

## THE EFFECT OF ROAD CONSTRUCTION ON THE ENVIRONMENT:-A CASE STUDY OF GOVERNMENT RESERVED AREA (GRA) AND KETEREN GWARI, MINNA

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**Abstract:** *The provision of infrastructure especially road is a necessary human need for effective movement from one point to another, however the impact this has on the environment is often not given adequate consideration. The paper therefore examines the effect of road construction to the environment with focus on government reserved area (GRA) and Keteren Gwari in Minna as case studies. The questionnaire survey was used to obtain the relevant data. The paper proffered solutions towards the reduction of the negative effects caused by road construction.*

### INTRODUCTION

Road construction is normally a process of moving, homogenizing, moulding and smoothing earth to produce a safe, efficient and hydrological stable vehicular surface. (Richard, 2001).

Road is a vital infrastructure that aids movement and linkages within and outside the built environment. Road, as defined in encyclopaedia Encarta, is a path established over land for the passage of vehicles, people, and animals. Roads provide dependable pathways for moving people and goods from one place to another. They range in quality from dirt paths to concrete-paved multilane highways.

Road construction has become an element of physical development and the growth level of a city, however the impact this construction activity has on the environment and the occupants of these environment is often given little consideration. This is more pronounced in intra city roads where the activity is carried out within well established settlements and neighbourhoods. The impact is felt on both the social and natural environment (humans, animals, physical structures and on vegetations).

The desperate needs for road rehabilitation and construction have made the assessment of its impact on the environment to be neglected. The negative impact includes transient disturbances during the construction, such as dust, noise, vibration and traffic encumbrances which can leave scar on both the physical and natural environment. Environmental impact assessment (EIA) as stated by (Adebayo, 2006) has become an instrument which can be used to safe guard the environment. It is expected to be part of the planning process of any major construction project.

### EFFECTS OF ROAD CONSTRUCTION

#### Air pollution

This is caused primarily from dust during construction especially while digging and backfilling of the road is going on. A lot of dust is experienced which defaces buildings and affect the

quality of air around the area of construction, this results into a lot of discomfort especially to those that have breathing related diseases such as Asthma. (Ojoye and Yahaya, 2007) are of the opinion that air pollution is generally the most easily widespread and obvious kind of environmental damage causative agent.

#### Mitigation measures for air pollution.

The best management practice as specified in Caltrans' Standard Specification is to have the soil surfaces watered and also to have the trucks transporting dust producing material in and out of the site covered. This should enforced by the supervising government authority.

Adequate compensation such as painting should be made to ameliorate and correct the damages made onto the surface of defaced building structures around the construction area.

#### Noise pollution

Noise has a significant impact which in turn affects the quality of life and in that sense, it is a health problem. Noise must be recognized as a major threat to human well-being, (Lane, 2007). Noise induced hearing loss usually take years to develop and can impair the quality of life, through the reduction in the ability to hear important sounds and to communicate effectively with family. Other effects of noise are sleep disruption, the interference with speech and the inability to enjoy leisure times. Noise is measured in units called decibels. Scientific studies have shown that hearing loss can occur when a person is exposed to more than 85 decibels of sound for more than eight hours. When two people are standing not more than 900mm apart and have to shout before each person is heard, then they are exposed to more than 85 decibels of sound. Construction noise levels are normally above 85 decibels as shown on the figure below.

Mitigation measures of noise

Noise from road construction activity can seldom be prevented; however measures can be taken to control it and also reduce it from the source. (Aremu et.al, 2007) are of the opinion that legislation have to be made towards the reduction of noise from automobiles, heavy duty equipment

and the provision of protective devices such as plastic foam, earmuffs and earplugs to the operators of noise producing equipment and machineries. The table below shows some of the road construction equipments and the level of their noise production.

Sound Sources Examples with distance	Sound Pressure Level <i>L<sub>p</sub></i> dB SPL	Sound Pressure <i>p</i> N/m <sup>2</sup> = Pa	Sound Intensity <i>I</i> W/m <sup>2</sup>
Jet aircraft, 50 m away	140	200	100
Threshold of pain	130	63.2	10
Threshold of discomfort	120	20	1
Chainsaw, 1 m distance	110	6.3	0.1
Disco, 1 m from speaker	100	2	0.01
Diesel truck, 10 m away	90	0.63	0.001
Kerbside of busy road, 5 m	80	0.2	0.0001
Vacuum cleaner, distance 1 m	70	0.063	0.00001
Conversational speech, 1 m	60	0.02	0.000001
Average home	50	0.0063	0.0000001
Quiet library	40	0.002	0.00000001
Quiet bedroom at night	30	0.00063	0.000000001
Background in TV studio	20	0.0002	0.0000000001
Rustling leaves in the distance	10	0.000063	0.00000000001
Threshold of hearing	0	0.00002	0.000000000001

