



# POWER AT WHAT COST?

A Report On The Impact Of Coal Mining And Coal Power Generation On Okobo And Itobe Communities Of Kogi State



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COAL MINING AND COAL POWER GENERATION  
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KOGI STATE



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## FOREWORD

Coal is a form of fossil fuel commonly used to generate electricity and heat. It can also be liquefied to produce gas and diesel fuel. It is one of the most widely used forms of energy globally. While it is considered a valuable source of energy, it is produced at a high cost to the environment and its production process has been scientifically proven to be dangerous to human health in diverse ways.

Coal provides 40 percent of the world's electricity and 39 percent of global carbon dioxide emissions which is largely responsible for the green gas emissions that are rapidly depleting the Earth's ozone layer and directly causing the increased warming of the earth – a phenomenon that threatens our collective existence on this planet. The question we must now ask ourselves is: Do the environmental effects of coal mining justify its continued use - especially when we have alternative, cleaner and renewable energy sources?

Nigeria has struggled for decades to meet its energy needs. The nation currently generates about 4500MW of electricity, but needs at least 12,000MW to ensure steady power supply and ultimately about 200,000MW to meet all of its electricity needs and ensure its reach to more than 50% of the nation's population who currently live without electricity. In order to meet up with this demand, the Nigerian government therefore sought to diversify its energy sources beyond hydro-powered dams and gas to include sources such as coal, and renewable energy technologies including wind and solar. In this policy thrust, it proposed to generate 30% of Nigeria's energy need from coal and therefore sought to develop its abundant coal resources for this purpose.

The Zuma Coal Mines Company was granted a coal mining license in 2012, to begin its activities in Kogi state. Mining in commercial quantity commenced immediately on the ETA Zuma 828 Coal Limited site located in Okobo/Enejema communities in Ankpa Local Government Area of Kogi state, Nigeria. The Zuma coal mines were commissioned with the hope that it would boost Nigeria's production of power and electricity, the Federal government at the time had stated that it had hopes of generating 30% of Nigeria's power supply from coal, to produce 12,000 megawatts (MW) of electricity by 2015.

The coal mined from the Okobo minefields is expected to be used for power generation at the Zuma Power Plant which the company plans to build at a location in Itobe at Ofu local government area of Kogi state. Governor Idris Wada of Kogi state, at the site's commissioning, promised the host community that he would provide them with a cottage hospital fully equipped with a medical team, a water treatment plant for potable water and the relocation and upgrade of the primary school in the area for the benefit of the host



community as a mark of his support for the investing company. In 2012, the chairman of the company stated that the mines had provided 300 direct jobs with a projection of raising it to 5000 in two years. There is no evidence this number of jobs ever existed in the company.

Nigeria's coal energy plans are at its infancy and needs to be carefully reviewed to determine its efficacy in effectively providing the projected power needs and yet ensuring that its opportunity cost does not outweigh its value. The environmental problems associated with coal mining can be devastating and difficult to reverse. Its effects must therefore be studied carefully in order to make an informed policy decision. For example, countries such as the United States and China that have heavily relied on coal mining for energy production bear the legacy of degradation to their environment, with extensive damage to the quality of their soil, water and air. Attempts to remediate the environment destroyed by coal mining and power production has proven difficult, and several countries including Germany, continue to struggle with the legacy of its devastation.

This report therefore seeks to provide a baseline and a realistic projection of the environmental and socio-economic effects of coal energy production at Okobo and Itobe as communities that will bear the direct impact of these activities.

### **Methodology**

This study provides a socio-economic analysis of both communities, supported by a scientific environmental study. Primary data was collected through structured interviews, on site observations, key informant interviews and focused group discussions with the people of Okobo and Itobe communities in Kogi State. Desk research was also employed in the evaluation of secondary data sources.

In determining the scientific and environmental impact, data was generated through the testing of soil and water samples collected from the sites at Itobe and Okobo and from the physical observation of these sites.

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*Abiodun Baiyewu-Teru*  
Country Director

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<sup>3</sup> *The Guardian Nigeria, Thursday, May 24, 2012*

<sup>4</sup> *The Guardian Nigeria, Thursday, May 24, 2012*




## INTRODUCTION

While coal is undoubtedly a valuable natural resource which has generated wealth and energy for scores of countries, its opportunity costs cannot be ignored. It has simultaneously led to irreparable environmental degradation, unquantifiable losses and great cost to health and the quality of human life. It has also been identified as a leading cause of climate change which threatens life on planet Earth as we know it. The debates around the value of coal as an energy source have increasingly garnered attention globally with calls for its reduction alongside other forms of fossil fuels. It is at the center spread of this debate that Nigeria has proposed to generate 30% of its energy needs from coal.

Nigeria's choice may be related to data which show that Nigeria has proven coal reserves of about 639 million tonnes and an inferred reserve of 2.75 billion tonnes. Following the decision of the government to generate power from coal, two major coal energy production companies came to the limelight: the ETA Zuma Group in Kogi state and the HTG/ Pacific Energy Company. The HTG/Pacific Energy Company intends to utilize the Ezinmo coal fields which ranges from Udi, in Enugu state, to as far as Benue state. The ETA Zuma Mining Company on the other hand obtained license to mine at Okobo community in Kogi state. The ETA Zuma Coal Company also approached Itobe community in Kogi state for land to situate a coal power plant and for the resettlement of members of the community who would be affected by the location of the power plant. The proposed power plant site is located in the Itobe-Itch community and its transmission grid will run through Itobe-Allor, Itobe- Ukpo and Itobe- Ugbedu. The company stated that it conducted an Environmental Impact Assessment, after which a public hearing was held in Lokoja, the capital of Kogi State with community representatives in attendance.

