils of the area are moderately acidic. The BOD value of 0.08 mg/l was obtained in groundwater sample exceeding the FMEnv permissible limit of 0mg/l. Nitrate concentration level of 73 mg/l was obtained which is above FMEnv recommended level of 10 mg/l.



Figure 6 Google earth; Imagery showing **Zeberced** Quarry site in Kubwa

The figure 6 shows the present location and indicate the closeness and the impact of the site on the environments or neighbourhood.

RECOMMENDATION

The study recommend among other things these important highlight;

- Operations of the various industries in the study area should be made to carry out community development services (CDS) on affected residential properties.
- Residential property investors in the study area should be made to understand the blast from the quarry site which has huge impact on the structures within the study area.
- Blasting of stone by the quarry company (ZERBERCED), should be done after a proper broadcast or jingle and should be at night or late in the evening.
- Further study should be done to verify why the water BOD value and nitrate value are high in the study area which are injurious to health.
- If possible, government should as matter of urgency relocate the quarry industry from within residential neighbourhood to a far site. And further assessment of damages done to residents should be carried out.

CONCLUSION

The impact of industrial activities on residential property is an environmental and man-made issues which requires formidable balanced approach so that land use which conflict one another, are relocated to other environment which are previously zoned for such operational activities. Hence, it is an issue that demands a collective responsibility to detail.

The property value has some primary factors of drivers which are peculiar to urban city like Abuja and serve as trade-off for the users or tenants. These factors are accessibility, infrastructure, and electricity. Electricity is one important thing that many can trade-off other dependent variables for in deciding location of business and residence. The study area is an example in which many prefer to stay there because the location has one of the best electricity supply within the part of Abuja.

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