Impact of Coal Mining on the Environment in Mainganga Community of Akko Local Government, Gombe State, Nigeria

Maina Benjamin[1], Maina Benjamin[2], Aliyuda Kachalla[3] and Aliyuda Kachalla[4]

[1] Gombe State University

Abstract

The discovery of coal in Maiganga village has attracted the location of coal mining industry in the area to mine an estimated proven cold reserve of 4.5 million tons. Coal mining has a significant impact on people lively hood and the environment, the environmental shock ranges from environmental degradation to destruction of wildlife and their habitat while on the other hand coal mining contribute to national gross domestic product. Data for the study were collected by means of geo-information techniques, questionnaire, oral interview and field observation. Generated data were analysed through digital image processing using IDRISI Taiga and Arc GIS Software. Descriptive statistics was used to present result obtained. Result revealed a significant conversion of land cover features to mining pits by coal mining activities which forces resident of Maiganga to migrate from their original settlement. Observation reveals that most of the mining pits were not reclaimed. The study also shows that mining activity has negatively affected the communities? lively hood, because most of the respondents complained of inadequate basic infrastructure in the area such as roads, pipe borne water, hospital and other basic public amenities. The study recommends Environmental Impact Assessment (EIA) and land reclamations by the mining industry in order to minimise the effect of coal mining on the environment. Furthermore the living condition of the affected communities needed to be given outmost priority to avoid hostile confrontation from the community as occurred in the past.

damage and hazards accompany mineral development.

The contribution of coal mining industries to the economic development of both developing and developed countries can never be over emphasised. For instance report confirms that coal industry has profoundly impacted Canadian economy and communities through employment, taxes and royalties to governments.

Coal is very important in the manufacturing steel and it is also an important source of chemicals used in manufacturing medicine, fertilizers, pesticides, and other products. Coal mining has a significant impact on the biophysical environment, some of these impacts can be quantified by estimates while others are hard to estimate, it also has serious social consequences on people's health and the environments they live in. Most literature point to the positive impacts of mining, such as job creation and businesses development and overlook the environmental consequences.

According to Cunningham (2002) Coal mining is a dirty and dangerous activity, in coal mine significant volumes of earth must be displaced to mine coal, coal mines and the resulting rock waste can harm the environment. Surface mining has resulted in a great deal of damage to the landscape. Many surface mines have removed acres of vegetation and altered topographic features, such as hills and valleys, leaving soil exposed for erosion resulting from ecological disturbance to pollution of air, land and water, instability of soil and rock masses, and radiation hazards.

The environmental damage has in turn resulted to waste of arable land, as well as economic crops and trees. On the other hand coal mining has it positive impact on the society which includes creation of employment, provision of basic amenities by the mining industry to the affected community and the increase Gross Domestic Product (GDP) of a country through economic activities, Withggott, S. Brennan (2011). Since much of the damages are inevitable and if the minerals must be developed, both the government and the mineral industries must be involved in taking precautionary and remedial measures that can minimize the ill-effects of mineral exploration.

The discovery of coal at Maiganga village of Akko local government of Gombe State has attracted the location of Coal mining industry at the site. The I.

Background to the Study nvironmental sustainability according to Sutton (2004) is 'the ability to maintain things or qualities that are valued in the physical environment'. Sustainability has become an issue today because the earth is under threat from unsustainable use of natural resources. For example biodiversity is threatened by extinction of many species in most ecosystems around the world. This unsustainable use of natural resources has resulted in greater need to protect the system from degradation.

Exploitation of mineral resources has been an important tool for national development in more than a few developing countries, for example, Nigeria is blessed with abundant mineral resources, which have contributed massively to the national wealth and socioeconomic benefits, as different types of environmental E mining industry is expected to mine an estimated proven Coal reserve of 4.5 million tons at the site, (Bakura M. B., 2007). This reserve is expected to satisfy Cement factory of Ashaka power requirement for more than 25 years and 2 million tons reserve will be further exploited. Observation reveals that mining activities is on advanced stage and a lot of environmental damage has taken place at the site and the affected communities complain of pollution, lack of drinking water and other social amenities.