In the course of negotiations with the community, the company indicated that the power plant will be situated close to a river to enable them get rid of waste from their operations. According to its representatives, the company intends to 'purify' its carbon waste before injecting it into the river. The company also promised to control smoke emissions released as a result of its operations. Although the power plant is yet to be established, the transmission grid has been built. The company intends to conclude construction of the plant by 2018.

As earlier stated, mining work has begun in Okobo and the method of mining is surface mining. Surface mining is also referred to as opencast mining; it is economic when the coal seam is near the surface. This mining method requires a large expanse of land, and it uses very large pieces of equipment such as draglines, power shovels, large trucks (used to transport the coal), bucket wheel excavators and conveyors. To achieve opencast mining/surface mining, the overburden of soil and rock is first broken up by explosives, then it is removed by draglines or by shovel and truck. Once the coal seam is exposed, the coal is drilled, fractured and systematically mined in strips. The coal is loaded onto trucks and moved to the preparation plant.




This method of mining in Okobo is in effect, deliberately altering the topography and as a consequence adversely affecting the fauna and flora of the eco system of the community. In the long term, it can be expected that this alteration will compromise the soil, plants, microorganisms and animals which have the potential to negatively impact both human and animal life through the food chain cycle.

## **GOVERNING POLICY FRAMEWORK FOR ENERGY IN NIGERIA**

### **National Energy policy 2003**

The National Energy Policy of 2003 places premium on the importance of energy to national economic growth and sustainable development. The Policy takes into cognizance Nigeria's heavy reliance on oil and the need to diversify the nation's energy source(s). The overarching objectives of the policy are therefore:

- (a) To ensure the development of the nation's energy resources, with diversified energy resources option, for the achievement of national energy security and an efficient energy delivery system with an optimal energy resource mix.  
Introduction
- (b) To guarantee increased contribution of energy productive activities to national income.
- (c) To guarantee adequate, reliable and sustainable supply of energy at appropriate costs and in an environmentally friendly manner, to the various sectors of the economy, for national development.
- (d) To guarantee an efficient and cost effective consumption pattern of energy resources.
- (e) To accelerate the process of acquisition and diffusion of technology and managerial expertise in the energy sector and indigenous participation in energy sector industries, for stability and self-reliance.
- (f) To promote increased investments and development of the energy sector industries with substantial private sector participation.
- (g) To ensure a comprehensive, integrated and well informed energy sector plans and programs for effective development.

- 
- (h) To foster international co-operation in energy trade and projects development in both the African region and the world at large.
  - (I) To successfully use the nation's abundant energy resources to promote international co-operation.

1.1. The policy identifies energy sources to include oil, natural gas, tar sands, coal, nuclear, hydropower, fuelwood, solar, biomass, wind, hydrogen and other renewable sources. The policy promotes private sector and indigenous participation in the coal industry. One of the objectives of the policy is the effective utilization of coal to complement the nation's energy needs. To achieve this objective, the policy seeks to intensify the drive for coal exploration and production activities as well as provide adequate incentives to indigenous and foreign entrepreneurs. The policy notes that the exploitation and utilization of the coal reserves shall be done in an environmentally acceptable manner. Thus the policy forms a bed rock of government's decision to encourage private sector involvement, one of which is the Itobe power project.

### **The Renewable Energy and Energy Efficiency Policy 2015**

The policy defines renewable energy as a resource that can be generated through natural process within a relatively short time such as solar, wind, biomass, hydropower, ocean etc. To this end, the policy notes that Nigeria is blessed with an abundance of renewable energy sources that can be used in generating electricity. The overall objective of the policy is to diversify the energy supply mix, to enhance energy security; increase energy access particularly in rural and semi-urban areas; promote employment; protect the environment and mitigate climate change. The policy gave credence to the need to expand access to energy in a sustainable manner. It furthermore recognized that overdependence on fossil fuels to the exclusion of renewable energy sources is unsustainable. The policy also identified the challenges facing the development of renewable energy sources in Nigeria. Some of the challenges identified include: lack of fiscal and economic incentive to attract local and foreign investments, low level awareness on the availability and usefulness of renewable energy, lack of local capacity, affordability, poor standards and quality control.

In addition to promoting renewable energy, the policy also promotes the efficient use and conservation of energy in line with best practices. In this regard the policy is geared towards mainstreaming energy efficiency and conservation best practices into all sectors of the economy. The aim of the energy efficiency and conservation drive is to among others; reduce the adverse impact of energy related activities on the environment while guaranteeing access to energy at affordable costs and in a sustainable and environmentally friendly manner. The policy concludes with a projection that renewable electricity will



