



AN ASSESSMENT OF THE IMPACT OF MINING ACTIVITIES ON RURAL DEVELOPMENT: EVIDENCE FROM MAIGANGA COAL MINE IN GOMBE STATE AYENI, BASHIR SAKA¹, DANKUMO, ALI MEDINA ² SAMAILA BUBA³ AND ⁴BUBA, E.S.

Department of Geography, Federal University Kashere, Gombe State, Nigeria.

Department of Economics and Developmental Studies, Federal University Kashere, Gombe State, Nigeria.

Department of Geography, Faculty of Humanities, Management and Social Sciences, Federal University Kashere, Gombe State, Nigeria

Department of Travel and Tourism, National Institute for Hospitality and Tourism, North West Campus, Bagauda, Kano

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Correspondence author:

Ayenibashirsaka@yahoo.com

Phone:

08062062429

ABSTRACT

Mineral deposits are found in almost all the states of Nigeria and it has contributed significantly to the economic development of Nigeria by serving as source of employment, revenue to the government source of foreign exchange earnings and export product of the country. The exploitation of minerals in Nigeria has also left devastating effects on the environment by pollution, destruction of the ecosystems, environmental degradation and loss of agricultural land in the affected communities in Nigeria. This paper examines the impact of coal mining on agricultural activities in Maiganga rural community in Akko local government Area of Gombe state. The focus of the paper is on activities of coal extraction in Maiganga and its impact on the environment and community's livelihood. The survey approach was used for the study and primary and secondary sources of data collections were employed. The respondents were randomly selected among the rural farmers in the communities and the factory workers/staff. A total of two hundred and twenty five (225) structured questionnaires were administered in the rural communities to collect information on the impact of mining. Tables, frequencies, percentages and Chi - square were used for analysis of data. Based on the data collected and analysis the result shows that mining activities have contributed positively and negatively to the economy of the rural communities In Akko local government area of Gombe state. The study recommends that the rural community should adequately be compensated over the loss of agricultural land to mining activities to avoid future crisis and clash between the coal mining company and communities.

INTRODUCTION

Nigeria is well endowed with abundant mineral resources, which have contributed immensely to the national wealth and socio-economic development. Most of these mineral are yet to be harnessed due to one reason or the other. In the areas where they are found

and exploited it has contributed in one way or other to the socio economic development of the area. Many of the mineral endowment found in Nigeria area within the rural and sub-urban settlement.

Some of these include Coal found at Okaba (Benue state), Maiganga Coal (Gombe state), Limestone and Marble at Ajaokuta near Lokoja (Kogi state) Ukpilla, Igarra (Edo state) and Igbeti (Oyo state), Gold found and mined at Ilesha (Osun state) Kabba (Kogi state) Aramoko- Ekiti (Ekiti state) Zaria (Kaduna state) and Sokoto, (Sokoto state), Iron ore found in large quantity in the iron ore triangle at Itakpe, Ajaokuta (Kogi state), Oshogbo (Osun state), steel in Aladja (Delta state) and Crude oil to mention but few found and mined around the Niger Delta. All these have both positive and negative effect on the host communities resulting from the mining activities.

Coal was first discovered in Nigeria in 1909 while the exploration began as far back as 1916 around Udi hill in Enugu and Okaba Benue state (Iyayi, 2007). The Nigerian coals are mainly sub-bituminous steam except for the Lafia-Obi bituminous Cooking Coal (Ajayi, 2003). There are more than 22 Coal fields spread over 13 States of the Federation. Adekoye, 2003, reported that so far the Nigerian Coal reserves totaling about 639 million metric tons while the inferred reserves sum up to 2.75 billion metric tons. Macmahon, 2014, asserted that the Nigerian Coal Industry has 4 existing mines, Okpara and Onyeama Underground Mines in Enugu state, Okaba surface mine and Owukpa Underground Mine in Benue State). The Nigerian Coal Corporation (2008), reported that, there are more than 13 undeveloped Coalfields which are of two categories, viz: the Virgin Coal fields where further detailed exploration work and/or access roadways are required and the developing Coal-fields where reserves have been proven and Mine access road ways developed. Godwin, (2008) classified the latter to include Azagba Lignite field in Delta State, Ogboyoga coal field in Kogi State, Ezimo Coal field in Enugu State, Lafia-Obi coal field in Nassarawa State and Inyi Coalfield in Enugu State. while others are located in Amansiodo in Enugu State, Ute in Ondo State, Lamla area of Adamawa State, Gindi-Akunti in Plateau State, Afuze in Bauchi State, Janata-Koji area of Kwara State and extension of Okpara Mine South in Enugu State. Although, most of coal deposit in these area are not large enough for commercial exploitation.