It is the purpose of this study in a nutshell to analyses the effect of coal mining on the environment in Maiganga village and also attempt to examine the possible precautions and remedies that can be applied in order to mitigate the effect of adverse environmental impact of coal mining activities, furthermore the research also provided insight into a number of issues that coal mining creates for communities and the surrounding environment.

1   a) The Study Problem

Mining generally has a significant impact on both people lively hood and the environment, the shock ranges from environmental degradation which can completely eliminates existing vegetation, destroys the genetic soil profile, displacement or destroys wildlife and habitat, degrades air quality, It also alters current land uses, to some extent permanently changes the general topography of an area mined. **??**Babagana Guti, et-al., 2012).

Generally mining of solid minerals in Nigeria accounts for only 0.3% of its GDP, due to the influence of its vast oil resources, as most domestic mining industries are underdeveloped, leading to Nigeria having to import minerals. Nigeria still holds large coal reserves, estimated to be at least 2 billion metric tons. The discovery of bituminous coal suitable for use in coke production for the iron and steel industries opens up potential new domestic markets. (Nigeria Ministry of Solid Minerals Development, 2008).

In Gombe state, an estimated proven reserve of 4.5 million tons of coal has been discovered, the coal reserve is expected to satisfy Ashaka Company's requisite for more than 25 years. As part of its social responsibility will undertake the complete resettlement of Maiganga village and provide basic infrastructures such as feeder road, school, mosque, a church, dispensary and skills acquisition centre for their women and the youth and boreholes for the affected communities. But unfortunately Chairman, Maiganga community Development Association, Mal. Gibar Sobta, tell Daily News correspondent on July 27 2014 that the company fail to fulfill their promises. According to him after 8 years of relocating the community, the company has only built 66 houses, one borehole and an already dilapidated two blocks of classrooms out of what it promised the community. He added that the houses they built for the community are of very low quality, in less than eight years of relocation, the houses have started collapsing.

Based on the aforementioned problem, the following research questions were raised:

106 ? What is the extent of environmental degradation caused as a result of coal mining in Maiganga from 2005
107 to 2015?
108 ? How those mining coal in Maiganga impacted people livelihood?
109 ? Are there reclamation measures in the study area?
110 ? How can environmental sustainability be enhanced in the study area?

2 b) Aim and Objectives

The main aim of this research is to assess the level of environmental degradation resulted from coal mining activities and it impact on the community's livelihood. While the objectives are as follows:
? Find out the level of environmental degradation caused as a result of coal mining in Maiganga from 2000 to 2015.
? Asses impact of coal mining on people livelihood.
? Asses' reclamation measure in the mining site.

3 c) The study area

The study was conducted in Gombe state, Akko local government area, (Fig. 1). Located between longitude 09 0 59'24.1"N longitude 11 0 09' 12.4". The study area which is Maiganga covers a land area of about 20129.47 Acres (48.16 Km 2) bounded to the south by Billiri to the west by kumo town, located on longitude 9°59'19.65"N and 9°59'3.03"N, latitude 11° 8'31.29"E and 11° 9'44.63"E (Fig. 1). basement complex sedimentary rocks underlie much of the area, the complex is formed during the Late cretaceous period, which has influence the topography of the area. Subsequently extended to the east and also there is discontinuous escarpment rising in some places particularly along kumo road to form sand stone and Clift with over 150 meters above the surrounding plains.

The soil are typically ferruginous, they are dark in colour with the pH value of 4-6 pending of the location. The soil is intensively formed as a result of incomplete weathering activities of the basement complex rock. Traditional management practice such as bush clearing, annual burning and livestock grazing have made the soil in the study area susceptible for erosion and reduce it water holding capacity.

