COAL MINE FOR ZUMA COAL-FIRED POWER PLANT:
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
EXECUTIVE SUMMARY

Project Name: Coal Mining at Okobo, Kogi State.
Country: Nigeria
Project Number: P-NG-FB0-001
Division: ONEC 1

1. INTRODUCTION

This report is a non-technical summary of the Environmental and Social Impact Assessment (ESIA) for the mining of coal at the Okobo Mine that will supply coal to the Zuma Coal-Fired Power Plant (ZCFPP) in Nigeria. It describes the potential impacts the mining may have on the physical and biological environments and on people in its area of operation. It also addresses the measures that the Project will implement to reduce adverse impacts and to enhance potential social benefits, and how environmental and social issues will be managed during its operations, taking into account the imperative for compliance with applicable safeguard policies, including those of the Bank. The contents of the ESIA includes: (i) Policy Legal and Administrative framework, (ii) Project justification, (iii) Project description, (iv) Description of the Project Environment, (v) Associated and Potential Impacts, (vi) Mitigation Measures, (vii) Public Consultations and Disclosure, (viii) Environmental & Social Management and Monitoring plans, and (ix) 16 Appendices.

2. PROJECT DESCRIPTION AND JUSTIFICATION

Project Area: The proposed Okobo coal mining site is located between longitude N07°28' and latitude E07°43' in Ankpa Local Government Area of Kogi State (Fig1). It is located about 16km east of Ankpa town in Kogi State approximately 200km North of Enugu.

Figure 1. Map of the Okaba Coal
**Project Purpose:** In addition to contributing to the diversification of the country’s economy, the purpose of coal mining at Okobo coal mine is to provide coal as a main source of fuel to the Zuma Coal-Fired Power Plant (ZCFPP) at Itobe, some that is expected to generate 1,200 MW to increase the electricity generating capacity of Nigeria, and support the country’s efforts to enhance people’s access to affordable and reliable electricity supply.

**Project justification:** The key to bringing the Nigerian economy into the 21st Century is the development of a reliable power generation system that has adequate electrical power to supply the needs of the population and attract industry to the country. Without a reliable and expandable power generation system, the country cannot support modernization or industrialization. The benefits of the revitalizing of the Nigerian coal industry and expanding the electrical generating capacity can therefore be evaluated in terms of the contribution it will make to: (i) increased job opportunities and employment; (ii) increased national income via corporate and personal income tax and increased capacity utilization of existing industries; (iii) reduced deforestation by discouraging cutting of trees through burning of coal as an alternative to wood for fossil fuel; and (iv) added raw material base for enhanced electricity production for domestic and industrial use that will enable Nigeria to improve upon its performance in many sectors of its economy. The project will also result in the improvement of infrastructure as well as the enhancement of the social-economic structure in the surrounding communities, as it will provide employment during its operational.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The ESIA process for the coal mine was undertaken in accordance with the requirements of all relevant Nigerian environmental laws legislation including *inter alia*, those of:

i. **Environmental Impact Assessment (EIA) Act No 86 of 1992**, which restricts public or private development projects without prior consideration of the environmental impact.

ii. **National Environmental Standards and Regulations Enforcement Agency (NESREA) Act (2007)**, which empowers the Agency to enforce all national environmental laws and regulations (except those related to the oil and gas sector) and international treaties or conventions to which Nigeria is signatory. The Agency has issued 24 environmental regulations, which prescribe pollution abatement measures, limits and other safeguards for various industries and for noise, surface and ground water discharges among others.

iii. **Nigerian Minerals and Mining Act 2007** The Nigerian Minerals and Mining Act 2007 ("the Act") was passed into law on March 16, 2007 to repeal the Minerals and Mining Act, No. 34 of 1999 for the purposes of regulating the exploration and exploitation of solid materials in Nigeria. In addition to environmental considerations, this Act also considers the rights of host communities in mining areas.

iv. **National Policy on the Environment**, with the goal of achieving sustainable development for the country and emphasis on (a) securing for all Nigerians a quality environment adequate for their health and well-being; (b) conserving and using the environment and natural resources for the benefit of present and future generations; and (c) restoring, maintaining and enhancing ecosystems and ecological processes essential for the functioning of the biosphere and for the preservation of biological diversity and to adopt the principle of optimum sustainable yield in the use of living natural resources and ecosystems.
v. **Land Use Act (1978)**, which recognizes the rights of all Nigerians to use and enjoy land and the natural fruits thereof in sufficient quality to enable them to provide for the sustenance of themselves and their families.

vi. **Endangered Species Act 11, 1985** Section 1 absolutely prohibits the hunting or capturing or trading in the threatened animal species. **Land Use Act, 1978**

vii. **The Nigerian Urban and Regional Planning Act 1992** Act 88 of 1992 established a Development Control Department (DCD) charged with the responsibility for matters relating to development control and implementation of physical development plans at Federal, State and Local Government levels within their respective jurisdiction.

viii. **Kogi State Environmental Protection Board Law No.3 of 1995**, which states, among others, that no person shall cause any waste generated in the process of manufacturing or business operation to be discharged without treating or purifying it in accordance with the standards approved by the Board.