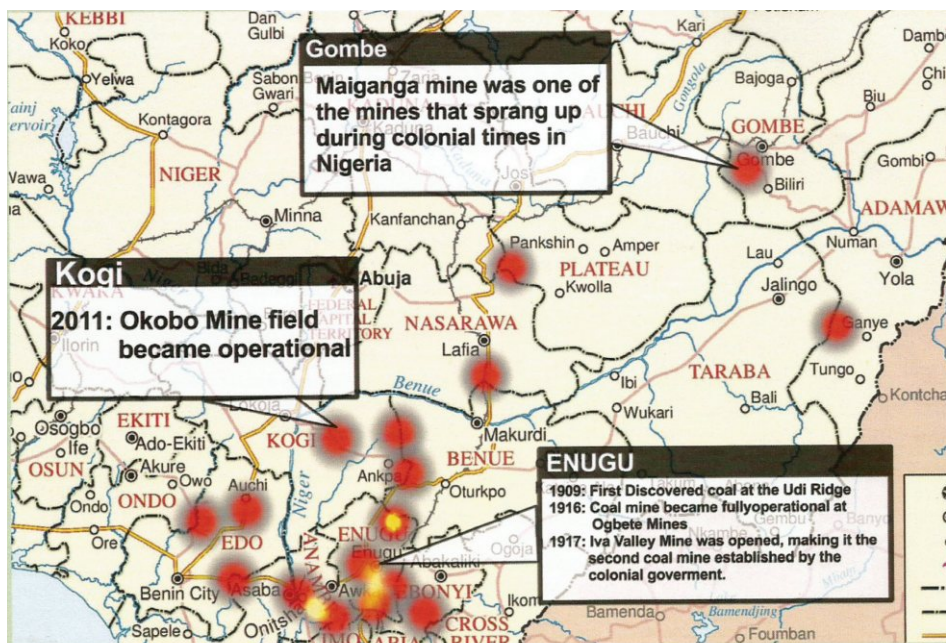
contribute about 20% of the total electricity supply of the nation. Overall, the strategic direction of the policy is geared towards sustainability which is very much in line with the global focus on sustainable development.

## COAL AND THE COMPOSITION OF COAL

Coal is an extremely complex, mostly organic, generally well bedded sedimentary rock. Coal is composed of complex mixtures of organic and inorganic compounds, for instance, organic compounds containing such elements as iron and zinc are needed by plants for healthy growth. After the plants decompose, the inorganic compounds remain in the resulting peat. Some of those elements combine to form discrete minerals such as pyrite. Pyrite is a metallic mineral composed of iron and sulfur atoms bound together in a ratio of one iron to two sulfur and it is arguably the most abundant sulfide mineral on earth. Coal may contain as many as 76 of the 92 naturally occurring elements of the periodic table. However, most of these elements usually are present only in trace amounts.

Occasionally, some trace elements may be concentrated in a specific coal bed, which may make that bed a valuable resource for these elements such as silver (Ag), zinc (Zn), or germanium. Some of these elements have the potential to be hazardous (example, cadmium or selenium) if they are concentrated in more than trace amounts.

Leachate from coal mining waste contain significantly elevated concentrations of undesirable material derived from the coal mining process, fly ash into the ground water is hazardous. Sulfur released from decomposing pyrite combines with water producing sulfuric acid, leading to acid rock drainage and potentially acid rain.





## OKOBO AND ITOBE

**OKOBO** is a rural community in Ankpa local government area of Kogi state, it has a landmass of 1200km and is accessible through the Ankpa-Ejema Road from the state capital, Lokoja. According to the Federal Government Census of 2006, Ankpa local government has a population of 261,353. The Nigerian Meteorological Agency estimates annual rainfall at this community to be between 1,100-1,300 mm. Due to its high water table topography, at the time of this study, no water wells were present in the community. Its indigenes are largely peasant farmers. Coal mining had commenced four years prior to this study, and as a result, there has been weathering and leachate of the host rock. A high quantity of heavy metals have resultantly been dissolved into the water bodies around the mining site, occasioning the high levels of acidity found in water within the coal mining vicinity . It was also noted that the waste water collected from the mining pit was directly disposed into the community's stream, which residents relied on for their domestic and commercial consumption.

**ITOBE** is a rural community in Ofu Local government area of Kogi state with a landmass of 1680 km. The Federal Government census of 2006 provides that Ofu has a population of 189,169. Just like Okobo, Itobe falls within the tropical rain forest area of Nigeria. It is located off the Old Ajaokuta Steel Company and the Anyigba Road, from Lokoja, the state capital. Annual rainfall is between 1,100mm-1,300mm. There are very few water wells dug in this community due to the high water table topography. Its residents are predominantly farmers and petty traders. Itobe is home to the proposed 1,200 mw coal fired power plant. In September 2015, Zuma energy signed a Power Purchase Agreement (PPA) with the Nigerian Bulk Electricity Company to begin Itobe Power Plant. Construction is planned to begin in 2016 and is expected to be completed between 2019 and 2020.

### **Vegetation:**

Ofu and Ankpa have the same vegetation formation. The study area falls within the Guinea Savannah belt and essentially consists of short and tall trees which reflect degradation by man through bush burning, cutting and cultivation. The study area is characterized with deciduous and occasional stunted trees including palms, akee apple and other towering trees. The trees which grow in clusters are up to six meters tall interspersed with other vegetal species.

## SOCIOLOGICAL FINDINGS




*A Focus group meeting at Okobo Community held at one of the classrooms donated by ETA Zuma Mines*

## HEALTH CARE

**ITOBE:** Itobe community has four public primary health facilities. However, these facilities are inadequate to meet the needs of the community and are not easily accessible. Residents therefore are more inclined to seek health care at the few private clinics within their vicinity. Both public and private health care facilities are grossly underfunded, understaffed and ill-equipped. The prevalent diseases in Itobe are malaria, typhoid, respiratory infections, urinary schistosomiasis due to lack of potable water for most residents, and gastrointestinal diseases such as diarrhea and food poisoning.