Fig 1 Source: <http://www.sengpielaudio.com/TableOfSoundPressureLevels>. (2010)

Some common noise levels in construction

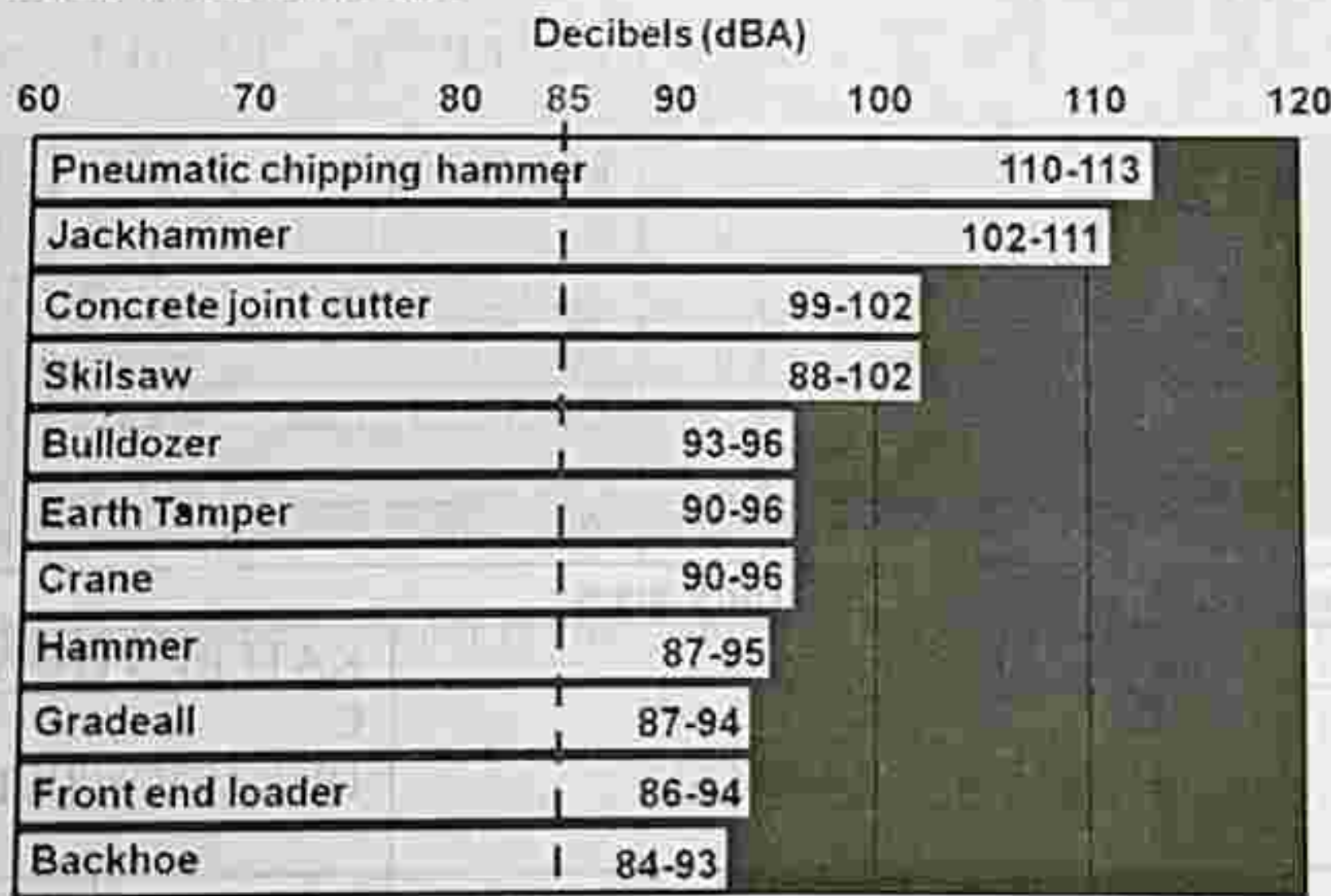


Fig 2: Source: Centre to protect workers' rights

The Study Area, Government Reserve Area (G.R.A) and Keteran Gwari Minna

The Government Reserve Area (G.R.A) is located centrally within the planned residential neighbourhood of Minna. It is accessible primarily through the main central dual carriage, popularly referred to as Bosso road (Abdulsalam way), old-airport road as well as Western bye pass and Okada road. It is an area that houses the Commissioners Quarters, the Government House, Secretary to the

State Government's office, Type 'A' and Type, B' quarters, Intermediate Housing Estate, Minna (old airport quarters) and private residential development. This area can be termed as low density as the occupancy rate here is below 7 persons per 930 square metre according to (Oluremi, 2003) land subdivision basic.