The key relevant global laws and conventions which were taken into consideration in the conduct of the ESIA for the coal mine include: (i) UN Convention on Biological Diversity with the goals of conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from genetic resources; (ii) UN Framework Convention on Climate Change, with focus on the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system; (iv) Vienna Convention for the Protection of the Ozone Layer and (v) Ramsar Conventions that are to stem un-progressive encroachment on and loss of wetlands and encourage the conservation and sustainable utilization of wetlands.

In addition to the ESIA requirements of Nigeria and the global conventions, the ESIA preparation recognised the need for adherence to with the general Environmental, Health, and Safety (EHS) guidelines of the International Financial Corporation’s Performance Standard ((IFC PS), as well as relevant safeguards, policies and procedure of the Bank.

### 4. DESCRIPTION OF THE PROJECT ENVIRONMENT

The following is a summary of the biophysical and socio-economic conditions prevailing in the project area.

#### 4.1 Bio-physical Environment

**Climate:** The climate of the project area is made up of distinct rainy (April to October) and dry (November to March) seasons. Mean annual rainfall ranges between 1000mm and 1250mm. The mean temperature in the project area is 36 °C and the values of relative humidity range from 36% in the dry season to 80% in the wet season.

**Geology:** The Okobo coalfield is underlain by a variety of Mesozoic [secondary] sedimentary rocks such the Awgu Formation which underlies the eastern flank and the Upper Coal Measures/False bedded Sandstones covering the western flank and the Formation is Santonian in age.

**Soil:** The major soils occurring in the study area include lithosols, alluvial soils and ferruginous soils. The soils are mainly characterised by sandy loam to sandy clay loam type, consisting of up to 50% sand, 15-20 % silt and 8-15 % clay, while the colour of the soils varied from light brownish soils to greyish soils of the flood plains. The pH ranged from acidic (pH 4.24) to slightly alkaline to pH 7.8, indicating low...
suitability of the soils for agricultural production. The concentrations of available phosphorus and nitrate were low requiring phosphate and nitrate fertilisation to sustain crop production while sulphate was found to be adequate for crop production.

**Hydrogeology/Water Quality:** The general ground water flow is predominantly intermediate and deep and in the direction of NE-SW. The physico-chemical analysis of the samples reveals alkaline pH values, found to be within safe limits. The other parameters analysed are within the WHO standard, except the iron (Fe), which was far higher than the WHO limit. The surface temperature recorded for surface water for the three streams ranged between 25°C - 30°C in both wet and dry seasons for freshwater environment. The pH measurements indicated acidic aquatic environment in the dry season and alkaline conditions in the wet season. The surface water shows evidence of hardness with high concentrations of the divalent ions, Mg²⁺ and Ca²⁺. The levels of dissolved oxygen recorded for the streams in the project area are between 1.4 and 3.0mg/l, indicative of clean and unpolluted water status. Analysis of phosphate indicated algal deficiency while that of nitrate was found to be typical of natural concentrations. The values recorded for all the heavy metals analyzed, were found to be within the Federal Ministry of Environment limits.

**Microbiology:** There is high incidence of coliform bacteria in soil and surface water samples in the project area. The diverse bacterial and fungal species encountered in the project environment during the wet and dry seasons include 25 microbial species comprising of 13 and 12 bacterial and fungal isolates respectively, the results show that the project environment is rich in microbial diversity. The prevalent microbial isolates during the wet season analysis were *Bacillus, Micrococcus, Pseudomonas, Escherichia coli, Aspergillus, Fusarium* and *Candida* species.