One of the public health centres visited had a total staff strength of ten (including nurses, auxiliary nurses, cleaners and clinic assistants, and without a doctor) and received an average of 236 cases each month. A lot of the medications including immunization drugs were compromised due to epileptic power supply. The health centres in this community do



not have laboratories or laboratory scientists to carry out diagnostic tests. Most of the diagnoses therefore are educated guesses, and in some instances, the clinics used home rapid diagnosis test kits for malaria, which is the most prevalent illness in the community.

The deplorable state of one of the privately owned clinics run by a female nurse at Itobe paints a tragic story that is reflective of many resource rich communities across Nigeria: patients were found receiving blood transfusions and saline drips, lying on mats on the bare floor in the heat of the clinic's unsanitary foyer. The clinic does not have a resident doctor and lacks basic facilities. For example, it did not have pipe borne water and sourced its water for the clinic's consumption from water barrow boys who fetch water from a polluted river near the clinic.

**OKOBO:** At Okobo, the only health facility is the ETA Zuma company-owned staff clinic, to which the community has no access. Sick residents therefore have to be transported well over 2 hours to the General Hospital at Ankpa, which is also understaffed, ill-equipped and grossly underfunded.

## **ECONOMIC CONDITIONS**

Most residents in both communities are indigent and live on less than a dollar a day with very low prospects for economic advancement in spite of the mine at Okobo and the proposed coal power plant at Itobe.

### **Livelihood**

The predominant occupations in both communities are farming, fishing, petty trading, wild game hunting, cattle rearing and butchery. The communities predominately cultivate annual crops such as cassava, maize, yam, beans pepper and vegetables for daily subsistence. The Okobo community also relies on the cultivation of economic trees such as oil palm.

### **Employment**

The unemployment rate in both communities as with the rest of the state is high. There is no visible access to credit for residents to invest in entrepreneurship or provide social security. Indigenes of both communities who are not farmers or do not have access to agricultural holdings, are inclined to migrate to the state capital or other states to seek employment opportunities.



At Okobo, the ETA Zuma Mines was the only visible industry. Employment of community members by the mining company was restricted to unskilled and casual positions. Skilled and managerial positions were held by only non-indigenes- a situation the community was aggrieved about. As at the time of this study, only 14 indigenes of the community were employed by the ETA Zuma mines. The company also rented some buildings from individual property owners which has generated income for some residents. Some women also engaged in petty trade and as food vendors to workers at the mines. However due to the lull in activities at the mine, their trade appeared to have been stalled as well. Apart from these, there are no other visible economic activities created around the mine site.

At Itobe, the coal power plant project has led to an influx of migrants anticipating employment in the proposed power plant company. Although the community was happy about the proposed power plant project and the potential developmental benefits it portends for them, they were oblivious of the adverse consequences the project may have on their community.

## **COMMUNITY STRUCTURE, INSTITUTIONS AND INFRASTRUCTURE**

### **Infrastructural development**

A common thread that runs through both communities (and most other communities in Kogi state) is the lack of basic social infrastructure such as roads, schools, hospitals, electricity, water and sanitation utilities. In Itobe-Iteh and Itobe-Ugbedu there were no health centres. Itobe has only one government secondary school while Itobe-Ukpo and Itobe-Ugbedu have only four government appointed teachers to take care of the educational needs of all the students in the community. Both communities decried the poor state of infrastructure and underdevelopment in their communities. The lack of infrastructure directly impacts on their socio-economic development, their health and security.

In both communities, inhabitants felt their underdevelopment was largely attributable to the lack of government presence at the grassroots and their inability to hold the government accountable.

### **Security**

Security in Itobe is very poor. There were only four police men manning the entire community. In view of the security challenges facing the community, being a transit community with high influx of travelers, the community self-organized local vigilante



groups to augment government sponsored security.

Okobo community on the other hand experiences minimal security challenges, in part because it is a secluded, rustic community with families that have coexisted for decades. The recent influx of migrants working at the mine however poses a potential security risk. The ETA Zuma company provides security for its operations, while the community has also self-organized a vigilante group to provide additional security. There was no presence of public security agents or a police station in the community.

### **Education**

Educational facilities were near non-existent in both communities. There was also a dearth of skilled and qualified teachers and basic infrastructure for education. At Okobo, the ETA Zuma company built and furnished a block of 6 classrooms for the community. At the time of this report, that was the only functional primary school in the community. According to the community, the former school building which had been built by the community was dilapidated and it had been further damaged by the company's mine operations.

The impact of the operations of heavy company tractors and excavators caused the collapse of one of the old school walls which led to the death of a pupil. The family of the deceased child received no compensation for their loss. Apart from the school building, other residential buildings were also affected by the heavy machinery.

At Itobe, government public schools are grossly understaffed. In a self-help initiative, the community's Parents Teachers Association (PTA) employed teachers to support their public schools.

## **COMMUNITY RESOURCES**

### **Land acquisition and compensation**

The system of land holding in Itobe is the customary land tenure system. Under this system, the traditional ruler or village head is the custodian of land and holds it in trust for the community. The ETA Zuma Group acquired land for the proposed power plant from the Anane of Itobe who is the traditional custodian of Itobe land.

The company also made arrangements to resettle Iteh community where the power plant will be constructed. According to the Itobes (Itobe people), the company has organized for compensation under a proposed Memorandum of Understanding which has not been



finalized. In essence, the communities involved are yet to arrive at a consensus on the compensation that will be paid by the company. Affected farm owners whose lands were evaluated by the company have protested the non-payment of compensation. They are also agitating to negotiate on an individual basis with the company, rather than a blanket settlement. The communities allege that the evaluators were only undertaking to pay compensation for surface rights, because according to the evaluators, the land belongs to the government. The community also claimed that at the inception of the power plant project, the government mapped a layout belonging to an assortment of families which it designated as development area. The area is now currently under the control of the government.