Keteran Gwari on the other hand is an area with mixed use accommodations housing, both residential, and commercial. It is also characterised

to have educational and health institutions facilities. At the eastern part, there are few colonial buildings accommodating railway workers. It is accessible via the Western by-pass off Kpakungu settlement through the Mobil fuelling station roundabout which terminates at Minna Central Market. The layout of the roads is linear and they are all linked up by primary and secondary roads. It can be referred to as a high density populated area as the occupancy rate is given to be more than 14 persons per 930 square metres. (Oluremi, 2003) The roads that were rehabilitated and dualised are Yakubu Lame road, Mu'azu Muhammad road and Keteren Gwari roads, covering a total distance of 6 kilometres.

### Research methodology

To investigate the effect of construction on the settlement, questionnaire survey was employed. Interviews and personal observation were also employed. The questionnaires were administered to provide information regarding effect of the road construction to the settlement. Interviews were conducted for both passerbies and those residing along the affected roads. The role of relevant agencies such as Niger State Environmental Protection Agency (NISEPA), State Ministry of Works and Transport and Niger State Urban Development Board (NSUB) was also investigated.

Traffic survey was also carried out during construction to ascertain the level of congestion on these roads during construction, and the impact of construction hazards on the commuters. Secondary sources include relevant documents from Niger State Environmental Protection Agency, State Urban Development Board, publications and textbooks.

### Findings

Questionnaires were administered through a systematic random sampling. A total of two hundred and sixty (260) questionnaires were administered and fifteen (15) were discarded due to errors observed in filling. The total number used for the analysis was 245 and they were administered as follows

- a. 140 number questionnaires to Keteren Gwari
- b. 105 number questionnaires to G.R.A

The distribution of the questionnaire is shown in table 1.

### Analysis of findings

The research found out that the occupants of the buildings along the roads were hindered and affected in various ways. These include the disruption of water supply, services such as power supply, sanitation; there was also exposure to dust and hindrance to vehicular access. Table 2 illustrates these findings.

Table 1 Distribution of questionnaires

GRA ROADS				KETEREN GWARI RD			
		No	%			No	%
1	Residential	57	59%	1	Residential	40	28.5
2.	Commercials	5	5.25%	2.	Commercial	69	49.3
3	Public Office	30	31.5%	3	Public Office	10	7.14
4	Schools	2	2.1%	4	Schools	3	2.14
5	Others(religious, sports etc)	11	11.55%	5	Others(religious, sports etc)	15	10.71
	Total	105			Total	140	

TABLE 2 Effect of construction activity on the study area

SN	A TYPE OF DISTRUPTIONS	GRA AREA			KATEREN GWARI AREA		
		B DURATION (WEEKS)			C DURATION (WEEKS)		
		1-3	4-8	9> ABOVE	1-3	4-8	9> ABOVE
1	Water Supply	15	30	60	10	NIL	NIL
2	Electric Supply	65	NIL	NIL	82	NIL	NIL
3	Vehicular Access To Accommodation	47	15	-	15	45	NIL
4	Telecommunication	10	NIL	NIL	NIL	NIL	NIL
5	Exposure to Noise	NIL	NIL	90	NIL	NIL	109
6	Dust pollution	12	68	NIL	24	106	NIL

Source: Field Work (April 2009).

The study showed that 10.2% of the residence in GRA and Keteren Gwari area suffered between 1-3 weeks the effect of interruption in water supply due to the removal of the supply pipes and in some cases the breakages encountered during construction. While, on the other hand 12.5% of the same area encountered 4 to 8 weeks interruption. It was also observed that 24.5% of the residents suffered water supply interruption for a period of 9 weeks and above.

The interruption in electricity supply was limited to a period of 1-3 weeks and it was observed that 53% of the residences were affected. The residents of the area attested that there used to be power

outages before the commencement of construction; however it became worse when the construction started as some poles had to be repositioned.

Vehicular access was another problem encountered, as 60% of the residence suffered obstruction to their accommodations for a period not less than 2 months.

The effect was more critical to the residents because there was no proper dissemination of information to the people for them to make adequate arrangements. Table 3 showed the way information was disseminated to the occupants before and during construction.

**TABLE 3 Source of Information on the road construction by residents**

SN	G.R.A AREA			KATEREN GWARI AREA		
	SOURCE OF INFORMATION			SOURCE OF INFORMATION		
1	MEDIA	LETTER/VERB AL	NONE	MEDIA	LETTER/VERB AL	NONE
2	10	12	83	23	18	99
3	Total	105		Total	140	

Source: field work April 2009

It was observed that majority of the residents of these areas were not carried along nor informed before and during the construction.