Some of the states in North Eastern Nigeria are blessed with minerals deposits which have not been effectively exploited for example the tin ore of Bauchi, Coal, Limestone, Laterite, Gypsum at Gombe state. At first in Nigeria when the mining of coal started, it was human labour that performed the bulk of work which was one of the challenges of coal mining. Today, this human labour has been replaced with the use of mechanically and electrically controlled devices that has increased the total productivity and problem being created in the mining areas. In the developing countries of Africa where minerals are exploited little or no Environmental Impact Assessment (E.I.A) is conducted before extraction begins which often leads to common cases of environmental abuse and protest from the affected people in the rural villages (host communities). Mineral extraction leaves a profound mark on the land and radically affects the local society, Ogumola, (2003) stated that mining project alters ecosystem, forces people to migrate and destroyed people natural assets. Since the commencement of coal mining which involved the processes of extracting, loading, transportation and processing, the environment and socio-economic conditions which prevailed before the operation have not remained the same. The mining operation in these rural areas/settlements might have interfered with traditional means of livelihood (mainly farming), it has some level of relationship with the suitability of the land for arable cropping, commercial and social activities, prevailing poverty, housing condition, income, ease of transportation and health status of the host communities. Evidence from literatures and researches conducted elsewhere have shown that mining activities has significant impact on the environment and socio economic activities of the people. Adekoya, (2003), in study of impact of mining in sagamu stated that the mining of Limestone has affected the output of Kolanut. In the same vein Obinna & Ogbonnaya, (2014), asserted that the scrapping of top soil during the open cast mining destroyed the farmland, altered the yield of economic crops and encourage the gully erosion.

Mining activities in an area also affect the health of the people in the environs, Aigbedion, (2005), in a study conducted on Koro cement shows that several people are suffering from eyes pain and asthmatic attack due to dust laden air that prevail within the few kilometers radius of the factories. Mining activities is at advanced stage and a lot of environmental damage has occurred at the site and affected communities complained of pollution, lack of drinking water and other social amenities. It is against this backdrop that this paper intends to assess impact of coal mining activities on the socio-economic development of rural areas and has therefore put forward these objectives.

Aim and objectives of the research

The aim of this paper is to assess the impacts of mining on rural development in the study area. In order to achieve the aim the following objectives will be considered.

- i. To identify the contribution of coal mining activities to rural host communities.
- ii. Find out the effects of the coal mining activities on the Agricultural activities of the rural host communities.
- iii. To seek people's responses on pre and post mining periods.

Hypothesis

Base on the objectives of the study the research has set the hypothesis

1. H_0 = the coal mining does not have a significant impact on socio-economic development of rural communities

H_1 = the coal mining has a significant impact on socio-economic development of rural communities

The study Area

Maiganga district is a rural community in Akko Local government Area of Gombe State, where coal mining had been a central socio-economic concern for past eight years that is from 2007 till date. Maiganga village is located between longitude $10\ 20'\ 00''\ E$ - $12^\circ\ 00''\ E$ and latitude $9^\circ\ 40''\ N$ - $11^\circ\ 40''\ N$ and it's about 8km off Gombe- Yola road, western part of Kumo town the headquarter of Akko local government area see (fig3.2). In terms of size, the village occupied a total land area of about $8\ km^2$ (Sanni, Abba, 1999).

The climate type of Maiganga is tropical dry climate, which is the predominate climate of Northern Nigeria. It is seasonally wet and dry with average annual rainfall of 850mm to 1000mm. At this area raining season last for only four to five months (May - September). The rest of the year is hot and dry with temperatures climbing as high as $40^\circ\ C$ ($104^\circ\ F$). (www.springerlink.com)Vegetation of Maiganga on the other hand comprises of a light close canopy, with spindling of under shrubs and sparse growth of grasses to a more open grass of lessee's height, more seeding and stunted slims and dense growth of grasses. Major trees in this area include Butyrosper, mumparadoxum, Tamarinindica, parkia, bogtlossa, balaniteagiftika, afzelia Africana, fabia, albida among others. Most are economic trees that help in increasing their income.