The vegetation comprised of sparse canopy with spindling of under shrubs and sparse growth of grasses to more open grasses of lessees height. Major trees species in the area include butyrosper, Mumparadoxum. Tamarine indica, parkia boglobossa, balanite agifika, afzelia Africana, fabia, albida among others, on the other hand the community are made up of different tribes which include Jukun, Tangale and Fulani which made up of the majority tribe in the study area. The population of Maiganga according to the NPC population census 2006 is about 3,520 people. Their main economic activities is Agriculture which include cultivation of different types of crops such as maize, beans, soya beans, guinea corn groundnut, rice, millet and sorghum.

4 II.

5 Methodology a) Data sources for the analysis

For the Purpose of this study data were sourced from Field reconnaissance survey, Field observation, Field interview, Questionnaires, Remote sensing and Geographic information system. Similarly supporting data was also sourced from relevant literature.

6 b) Satellite Imagery and Digital Image Processing

High resolution satellite images of Land sat ETM of 2005 and 2015 where acquired and used for the land cover features detections. Efforts were made in acquiring satellite images of the study area in the same session. Digital image processing was carried out in order to improve the pictorial quality of the images for easy interpretation. The satellite images were processed using IDRISI Taiga Software. The colour composite used for the bands of Land sat ETM are 3, which means that on the RGB band 3 will be on Red, band 2 on Green and band 1 on Blue. This combination produces a False Colour Composite (FCC) with vegetation appearing as red and build up area in blue. Supervised classifications were carried out for the classification using maximum likelihood algorithms. To save time and get detailed and relevant information, systematic sampling technique were applied to represent the entire population of the study area, which was used during the field interview and administration of questionnaires. Collected data were analyzed and interpret using descriptive statistics for clear understanding.

7 III.

8 Result and Discussion

Land cover features were identified and delineated on Land sat ETM of 2005 and 2015 respectively. The analysis shows significant conversion of vegetation, farmlands and settlement into mining site and mining ponds from 2005 before mining begins to 2015 in the study area as presented in Figure **??** and 4. acres, mining in general is associated with site clearance of all vegetation cover for mining operation, in which it exposes the bare soil to be more susceptible to wind, water erosion, the removal of the trees and plant root system which act as a binding

mechanisms, which can also lead various types of erosion. Thus deforestation can lead to exposure of top soil venerable and susceptible to erosion.

Farmland has also reduces from [5771.23] acres in 2005 to [3344.65] acres in 2015, It is obvious from the result obtained that coal mining has affected both vegetation and farm lands, this is evident in the rate at which areas cover by vegetation and farm land were shrinking giving way to mining site and ponds due to expansion of mining activities. Thus deforestation can lead to lowering in general fertility of soil and consequently the productivity of the soil due to absence of humus and nutrient content (Fig. **??**).

Table 1, Show decreased in build up area from [713.23] acres in 2005 to [3291.71] acres in 2015. The decreases in build up area could be as a result of the resettlement of the resident done by the mining company which compel most the resident to relocate from their original settlement. On the other hand socio-economic data was collected from respondents using questionnaires administered to 98 household heads out of which, 51.0% of the respondents are male while 49.0% are female, their occupational status stood at, 53.3% Famers, 27.0% Traders and 20.0% engage in various business activities, the data obtained indicate that most of the respondents are famers. Furthermore, 47.4% of the respondents did not attend any formal education, 28.9% attended primary and secondary education, this result indicate that most people of the community are illiterate, an elder in the community during field interview, stress the need for the mining industry to start up skill acquisition centre as they have promised. In other to assess the socioeconomic impacts of coal mining on the locals, respondent were asked if the mining company in the area provide you or any member of your household with employment, 78.5% of the respondents disagreed that the mining industry does not provide them with employment while 21.5% agreed. Since one of the importances of industry is to provide employment, the mining industry should take employment of the community members seriously as stated in their memorandum of understanding sign by the miners, according to community leader.