At Okobo, the land holding system also follows the customary land tenure. Families from nearby communities also own land in Okobo. Some residents claimed that they had voluntarily given up their land to the company. Others claimed that their land was deceitfully taken over by the company, when the company misled them with promises of scholarships and a 10 percent employment quota in the company and that it was on the basis of these promises that the community members gave their consent to the company's acquisition of their land.

According to the community head, in some instances, consent for the acquisition of land was obtained from people other than the affected land owners, some of the land owners stated that they did not know the persons who signed on their behalf. Regarding compensation for land acquired, the community admitted that the company paid compensation to land owners and pays an annual surface rent which is due in April every year.

As the mine operations advance, the company plans to relocate the community in order to mitigate the impact of its operations. To facilitate this, the company is requesting for more land. The community is however not agreeable to the company's request because the land intended for resettlement does not belong to a single community and this may lead to further complications in the land tenure holding process. The community lamented that the state government has been silent on the issue of their relocation.

Another unfortunate point of contention related to land acquisition in Okobo is the fact that economic crops in the lands acquired by the company are now being harvested and sold by the company's staff to the indigenous land owners to whom they had originally belonged. Complaints by land owners have been met with intimidation by security personnel.

## FORENSIC ENVIRONMENTAL IMPACT STUDY



*Water sample collection at Itobe*


### **Water**

The major source of water at Itobe is the River Niger which courses along the community. The community's needs are supplemented by minor streams including Anumaya, Idebu, Ukpo, Akilagba, Ajialemeji streams for fishing, irrigation, domestic and industrial purposes.

In the dry season, most of these streams dry out and the community resorts to digging up water springs on its highlands. The government had in the past attempted to provide three boreholes in Itobe, however, the projects were unsuccessful because of the depth of the water bed.

The only stream at Okobo has been polluted by the activities of the mining company. With no pipe borne water or borehole to meet their water needs, women and children from the community travel long distances daily to source water from another community, or queue long hours to fetch from the overhead water tanker at the school provided by ETA Zuma.





At Itobe, an analysis of water samples collected from a borehole in the dry season revealed a temperature value that was below the limit set by the Federal Ministry of Environment (30 °C, instead of the acceptable level of 40 °C), but the PH level recorded was within the acceptable limit considered safe for drinking. Unfortunately, most residents at Itobe do not have access to the borehole water source. An analysis of the well water which a larger proportion of the population relied on, revealed that they averagely had a pH level lower than the acceptable WHO limit and was therefore highly acidic and unfit for human consumption.

At Okobo, the water sample from the overhead water tank recorded a low pH level. Subsurface water sample in Itobe was recorded as acceptable for domestic uses but not for human consumption.

As a result of the coal mining activities which have been ongoing in Okobo for the past four years, the weathering and leachate of the host rock has led to heavy metals dissolving into the waterbodies around the mine site which has made the water acidic and highly toxic. In addition, waste water from the mining pit is disposed into the common water body, further polluting it and making it unsuitable for both domestic and human consumption. Over time, the condition of this water body will affect the organisms within its eco-system and will compromise the food chain.

The surface water samples in Itobe and Okobo communities fall short of permissible limits. Due to the high turbidity of the water, the biological analysis showed that disease causing bacteria were present in high levels in the water at both communities.

## **SOIL AND VEGETATION**

The soil types at Itobe and Okobo are hydromorphic which contain a mixture of coarse alluvial and colluvial deposits. The alluvial soils along Itobe are sandy while Okobo is characterized with laterite soils and are deeply weathered and grey or reddish in colour, sticky and preamable.

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*Turbidity is caused by particles suspended or dissolved in water caused by a large number of individual particles, the measurement of turbidity is a key test in measuring water quality*

For the purpose of this study, the soil characteristics analyzed was taken from the top 30cm of the soil profile. This is because the roots of plants are usually concentrated in the top 30 cm of the soil profile while the bulk of plants nutrients are contained in their roots. We investigated the soil elements reflecting the soil nutrients and soil property that may affect the productivity of soils. The soil samples taken around the mining site in Okobo was as highly toxic due to high levels of elements above acceptable standards as shown in the tables below:

Dry Season Physical/Chemical Parameters in Soil (SS)

S/N	PARAMETERS (units in mg/kg )	SS ITOBE (A)	SS ITOBE (B)	SS OKOBO(A)	SS OKOBO(B)	FME LIMIT
1	TEMPERATURE (°C)	29.9	30.0	29.8	30.0	<40
2	pH	7.35	6.95	6.81	7.25	6-9
3	CONDUCTIVITY (µS/cm)	566	273	532	465	1000
4	RESISTIVITY (K? )	1.77	3.66	1.87	2.15	-
5	SALINITY (%)	0.28	0.13	0.26	0.23	0.1
6	PHOSPHATE	2.7	5.5	17.4	12.3	5
7	PHOSPHORUS	0.9	1.7	5.8	4.1	0.1
8	NITRATE	2.9	37.36	0.463	0.31	20
9	CHROMIUM 6+	1.979	0.077	0.136	0.121	0.01
10	MAGNESIUM	5.61	0.081	0.129	0.108	50
11	MANGANESE	1.99	0.29	0.84	0.59	0.05
12	IRON	1.88	1.2	0.21	0.18	1.5
13	COPPER	1.3	0.29	0.57	0.45	0.1
14	CYANIDE	0.51	0.04	0.06	0.05	<1
15	POTASSIUM	2.9	0.15	13.62	9.97	-
16	CADMIUM	1.98	0.12	0.07	0.21	0.01
17	MOISTURE CONTENT (%)	0.051	0.058	0.015	0.127	-
18	WET DENSITY (g/m3)	0.614	0.824	0.657	0.653	-
19	DRY DENSITY (g/m3)	0.563	0.766	0.642	0.526	-
20	ORGANIC MATTER (%)	0.017	0.019	0.026	0.024	-