According to Hobart (2015), Coal is formed from the accumulating of plant debris beneath the earth, usually in swamp environment. When plant debris dies and fall into the swamp the standing water of the swamp protects it from decay. Swamp waters are usually deficient in oxygen, which would react with the plant debris and cause it to decay. This lack of oxygen allows the plant debris to persist. He added that insect and other organism that might consume the plant debris on land do not survive well under water in an oxygen deficient environment

There are five (5) major ethnic groups in Maiganga village viz: Tangale, Fulani and Jukun and based on 2006 census village has a population of 400 households.

The main economic activities of this people is rural agriculture, the major crops produced are Maize, beans, soya-beans, guinea corn, groundnut, rice, millet and sorghum. Also in terms of livestock, the large numbers of cattle rearers are found in this area, and are among the best pastoralist butter. The cattle rearers also sometimes engage in crops production, by cultivating guinea corn, maize, millet and other crops for their own consumption and marketing it in their wet seasonal camp.

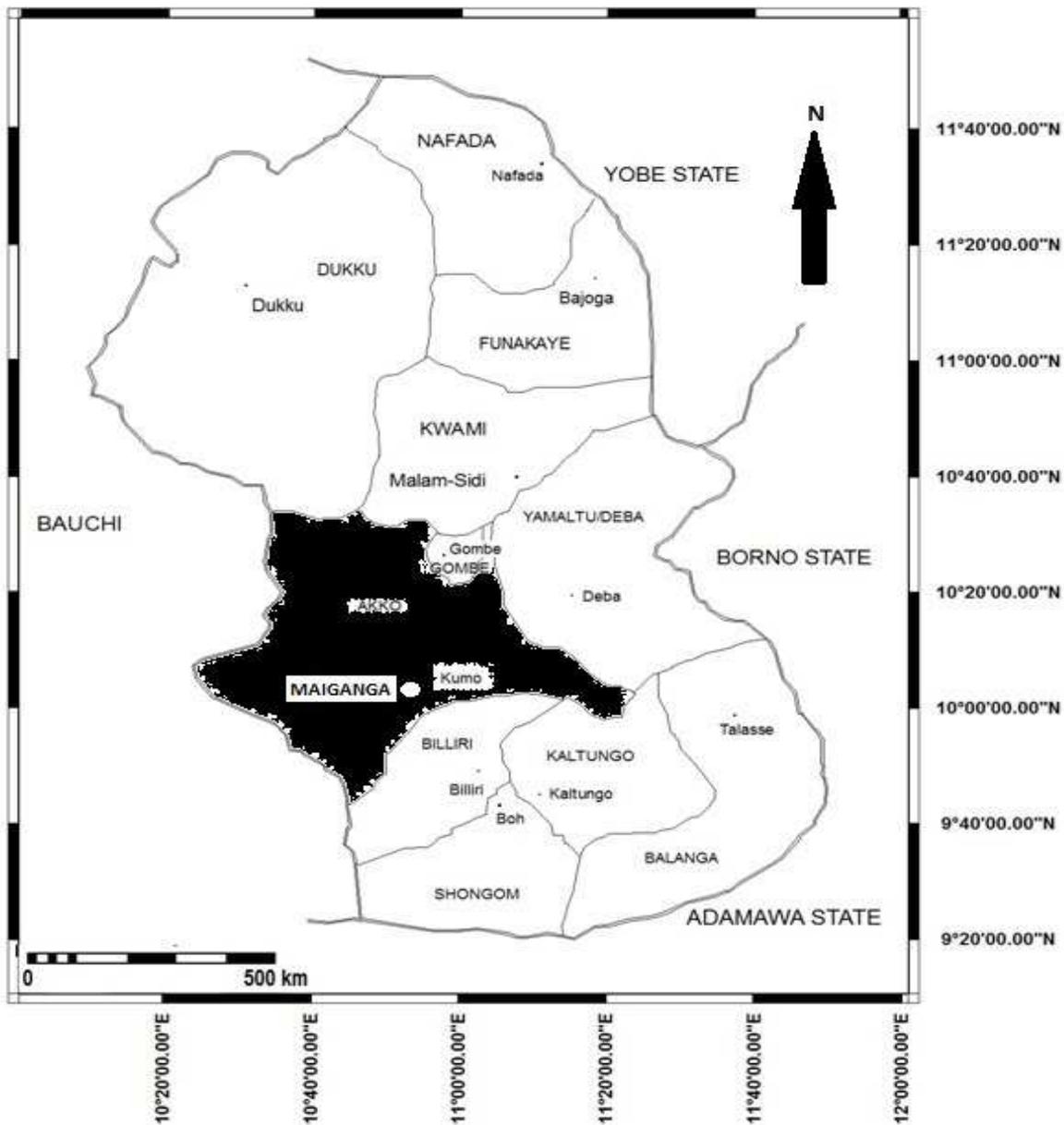


FIG.2: MAP OF GOMBE STATE SHOWING THE STUDY AREA

Source: GIS Lab, Geography Department, MAUTECH, Yola.