When asked if mining activities in the area increase your income, 86.9% disagreed that the mining activity has increase their income, as 13.1% agreed. During the field interview with the community members most of them lament that most of their compensation was not fully paid that was why they embark on street demonstration in July, 2014. On investment, the respondents were asked if they have any investment or share in the mining industry in the area, none of the respondent said that he or she has an investment in the industry. On migration 94.3% of the respondents agreed that mining activities in the area has effect on migration, 5.7% disagree, this large percentage is as a result of the community relocating from their original settlement where the mining is currently going on.

To test the respondent level of awareness on problem associated with coal mining, the respondents were asked if they agree that coal mining activities in the area can affect health, 76.4% agreed while 23.6% disagreed. Since coal mining is associated with health hazard the community need to be enlightened on such issue. From the land use and land feature analysis its clearly seen that the mining activities have taken over most of the community's farm lands and in line with this issue the respondents were asked if they notice the effects of coal mining activities on local community's farm land, 82.9 % agreed that mining in the area makes their farmland scarce and unproductive while 17.1% disagree.

© On basic amenities provided for the community, respondents were asked if they are satisfied with the basic amenities provided by the mining industry, most of the respondents were not satisfied, as 87.6% satisfied and 12.4% not satisfied. During our field observation we have noticed that the industry has build houses, mosque, church, clinic and a primary school for the community. However, most of the structures are substandard and has now become dilapidated as lamented by the community leader during their protest and the industry fail to build road, skill acquisition centre for community as the agreed before the mining start in 2007.

Finally on reclamation the respondent were asked if their satisfied with reclamation measure carried out by the mining industry, 79.6% are not satisfied with reclamation measure taken by the mining industry while 20.4% were satisfied, land reclamation involve restoring back mined lands to productive use after minerals have been extracted through mechanical and biological means. Base on the data collected during the field observation as seen in Plate 1,2,3 and 4 open cast method of mining is used in the study area which has resulted to large deep cut in to the soil to mine coal, observation reveals that most of the mining ponds were not reclaimed, further more mining in the area has not only changed the pattern of the land but have greatly contributed to degradation of the environment, the effect can be clearly seen in the study area which includes lost of arable land for agriculture as well as change in the land cover feature such as vegetation and farm lands which are converted into mining ponds.

IV.

9 Conclusion

Many surface mines have removed acres of vegetation and altered topographic features, such as hills and valleys, leaving soil exposed for erosion resulting from ecological disturbance to pollution of air, land and water, instability of soil and rock masses, and radiation hazards. On the other hand coal mining has it positive impact on the society which includes creation of employment, provision of basic amenities by the mining industry to the affected community and the increase Gross Domestic Product (GDP) of a country through economic activities.

Since much of the damages are inevitable and if the minerals must be developed, both the government and the mineral industries must be involved in taking precautionary and remedial measures that can minimize the

ill-effects of mineral exploration. For mining to be effective in the study area and the world at large the following measures needed to be taken with all sense of seriousness.

? Where ever possible, mining industry should be mandated to carry out and fully implement Environmental Impact Assessment [EIA] of the project before embarking on the project

? Coal mining industries should fund research and public action to ensure that the mining standards are applied.

? All arable land affected by mining operation in the area need to be regularly and urgently reclaimed.

? Government need to compel all operating companies to take their cooperate responsibility to provide standard houses and other needed amenities for the affected communities.