Wet Season Physical/Chemical Parameters in Soil (SS)

S/NO	PARAMETERS	SS OKOBO (A)	SS OKOBO (B)	SS ITOBE (A)	SS ITOBE (B)	FME LIMIT
1	TEMPERATURE (°C)	28.40	29.7	29.9	30.0	<40
2	pH	6.63	7.40	7.35	6.95	6-9
3	CONDUCTIVITY (µS/cm)	528	579	566	273	1000
4	RESISTIVITY (K?)	1.90	2.11	1.77	3.66	-
5	SALINITY (%)	0.21	0.28	0.28	0.13	0.1
6	PHOSPHATE	4.10	14.11	2.7	5.5	5
7	PHOSPHORUS	4.10	5.60	0.9	1.7	0.1
8	NITRATE	13.2	12.6	2.9	37.36	20
9	CHROMIUM 6+	0.10	0.11	1.979	0.077	0.01
10	MAGNESIUM	0.28	0.30	5.61	0.081	50
11	MANGANESE	0.66	0.71	1.99	0.29	0.05
12	IRON	0.19	0.22	1.88	1.2	1.5
13	COPPER	0.51	0.55	1.3	0.29	0.1
14	CYANIDE	0.04	0.03	0.51	0.04	<1
15	POTASSIUM	8.88	12.72	2.9	0.15	-
16	CADMIUM	0.06	0.18	1.98	0.12	0.01
17	MOISTURE CONTENT (%)	0.02	0.16	0.051	0.058	-
18	WET DENSITY (g/m <sup>3</sup> )	0.68	0.65	0.614	0.824	-
19	DRY DENSITY (g/m <sup>3</sup> )	0.63	0.64	0.563	0.766	-
20	ORGANIC MATTER (%)	0.02	0.03	0.017	0.019	-

Analysis of the vegetation samples showed that the vegetation had not been altered from their natural state.


## Topographical Impacts

In its short existence at Okobo, mining operations by the Zuma 828 Mines have resulted in considerable alteration of the topography and environmental pollution - including the pollution of the only potable and easily accessible communal water source. In the water bodies sampled, anomalies were identified in the topography of the waterbodies. The disproportionate metallic elements in the waters have potentially dangerous effects on the human body, animals, micro-organisms and over time – plant life. Its high turbidity levels are associated with high levels of disease causing microbes.

As seen in most communities globally, coal mining is steadily causing irreparable damage to plant life and soil composition and has already succeeded in contaminating local water supply at Okobo. Although the community was informed through its traditional leadership about the Environmental Impact Assessment (EIA) which was conducted by the company and some members were present during its public hearing, they were however not provided with copies of the report nor were the results explained to them in a language they could understand, given that most of the community is illiterate.



*Coal at Okobo*



An alarmingly high level of the following elements were found in the samples collected from the soil within 10 meters of the mining pit in Okobo for both dry and wet season analysis in the course of this study:

- Copper
- Cadmium
- Chromium
- Phosphates
- Manganese

COPPER: In fresh water, the excessive presence of copper interfered with the fishes' eco system. The excessive copper found in the soil can be transferred through vegetation or through livestock. In high doses, copper can lead to certain health conditions like liver damage, kidney damage and anemia.

CADMIUM: This is regularly found in ores together with zinc, copper and lead. It is released into the environment through mining and smelting and poses a hazard to the environmental. It is used in various industrial processes and enters the food chain from uptake by plants from contaminated soil and water. It is produced as a byproduct from coal mining and human exposure to this element can lead to a variety of health defects including cancer. Acute inhalation exposure (high levels of exposure over a short period of time) can result in flu like symptoms. Examples are: chills, fever and muscle pain. Chronic exposure (low levels of exposure over a long period of time) can result in kidney disease, lung disease and liver disease.

CHROMIUM: This is a mineral the human body utilizes in micro amounts for normal body functions. However, exposure to high levels of chromium can lead to gastro-intestinal diseases, hypoglycemia, damage to the liver, kidney and nerves. It may cause irregular heart rhythm and other forms of cancer. It may also lead to skin conditions such as eczema and other skin inflammations.

This element exists at Okobo in two different forms Chromium III and Chromium VI. Chromium VI is the most harmful, very high levels of Chromium VI were identified in the water samples tested for both dry and wet season analysis.

PHOSPHATES: These are inorganic components containing phosphorous. Their presence in excessive amounts are a major source of water pollution and their presence in water encourages explosive algae growth which depletes water of dissolved oxygen resulting in the elimination of other forms of aquatic life. Large quantities have been emitted into the

environment due to mining activities in Okobo community.