Mining Activities in the Study Area

The discovery of coal in Maiganga village of Akko local Government Area has resulted into the sitting of coal mining industry at the site. The coal deposit of Maiganga has an estimated reserve of 4.5 million tons, the mining activities in Maiganga commenced at the site in October 2007 and lignite burning in January 2008 at its factory site under the control of Ashaka Cement Plc . The coal mine is expected to provide the Cement industry power requirement for more than 25 years.

According to the assessment conducted, the lignite mining project at Maiganga will cost Ashaka Cement Plc N5.5 billion (34.2 million Euros), (Benjamin, 2013).Ashaka Cement Plc, as part of its agreed social responsibility shall undertake the complete resettlement of Maiganga village community, and provide them with infrastructures such as constructions of 14 kilometers of feeder road up to Sambo Daji the District headquarter 3 Bridges and about 20 culverts.

Other amenities include the building of a primary school, mosque, a church, dispensary and boreholes for the affected communities (Bajoga, 2007).

Basically, there are two types of coal mining methods in Nigeria the surface mining and underground mining. The Maiganga coal mining is done through surface mining which involved mechanically operated machines and contrivances that has aided large daily productivity of coal. The surface mining first involved the removal and storage of the soil and rock covering the coal, called “the cover burden” workers use a variety of equipment such as draglines, power shovels, bulldozers and front end-loaders to expose the coal seam for mining. The surface mining method includes open-pit mining, drift mining, slope mining, contour mining, and auger mining. The open-pit mining and slope mining are the major method in Maiganga. The type of coal mine in Maiganga now is the low carbon content which highly moist and soft called “Lignite”

Method of Data collection and Analysis

The data for this paper was collected basically through primary and secondary sources. The primary source comprises of reconnaissance, personal interview, field work, survey and use of questionnaires. The field work involves some measurements, making observations and taking records at the mining site on the method and equipment used for extraction in order to ascertain the level of coal mining and its effect on the environment as well as Agricultural activities. A total number of 225 questionnaires were administered to both the staff of Maiganga Coal Mining Company and rural people of Maiganga Community. This is based on the population of both the company workers and the Maiganga community. The population according to Ashaka cement quarterly journal is estimated about 675 people. 1/3rd of the population is justified for empirical studies (Churchil, 2001 and Kerlinger, 1968). A personal interview was conducted among the employee of Maiganga coal mining company as well as indigenous rural dwellers of the community. Secondary data was collected through text books, journals, newspapers, magazines, reports etc.

The collected data was analysis using descriptive and inferential statistics, the descriptive statistics involved the use of tables, frequencies and percentages while the inferential statistics of chi – square (X^2) was used to test for the working hypothesis. The formula is given as follows:

$$X^2 = \sum (FO - Fe)^2 / Fe$$

Where:

X^2 = Chi-square

FO = Observed frequency

Fe = Expected frequency

\sum = Summation

RESULTS AND DISCUSSION

The data collected on various variables through the questionnaires and observations were analysed and discussed in tables. These sets of data describe demographic variables of the respondents which consist of sex, age, occupation and educational level of the respondents from the community.

Table 1: Socio- Economic Characteristics of Respondents

Sex	Frequency(F)	Percentages (%)
Male	154	68.4%
Female	71	31.6%
Total	225	100.0%
Age	Frequency(F)	Percentages (%)
18 -25	47	20.9%
26 -35	77	34.2%
36 -45	40	17.8%
46 -55	39	17.3%
56 above	22	9.7%
Total	225	100.0%
Occupation	Frequency(F)	Percentages (%)
Farming	151	67.1%
Civil Servant	42	18.7%
Private Bussiness	10	4.4%
Driving	15	6.8%
Others	07	3.2%
Total	225	100.0%

Source: Field work, 2015

The data shows that (154)68.4percent are males while (71) 31.6percent are females. So the highest respondents for this research study are males that engage in primary activities of farming. The data also revealed that majority of the respondents are youths and teenagers with age grades of 18-25 (20.9%) and 36-45(17.8%) respectively. This indicated that, the community has the high population of working age grade of unskilledlabour which the mining company requiredfor extraction.