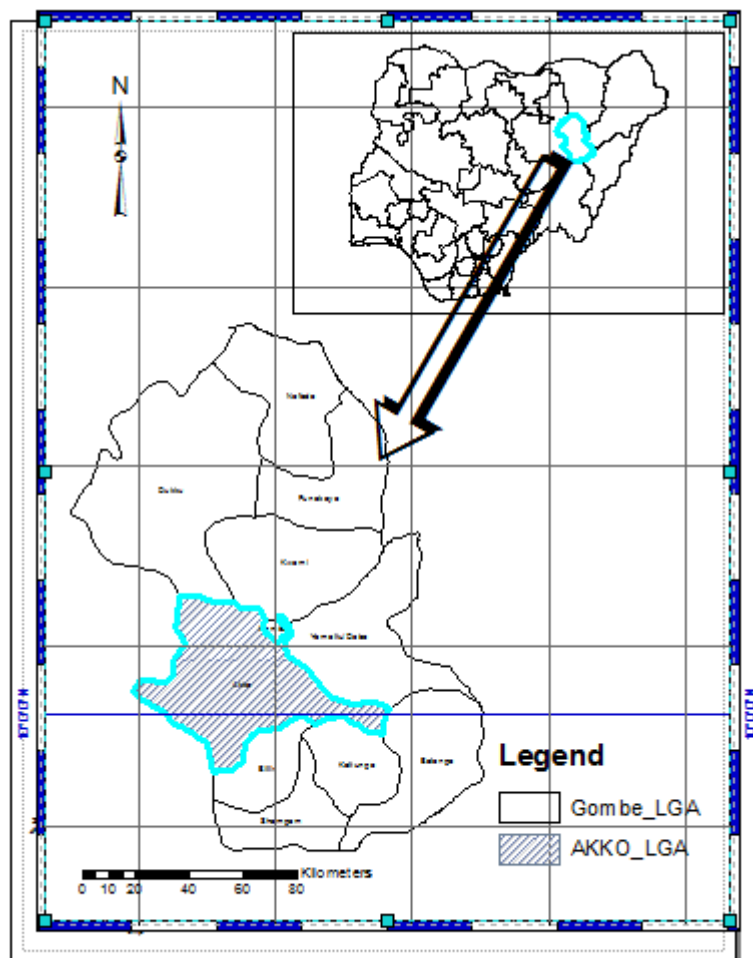? The company need to give priority to all able locals in terms of employment.

10 Plates

Volume XVI Issue III Version I 23 (B)   [1]

Figure 1: Figure 1 :