MANGANESE: In Okobo and Itobe communities, the manganese levels in the soil samples taken for dry and wet season analysis were exceedingly higher than the Federal Ministry of Environment's acceptable limits during the dry season analysis. Manganese compounds occur naturally in the environment as solids in the soil and water. Manganese deficiencies are common when pH levels in the soil are low, and when manganese in soil is highly toxic it can lead to the swelling of cell walls. Laboratory tests have also shown that severe manganese poisoning could cause tumor development in animals.



*Coal Mining Pit in Okobo*




*Surface coal mine pit at Okobo*

## **CLIMATE CHANGE**

With the highest carbon content of all the fossil fuels, coal mining and coal combustion cause major greenhouse gas emission. When coal is burned carbon dioxide, sulfur dioxide, nitrogen oxides and mercury compounds are released into the atmosphere.

The mining method adopted in Okobo, surface mining otherwise known as strip mining, or opencast mining, causes deforestation and releases toxic amounts of minerals and heavy metals into the soil and water as we have observed in the scientific analysis presented above. This form of mining also destroys landscapes, forests and wildlife habitats. At the site of the mine when trees, plants, and topsoil are cleared from the mining area, it leads to soil erosion and destruction of agricultural land. When rain washes the loosened top soil into streams, sediments pollute waterways. This can be harmful to aquatic animals such as fishes and smother plant life downstream. It can also cause distortion of river channels and streams,



which may lead to flooding. There is an increased risk of chemical contamination of ground water when minerals in upturned earth seep into the water table, and watersheds are destroyed when disfigured land loses the water it once held.

### **Noise and Dust Pollution:**

At Okobo community, the excavation and transportation of mined coal around the community, causes an elevated amount of coal dust in the air which is dangerous if inhaled over an extended period of time. The roads at Okobo are untarred and in the dry season, the movement of trucks from the mine site raises dust to very high levels for prolonged periods. The dust in the air causes air pollution which in turn leads to respiratory disorders like asthma and bronchitis. It is important to note that coal dust raised while mining the coal itself, which if exposed over a protracted period can cause black lung disease. When elevated amounts of metals such as mercury and lead metals often associated with coal mining comes along with dust, it further complicates the health of residents, especially children and may stunt their mental and physical growth.

With no equipped health center within Okobo and the fact that most residents are too indigent to seek medical assistance in neighbouring communities, it is difficult to ascertain the types and extent of respiratory diseases they have complained about, and to establish a correlation between the dust from the mining activities and their complaints.

The coal mining process is loud and disruptive to residents in the community. In the course of this study, very loud noises were heard and heavy vibrations were felt due to the heavy equipment excavating and the transportation of mined coal. This sustained phenomenon has resulted in cracks on some buildings and the collapse of the former school building within the community.

### **Community Development Agreement (CDA)**

The leadership of Okobo community asserted that the first CDA negotiated with the company was for an initial period of 99 years but was later reduced to 5 years. According to them, in 2014, the company sent a revised version of the CDA to the community for their assent, but the community refused to sign it because they did not agree with some of its terms. They are yet to receive any response from the company on the concerns they had pointed out.



In spite of the facts stated above, the company had built a school block and provides a monthly stipend of 100,000 Naira to the school for its operations as part of its corporate social responsibility.

At Itobe, the community was yet to reach a CDA with the company.

### Provision of Facilities

When the Okobo community had complained about the pollution of its only water source and other health hazards posed by mining operations of ETA Zuma Mining Company, the company promised to provide a health facility and a borehole powered by an automobile engine. The company is yet to make good its promise as at the time of this report. The company however supplies the community with water using water tanks. Samples of the water supplied revealed that its iron content was much higher than the acceptable standards set by the WHO and was therefore not safe for drinking.

Another request made by the community for the construction of the main access road has also not been honoured by the company. The community alleged that the company agreed to construct only when they start making profit from their operations. The community opined that the company should at the barest minimum sand fill the road to prevent the dust pollution emanating from the company's tractors, trucks and the increased use of motorcycles which is the major mode of transportation in the community.



*Global Rights meets with Okobo Community Elders*



*Women at Okobo*

### **Gender Dimensions**

The women of Okobo were generally pleased with the presence of the coal mine in their community and the opportunities it had brought, especially regarding the education of their children, given that the company provided a block of classrooms for the primary school and gives a monthly stipend for operating costs. Some women were also glad that the increased population in the community working at the mines provided more customers for their petty trades.

However, most of the women are farmers and their crops have been adversely affected by the mining project. Before the advent of mining activities, the women had depended on the cultivation of economic trees for palm production. Their major source of livelihood was the proceeds from the economic trees which they lost when the company acquired land for its operations. Most of the negotiations were done with the male folk of the community which short-changed most of the affected women farmers. Although, at the initial stage of the company's operations, they were able to make some money by becoming food vendors and selling essential provisions to the thriving population the mines drew to the community at the time, however, with the seasonal nature of the mines operations and recently, the decline in the company's operations, their businesses have dwindled or shut down.

The women of Okobo were also bothered by the fact that they have to travel extra miles to obtain clean water for their families because their water source had been polluted. They

were also disturbed by an increase in sexual violence in the community following the presence of the coal mine and the influx of strangers into their community.



*Okobo Community Women*

## CONCLUSION

There has been a growing school of thought positing the need to recognize the right to energy as a human right. As the Secretary General of the United Nations, General Ban Ki Moon has rightly said: "*Energy is the golden thread that connects economic growth, increased social equity, and an environment that allows the world to thrive.*" The right to energy as with all other rights is not absolute and must be carefully thought out. The right to energy should never outweigh the right to life and the right to a healthy environment.