The table shows the occupation of the people in the rural villages of Maiganga. The data revealed that (151) 67.1 percent of the respondents engaged in farming activities. This clearly shows that majority of the people of Maiganga district depend on agricultural activities as their main occupation. As mining

activities began in these areas for the past seven (7) years the cultivable land has being greatly affected.

Coal mining activities play a vital role to local community of Maiganga, and this mining activities shaped the life style of this community negatively and positively, negatively in the sense that their agricultural land has been converted to mining field, and positively compensation has been given to them and they had been relocated to new settlement, where some basic infrastructure were put in place. The study revealed that (136) 90.0% out of the 151 that are farmers had their agricultural lands converted to mining sites. The hectares of land converted from the farmer are shown in table 3 below

Table 3: Hectares of Farmland converted to mining Activities

Hectares of land	Frequency (F)	Percentage (%)
1-2	50	36.7
3 -5	34	25
6 -8	22	16.2
9 above	23	22.1
Total	136	100.0%

Source: Fieldwork, 2015

This data shows that large expanses of land for agricultural and residential were converted into mining of coal in the study area. The revealed that (50) 36.7 percent of agricultural land between 1-2hectres were converted by the mining company, (34) 25 percent of 3-5hectres of land, (22)16.2 percent6-8hectre and (23)22.1 percent9hectresof agricultural land were converted to mining sites. The implication is that the size of arable land for

agricultural production has reduced as a result of mining activities in Maiganga district of Akko local government of Gombe state.

The rural dwellers enjoy some benefits from the extraction of coal in the community among the benefits enjoyed include compensation for land converted to mining sites, resettlement scheme, provision of electricity and pipe borne water.

Table 4: Types of Benefits for villagers from Mining Company

Benefits	Frequency(F)	Percentage (%)
Employment	77	34.2
School	52	23.1
Road	10	4.4
None of the above	86	38.2
Total	225	100.0%

Source: field work, 2015

The communities derived some benefits from the coal mining activity, the data presented in table above revealed that mining in Maiganga village has contributed immensely to the economic development of the areas in term of Employment, road construction and schools, Employment account for (77)34.2 percent, (52)23.1 percent for building of schools (10) 4.4 percent for construction and maintenance of roads that link the rural villages. The oral interview conducted among the rural dwellers revealed that38.2 percent of people are of the opinion that the company doesn't provide any social amenities in their locality. From the information gathered though field observation has shown that the company

provided electricity and bore-hole in the area but as of the time of this study they are not working efficiently and the road linking the rural villages, although some of the tarred roadsare in deplorable condition most especially during the rainy season.

The study revealed that the mining of coal in maiganga has created some environmental degradation such as pollution (air, Noise, water), Deforestation and Erosion. The study shows that (41) 29.1percent of the rural water sources are contaminated by dust through coal mining and there were reported cases of environmental health diseases that aroused from the mining activities.

Benefit That Indigenous People of the Area Derived From the Mining Company

Observed Frequency (F _o)	Expected Frequency (F _e)	(F _o - F _e)	(F _o - F _e) ²	$\frac{(F_o - F_e)^2}{F_e}$
77	56.25	20.75	430.6	7.7
52	56.25	-4.25	18.1	0.32
10	56.25	-46.25	2139.1	38.02
86	56.25	29.75	885.1	15.7
Total	225	0	3472.9	61.74

Source: Field survey, 2015

Critical value (0.05) = 7.81, calculated value: 61.7

The calculated chi-square (χ^2) is 44.87 and the tabulated chi-square (χ^2) at 5% level of significance level is 7.81. The alternative

hypothesis is accepted that coal mining has a significant impact on socio-economic development of rural areas.

Effect of Mining on Agricultural Productivity

Observed Frequency (F_o)	Expected Frequency (F_e)	$(F_o - F_e)$	$(F_o - F_e)^2$	$\frac{(F_o - F_e)^2}{F_e}$
102	75.5	26.5	702.25	9.30
49	75.5	-26.5	702.25	9.30
151	151	0	6728	18.6

Source: Field Survey, 2015

Critical value (0.05) = 3.84, calculated value: 18.6

The calculated χ^2 is greater than tabulated χ^2 that is $18.6 > 3.84$. We therefore reject the H_0 and accept H_1 , that state mining activities affected agricultural productivity of the rural communities.