**Flora/Fauna:** The study area is located in the Guinea savannah belt of Nigeria. More than 120 species of plants were observed in the study area. *Panicum maximum* and *Mimosa pudica* constituted large colonies in some places and dominated the vegetation in those places. Species such as *Elaeis guineensis, Anarcadium occidentale* and *Pentaclethra macrophylla* were among the trees that physically dominated the vegetation very frequently. Deep in the forests and old fallow lands, species such as *Senna accidentalis, Senna hirsuta and S. Obtusifolia, Daniellia olivieri, Chamaecrista mimosoides, Ficus exasperata, Peperonia ellucid and Isoberlinia doka* were very regular. The most prominent families of plants in the area are *Poaceae, Fabaceae (Caesalpinioideae, Mimosoideae and Papilionoideae), Asteraceae (i.e. Compositae)* and *Euphorbiaceae*. *Poaceae* (grasses) family has the highest species diversity of nine (9) and *Euphorbiaceae*, which had seven (7) species each, *Cyperaceae* six (6) then *Asteraceae* and *Commelinaceae* having four (4) species each. Among these species of plants, herbs and grasses where predominant, covering 56.25 % of the total area under study while trees, climbers and shrubs have 18.75 %, 7.5 % and 17.5 % respectively. No portion of the project area has been so far designated as conservation area or area of outstanding resource interest either by the Federal Government of Nigeria, or the Kogi state Government. However, most communities in the project area have sacred forests in which their shrines are located. For such communities, the sacred forests are strictly under prohibition to disturbance; hence serve as phytodiversity conservation centres. The wildlife of major interest was mammals, birds and reptiles which constitute the major wildlife in the area. Thirty three (33) species of mammals representing seventeen (17) families were identified in the area, about five (5) are reportedly extinct and a few others were found to be threatened. Forty (40) species of birds representing twenty (20) families were sighted at the study area.
4.2 Socio-Economic Environment

The people of the project area are of Igala extraction. The traditional occupation of the people is farming, artisanship and trading. Farming is on cassava, maize, beans, yam, millet, groundnut and vegetable crops like pepper, tomato, okro, while trading is focused on foodstuffs, household provisions and general merchandise. A relatively large number of community youths are involved in the transportation (especially motorcycle) and farming business, while the female folk engage in food processing activities with focus on cassava derivatives (garri and fufu) and the production of ground nut cake. A reasonable number of youths in the study area are involved in artisanal occupation and commercial ventures like carpentry, mechanics etc. Land ownership is communal, Islam is the major religion and constitutes 82% of the population, the most prominent festival in the land is the Otagu festival, and educational attainment in the place is quite low and could be attributed to poor infrastructure. Prevalent sicknesses include malaria, typhoid, cholera etc. There is no potable water supply; the people’s sources of water are the three streams in the area supplemented by dug well water.

5. PROJECT ALTERNATIVES

Following the adoption of the mining option four mining alternatives were considered. They were (i) only surface mining; (ii) only tunnel mining; (iii) highwall mining; and (iv) combination of surface and highway mining.

Only surface mining option: This alternative favours coal mining but suggests that only surface mining would be carried out especially to reduce risks caused by tunnel mining operations. This option is rejected because it requires large surface area excavation, which is not economically viable. As a result, most of the natural coal mineral reserve will not be exploited. This would result to the under-harnessing of natural coal reserve and less foreign exchange earnings for the nation as well as insufficient source of material for energy supply.

Only tunnel mining option: This alternative implies the choice of only tunnel mining, especially to avoid disturbance of the environment by modification of the landscape or terrain, farming and land use. This option is rejected because outcrops of coal mineral deposits would be unexploited. The result of this is loss of foreign earnings as well as insufficient alternative to petroleum-based energy sources.

Highwall mining option: Highwall mining is a hybrid of surface and underground mining technology that is utilized to extract coal from underground at the point where the surface mine highwall stripping ratio becomes too high to be economical. The environmental benefits of highwall mining include: (a) displacement of very little soil/overburden in contrast with mountain top removal - the ecosystem/environment is not 100% distorted; (b) preservation of the landscape, fertile topsoil and agricultural lands; (c) preservation of the wildlife habitats; (d) reduction in the amount of particulate dust and noise pollution; (e) creation of minimum disturbance of river channels and prevention of soil erosion; (f) minimization of the cost of surface reclamation and/or rehabilitation during the phase of mine closure. It is a proven primary method for mining coal from outcropping horizontal seams. This alternative implies mining of coal from underneath the final highwall, when the strip limit is reached. This option is good, but cannot be used alone as the surface has to be fully exploited before continuing to highwall.
**Combination of Surface and Highwall mining:** This alternative allows for complete exploitation of the coal reserve in the area employing the surface and the highwall mining for greater stripping ratios. This alternative was, therefore, chosen.