Nigeria's quest to diversify and increase its energy sources by proposing a policy to generate 30% of its energy needs from coal needs to be reviewed with circumspection especially in view of the effects this policy thrust will have on a mass of vulnerable and indigent host communities as can be deduced from the examples at Okobo community where coal mining commenced barely 4 years ago.

It is clear from the case study that mining at Okobo community has resulted in the following:


*A negative alteration of the topography of the community:* The surface mining of coal employed by the mining company has resulted in the physical alteration of the topography of Okobo community thereby disorienting the eco-system.

*A gradual but steady pollution of the soil and water on which the community relies:* The gradual pollution of the soil by the release of sedimentary minerals and elements affect the soil and water composition in the surrounding vegetation, which as a consequence affect the humans and animals who consume them. Over time, they will result in alterations to the plant life in the region.

The only stream in Okobo, which was their major source of water, has been polluted by mining activities. The turbidity of the stream water limits the occurrence of photosynthesis which will inevitably lead to the death of aquatic, animal and plant life in the surrounding area. The water tank supplied by ETA Zuma for the community is the only other source of water and at the moment. Its samples have recorded a high iron(Fe) content which may continue to rise over time and is already unsafe for human consumption. Clean water is critical to health, economic and social wellbeing, and resultantly, the quality of life.

*Air and noise pollution:* Coal mining and its energy production contribute largely to greenhouse emissions because of the high carbon and methane content. Other particles such as mercury, arsenic and lead are dangerous contaminants associated with coal mining and potentially may result in carcinogenic growths in the human body.

Another potential pandemic in the pipeline are the respiratory diseases which will result from these mining activities, with the unavoidable release of coal dust into the air, especially evident in the dry seasons when the dust is raised to higher levels due to the constant movement of trucks and excavations on the mining site.



The noise and vibrations caused by heavy machinery and explosions are another source of contention for these communities as the noise and heavy vibrations have started to weaken structures resulting in cracks in the framework of buildings in the community.

**ITOBE:**

The effects of coal power generation at Itope remains to be seen after the plant becomes operational in 2018. Our study has however provided a baseline from which to scientifically deduce its effects when the power plant begins operations.

Nevertheless, if statistics from other parts of the world where coal energy forms an integral part of their energy pool are to be considered, the inhabitants of Itope may be better off without the coal power plant in their vicinity. The Lancet, in a 2007 publication on the effects of coal generated electricity estimates that for every TWh (Terrawatt-hour) of electricity produced from coal in Europe, there are 24.5 deaths, 225 serious illnesses including hospital admissions, congestive heart failure and chronic bronchitis, and 13,288 minor illnesses. When lignite, the softest and most polluting form of coal, is used, each TWh of electricity produced results in 32.6 deaths, 298 serious illnesses, and 17,676 minor illnesses.

Given the poor access to health care or social amenities at Itope, these effects may be exacerbated.

**Alternative sources of Energy** Nigeria is yet to make a clear commitment to other sources of energy, in particular renewable sources of energy. World over, there have been advancements in making these sources of energy – in particular solar ocean and wind, affordable and given Nigeria's naturally strategic position, these sources of energy which will remain renewable and have minimal environmental effects; are available in sustainable quantity.



## RECOMMENDATIONS

In view of the foregoing, we make the following recommendations:

- Nigeria needs to review its energy policy utilizing a combination of studies on the feasibility of various energy options. These studies should be holistically reviewed, taking into consideration their various opportunity costs to determine the best structure of energy diversification for Nigeria.
- The foregoing study also presents Nigeria with a foundation for conducting further research on the cost effectiveness of coal as a source of energy, especially in tandem with the nation's obligation to reduce greenhouse gas emissions and the depletion of the ozone layer which as a consequence causes global warming.
- The Ministry of Mines and Steel Development in collaboration with the Ministries of Environment; and Power needs to review the environmental management systems it has adopted and find ways to reduce the pollution and environmental degradation caused by the activities of coal mining and coal energy production activities to their barest minimum.
- There is an urgent need for the government to supervise the remediation of Okobo community in Ankpa local government of Kogi state; and to ensure that the effects of further coal mining activities do not overwhelm the environment or their host communities. Pollution control measures should be implemented and enforced by the state government in collaboration with the Federal Ministry of Environment. Mined areas should be rehabilitated and reseeded after mining operations have been concluded in those areas
- Water pollution can be controlled by carefully separating the water run-off from mine workings. The waste water should be treated through technological means and excess levels of dust can then be controlled by spraying the roads with the treated water, which can also be used at the coal powered plants.
- The government should ensure that land reclamation policies are implemented by the companies involved and when these companies fail to adopt these policies, enforcement should be ensured.
- The government needs to radically upgrade and equip the health centres in these communities. The private clinics and public health centres, hospitals and primary health care providers are wholly undersupplied and lacking in the basic health care amenities like beds, medicines and basic life-saving equipment.
- As the populations of these communities grow in relation to the development of coal mining in Kogi state, there is an urgent need for the government to upgrade social amenities in the region. Such amenities would include potable water, roads, electricity, transportation, schools and hospitals.

- If Nigeria resolves to continue with its 30% coal power generation policy, then it must take extraneous care to ensure that the rights of these host communities are protected. In this regard therefore, it must ensure that community development agreements are reached and respected by mining companies and promoted by the government. It must also ensure that the benefits outweigh the risks for these communities at all times.