According to the study mining company has provided accommodation for the rural dwellers as resettlement scheme but more than 80 per cent complained of the size of the accommodation in relation to their family size, that it too small and not comfortable for them. The oral interview conducted among the coal miners revealed that over time there are resistance and reaction from the people over their activities of exploitation and this is the major challenge faced by the company.

CONCLUSION.

The result revealed that, mining activities in Maiganga has improved the life style of the rural communities by providing the infrastructural facilities. The mining company has employed 24% of the rural communities of Maiganga district, provide schools, construct and maintained the feeder rural roads. The coal mining therefore has significant impact on the socio economic development of the rural communities, as it exposes them to amenities like schools, pipe born water, increases their income, provided employment opportunities.

The mining of coal in the rural communities of Maiganga on the other hand affected the life of the inhabitant negatively by contamination of the rural water sources, pollution inform of air land and destruction of agricultural land thereby affecting productivity negatively. 29.1 per cent of the rural water source have being contaminated by dust from the coal mining, it is also reported that there cases of environmental health diseases that aroused from the mining activities. Large expanse of land were converted from the farmers into mining sites, 43.6 per cent of agricultural land between 1-2hectares were

converted by the mining company into mining sites. This has greatly affected the productivity of the peasant farmers of the rural communities. It is therefore concluded that the mining of coal in maiganga village has affected the life of the rural communities positively by given employment opportunities to the rural youths. It has also affected their lives negatively as its activities has deprived the farmers of the arable land for food production and cattle rearing, contamination of the rural sources of water supply, pollution of air through released dust into the atmosphere and destruction of the vegetation. The coal mining at Maiganga community has greatly affected the natural ecology of the area.

Recommendations

Based on the observation and result of the study a number of recommendations were made

1. The problem of pollution of the rural water sources can be solved by providing alternative sources. The company should also make the amenities provided for the rural communities' workable, for instance electricity, pipe borne water and also construct the roads linking the rural settlements. The company should also install modern equipment to prevent or minimize pollution. The Geographical Information system (GIS) should be used to monitor the land cover, land use changes of the mining areas.
2. The lost arable farmland converted to mining site canbe solve if the farmers are properly relocated away from the mining site and given adequate compensation for their land. The company should make adequate provision of farm implements such as fertilizer to farmers to improve their productivity as the size of the agricultural land is reduced.

3. The problem of accommodation provide through resettlement scheme should be proportionate to the size of the families relocated to the new area
4. The company should review the terms of compensation given to the rural dwellers to avoid confrontation and future clash between the rural dwellers and miners.
5. The state government should intervene by providing an alternative land for the peasants' farmers.

REFERENCE

- Abba, S.A. (1999) A History of the Land and the people of Gombe State: Ahmadu Bello University press, Zaria
- Adekoya, J.A(2003). Environmental Effects of Soli Minerals Mining in Nigeria Heinemann Publisher Ibadan.
- Adepelumi AA, (2006). Model tank electrical resistivity characterization of LNAPL migration in a clayey-sand formation. *Environ. Geol.* 50: 1221–1233.
- Aigbedion. I & Iyayi, S.E. (2007), Environmental effect of mineral exploitation in Nigeria *International Journal of physical sciences* Vol 2(2) pp 33 – 38 February, 2007
- Aigbedion I.N (2005), Environmental Pollution in the Niger-Delta, Nigeria. *Inter-Disciplinary Journal of Environment.* Enugu-Nigeria: 3(4): 205–210
- Ajayi, M. (2003), Paleo- Environmental Studies of Odagbo Coal mine sequence Northern Anambra Basin Nigeria. *International Journal of current Research* Volume 7 page 9
- Bajoga, B.M. (2007), Newsletter Ashaka Cement 5.5 billion Coal Mine investment in Gombe State Northern Nigeria.
- Benjamin, M. (2013), Environmental impact of Coal Mining in Maiganga, District. *Journal of Education Nigeria Environment* Vol. 2 (2013)
- Churchill, A. (2001) Introduction to Behavioral Research: A Journal of Educational Research
- Hobart, K. (2015) Geological.com <http://www.springerlink.com/content/w33602907w473v31>
- Kerlinger, F.N. (1968), Foundation of Behavioural Research 2nd Edition New York, John Wiley and sons.
- Macmahon, G. Remy, F. (2014), Large mines and the community; Socio economics and Environmental effects in Latin America, Canada and Spain Ottawa international Research Centre, 2001 p.335
- Ogunmola, B. (2003), Natural Resources Planning in the third World Countries,