34555

Figure 2: Figure 3 :Figure 4 :Figure 5 ,Figure 5 :Figure 5 ,
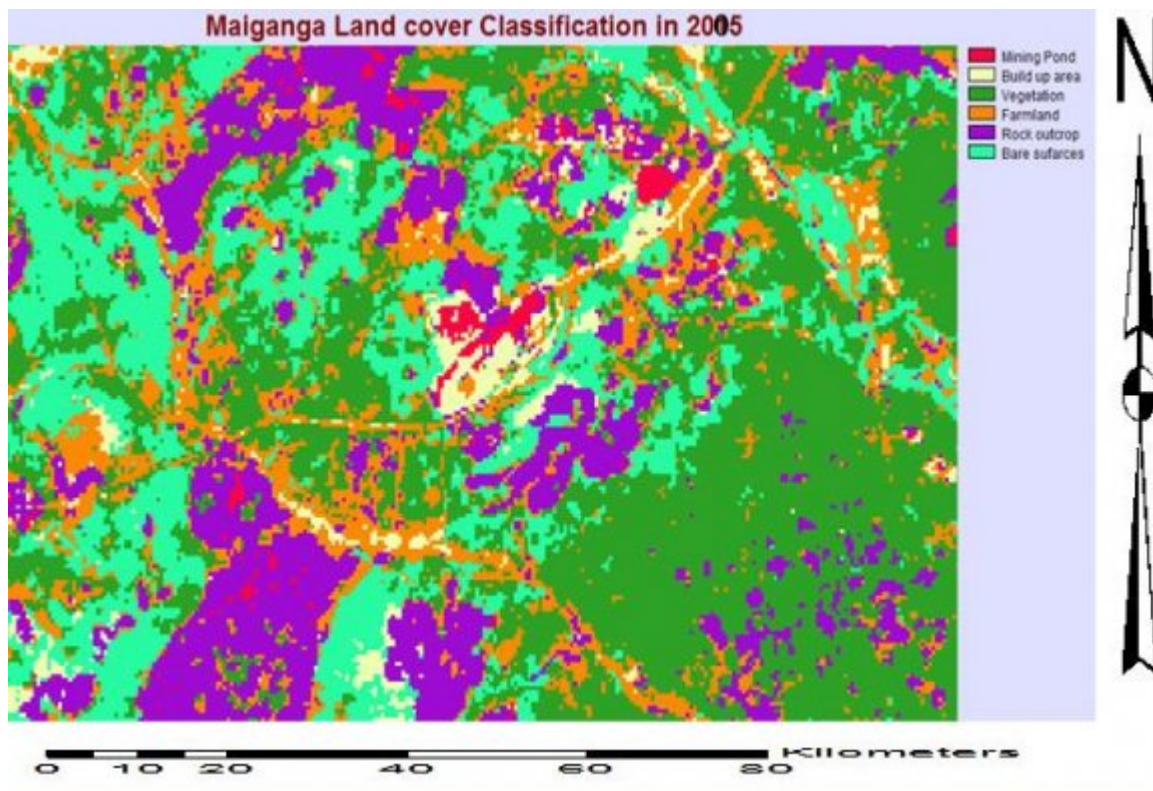
Figure 3:
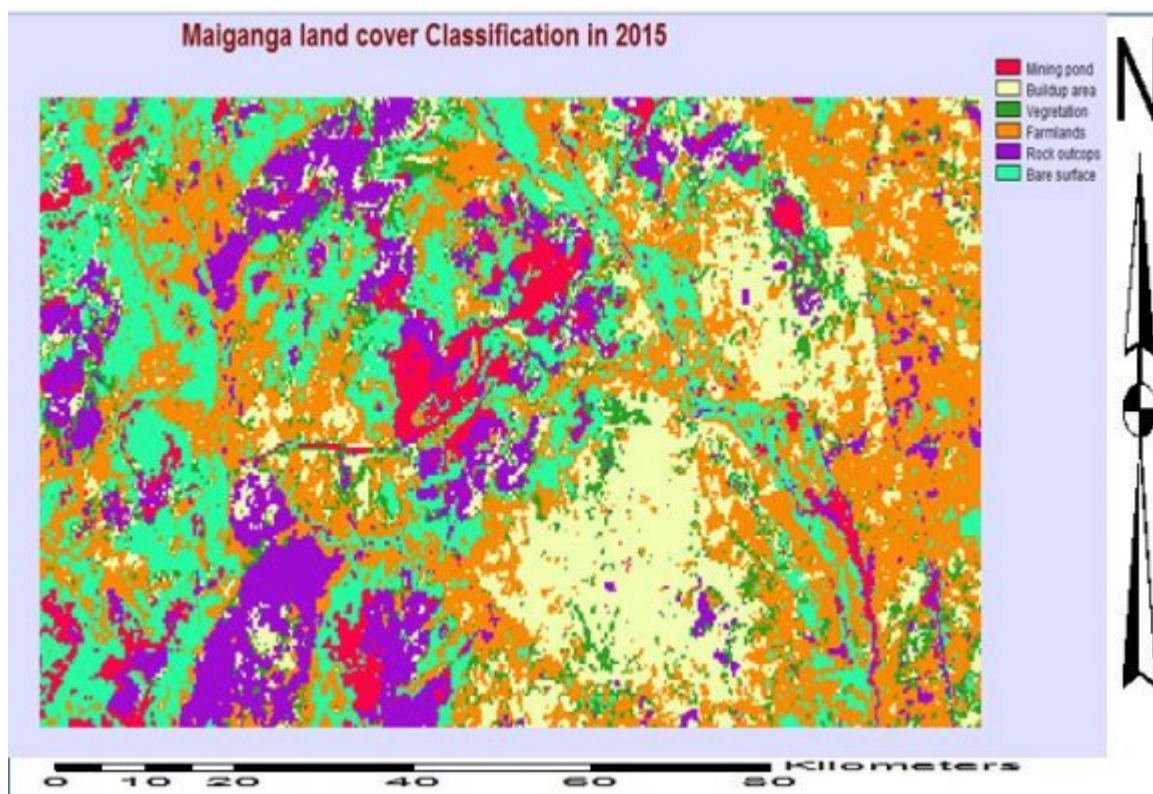
Figure 4:

Figure 5:

1

Figure 6: Table 1 :

		2005		2015	
22	Category				
		Area in Acres		Area in Acres	
Volume XVI Issue III	Mining Pond Build	172.58	713.23	1131.56	3291.71
Version I	up area Vegetation	7126.30	5771.23	1391.54	3344.65
	Farmland Rock	2762.40	3583.72	2278.25	3838.59
	outcrops Bare surfaces				
(B)					
Global Journal of Human Social Science					

Figure 7: 2016

.1 Plate 1 :

Mining pond Plate 2 :

.2 Hips of coal Mine

[Philip (2004)] 'A perspective on environmental Sustainability. Retrieved from www.greeninnovations'. Sutton Philip . *asn.aul on* 2004. 12 August, 2008.

[Bakura ()] *AshakaCem N5.5 Billion Coal investment in Gombe State By Bakura M. Bajoga Dan'amar Funakayewww.coal investment in Gombe State or mailto*, M B Bakura . `bajoga@ashaka.lafarge` 2007.

[Cunnigham and Saigo ()] W Cunnigham , B W Saigo . *Environmental Science: A Global Concern, 5 th Edition*, 2002. McGraw-Hill Companies. p. .

[Daily News Paper (2014)] Daily News Paper . `http://dailytrust.com.ng/sunday/-index.php/news/17653-maiganga-community-shuts-coal-mining-company#vy7SLccywVwII6Gw.99` *Maiganga community shuts coal mining company*, (Gombe Publish Date) Jul 27 2014. Jul 27. 2014. 4 p. 00A. (4:00AM | Updated Date)

[Withggott and Brennan ()] *Encyclopaedia microsoft ® Encarta ®*, S Withggott , Brennan . 2011. 2009. 1993-2008.

[Aigbedion and Iyayi (2007)] 'Environmental effect of mineral exploitation in Nigeria Ambrose Alli University, Ekpoma-Nigeria'. I Aigbedion , S E Iyayi . `http://www.academic-journals.org/IJPSISSN1992-1950©2007AcademicJournals` *International Journal of Physical Sciences* 2007. February, 2007 Available. (2) p. .

[Babag A Guti et al. ()] *Environmental Impact of Natural Resources Exploitation in Nigeria and the Way Forward*, Babag A Guti , Garba Muhammed , Magaji . 2012.

[KP M (2008)] 'Investment and Mining Opportunities" (PDF). Ministry of Solid Minerals Development'. KP M . `http://www.-academicjournals.org/IJPS` *A KPMG network publication 2012*, 2008. 2008-04-12. Nigeria Ministry of Solid Minerals Development (cutting through complexity, Nigerian mining sector)

[Microsoft Corporation] *Microsoft Corporation*,

[Bose and Abubakar] *Mohammed (2009) the effect of Coal mining on the socio economic Development of Maiganga village*, Bose , Abubakar . Akko LGA of Gombe State, Nigeria; Nigeria. Gombe state University (Bsc theses, submitted to the Department of Geography. Unpublished)

[Republic of Nigeria Official Gazette: Legal Notice on publication of 2006 Census Report ()] *Republic of Nigeria Official Gazette: Legal Notice on publication of 2006 Census Report*, 2007. p. 185.