Plate 1. showing dust being raised by a motor cyclist. Source :field work ( April 2009)



Plate 2: Showing the government house road before the cutting down of trees source field survey 2009

#### Vegetation destruction

Government Reserve Area (GRA) was blessed with a lot of trees that were aligned along the road. These trees were not only a source of shade to pedestrians but also were highly valued trees amongst the locals; they also served as source of wind breakers to the structures and also formed beautiful scenery. Today the whole trees along the road under construction were cut-down completely thereby exposing the whole area to the harsh elements of weather.

#### Traffic hindrance and congestion

During the construction of the road, there was no proper planning cover respect to the

deposits of material on the road thereby blocking almost half of the road. In some instances vehicular entrances into some compounds were hindered, the residents were not pre informed and alternatives were not provided. The most devastating is that some accidents were experienced due to blockages. Proper signs were also not placed and a lot of pits dug could not be noticed especially by motorists at night. Road diversions were left at the instances of motorists as roads were closed and opened at will without any systematic planning. The picture below shows a blockage at the middle of the road without signs.



Plate 3. Showing road blockage without any signage. Source:- field work (April 2009)

### Infrastructure disruption

The occupants of Government Reserve Area (GRA) and Keteren Gwari in particular and Minna in general experienced acute disruption of water supply lasting through the dry season and extending to the raining season because of the main water supply pipes that were being removed. This affected the residents of the study area for almost 6 months. As alternatives were not provided the residents were put to undue hardship, especially during the dry season when they solely rely on the supply from the state water distribution network.

### CONCLUSION

From the above analysis, it is evident that the government did not consider the environmental impact assessment which was not carried out in the first instance before the commencement of the project, as was found out from the relevant ministry.

It was equally observed that as results of the above, series of inconveniences were noticed which affected the quality of life of the residents around the construction area. To this end the researchers opined that if all necessary precaution and steps were followed, a lot of these inconvenience would have been averted.

### RECOMMENDATIONS

To avoid adverse effect on the environment during road construction, an environmental management plan (EMP), has to be prepared specifically for each road construction after analyzing the environmental impact assessment report. This will take into consideration environmental protection measures, mitigation measures, contingency measures and taking measures necessary to ensure

### REFERENCES

**Adebayo, A. E. (2006).** Urban Environment Sustainability: Interventions and Responses. Akure: Shalom Publishers.

**Aremu, S. C., Olagunju, R.E, Ayuba, P. and Ogundele, J. (2007).** 'Environmental Pollution, Causes, Effects, Prevention Strategies and Control Measures'. 1<sup>st</sup> Annual Conference, School of Environmental Technology, Federal University of Technology –Minna, 28<sup>th</sup> February-2<sup>nd</sup> March

**Ojoye, S. and Yahaya, T.I. (2007).** 'Land Pollution and Its Effect on The Environment – A Case Study of Gwagwalada and Its Environs', 1<sup>st</sup> Annual Conference, School of Environmental Technology, Federal University of Technology –Minna, 28<sup>th</sup> February-2<sup>nd</sup> March

the least impact to the environment and its occupant during the road construction. Environments that promote good health is crucial, therefore all necessary measures and legislations are necessary towards its achievement.

It is also important that before any construction is undertaken, the people residing in such area ought to be informed on time so that all necessary measures would be taken to avert its impact. Community participation should be encouraged to minimize the effects. However, the following ought to have been considered.

The public ought to be alerted about detours, lane blockages and truck entrances through the use of appropriate signs. Temporary culverts also need to be placed along the entrances into the various compounds pending when the permanent ones are constructed. Critical areas need to be given priority and speedy completion.

Measures need to be taken to lay alternative source of water supply first before the main water supply was disrupted. In situation where this cannot be achieved then plans has to be made in such a way that the disruption in water supply does not exceed twenty four hours and the occupants have to be informed. This is also applicable to electric and telephone services.

The government should ensure that construction companies substitute noisy equipment for quiet ones. Survey should be taken to ensure that trees which do not necessarily affect the construction of the road are preserved and in situation where they have to be removed, new ones should be planted so as to get back the original scenery, this adds value to the roads and presents an aesthetically pleasing environment.

**Oluremi, I.O. (2003).** Land Subdivision Basics. Ibadan: Penthouse Publications.

**Lane, I. (2007).** Noise Pollution. [http://www.cwru.edu/med/epidbio/noise\\_pollution.pdf](http://www.cwru.edu/med/epidbio/noise_pollution.pdf) on retrieved 28/10/2009 Microsoft Encarta premium 2006- pub Microsoft cooperation 1993-2005

**Richard, T. T. F. (2001).** 'Roadsides and Vegetation: International Conference on Transport and Ecology- Cambridge: October 15<sup>th</sup> -18<sup>th</sup>

**Tables of sound pressure level**  
<http://www.sengpielaudio.com> Retrieved (25/01/2010).