6. **POTENTIAL IMPACTS AND MITIGATION/ENHANCEMENT MEASURES**

6.1 Potential and Associated Impacts

The coal mining project is expected to have both positive and negative impacts on the physical and socio-economic environment of the project area. The anticipated *positive impacts* include:

- **Job Creation:** During mobilization, movement of goods, personnel and equipment will create unskilled job opportunities (offloading, storing, security-related, etc.). The local citizens would be employed for the majority of these non-skilled jobs as much as possible. During the site preparation and construction of the Okobo coalfield mining project, community members and a few other nationals will benefit from land clearance and ground preparation jobs. During actual construction, operation and maintenance phases local citizens and other nationals will be engaged for most of the skilled and non-skilled job positions. Industrial development following availability of power in the area will further expand job opportunities in the project area.

- **Business Opportunities/Economic Enhancement:** Movement of the workforce during the mobilization phase will trigger an increase in local economic activity especially for food vendors, retailers, landlords, transporters, etc. This activity will promote economic empowerment of the local populace. The local economy will enjoy a “boom” that is expected to last throughout construction phase and even slightly beyond. Employment opportunities will increase with the establishment of project related processing plants and industries. The presence of new neighbours with obviously higher purchasing power in the project area will provide an opportunity for farmers, hunters and fishermen to sell their items at a higher price than they ordinarily would.

- **Improved Infrastructure:** The presence and the operation of the project will potentially bring about the improvement of existing infrastructure and introduction of new infrastructure. For example, the provision of health facility and good access roads for the project’s use will benefit the immediate and the surrounding communities.

- **Skills Acquisition:** The construction, operation and management of this Okobo coalfield mining project have the potential employment opportunities for qualified community indigenes (who may be employed in the project), new skills in building, construction and overall project development and management will be provided.

- **Increased Potential for Sustainable Rural-to-Urban Community Transformation:** This project has the potential to increase the amenities in the area. Some workers attracted during the construction phase will not all depart even after demobilisation of workers at the end of the construction phase. Through the process of natural increase (and further influx of people over time), the population of the community will be on the increase. Other types of need would evolve providing business economic opportunities, and this occurrence will increase demand and supply for essential infrastructure and services, features of urban communities.

- **Increased Potential for Corporate and Community Understanding:** By encouraging the fostering of local institutional responsibilities, adopting a participatory approach and sustained dialogue, this project offers an opportunity for improved corporate relations between project construction workers and the host communities.
Significant **negative impacts** at various stages of project implementation may include:

- **Increased potential for road traffic volume and risk of accidents/injuries:** It is anticipated that road traffic will increase during mobilization of personnel and equipment to site. Throughout the construction and operation phase, traffic is also expected to increase because more people and vehicles will be expected at the project area. Increase in the volume of traffic has the potential to increase the risk of accidents.

- **Influx of People-related Impacts:** These will include (a) alteration of age-sex dynamics; (b) increased pressure on infrastructure; (c) increase in communicable diseases; (d) increase in cost of living; (e) increase in social vices: (f) increased stress on security infrastructure; (g) shift in local occupation; (h) increase in community unrest, among others.

  ✓ **Alteration of the age-sex distribution:** During various phases of the project especially during mobilization and construction, influx of workers at the peak construction period, will consist mostly of young males and a small number of females. This could serve to alter the age ratio, loading more people in the 20 - 44 age groups and thus further increasing the noted concentration in this age bracket. Similarly, since the immigrants will be mostly males the sex ratio will be altered in favour of males.

  ✓ **Increased pressure on existing infrastructure:** Influx of people mostly during the mobilization and construction phases will put more pressure on the already deficient physical, social and economic institutional infrastructure.

  ✓ **Increase in communicable diseases (including STIs):** The influx of a largely youthful, sexually active people, many of who are likely to be single and without their families is anticipated to increase the potential for casual sex and the transmission of STIs. Experience from past projects completed in the neighboring communities indicates that commercial sex workers (CSWs) often constitute a significant proportion of camp followers and if the same occurs for this project, it is likely to increase the risk of contacting STIs given the baseline circumstances. The workforce from outside the area (both national and expatriate) and their camp followers may also import some communicable diseases such as tuberculosis. Many camp followers are expected to live in poor housing conditions with overcrowding and inadequate sanitation. These conditions are favourable for the spread of communicable diseases.

  ✓ **Increase in cost of living/Inflation:** Any significant increase in movement of people to an area, especially those expected to be economically stronger than the local population usually triggers an increase in cost of living, and therefore inflation. This situation is due to the increased demand for accommodation, basic daily needs, food items and services. Inflation is likely to commence during the mobilization phase as people and equipment begin to move in. It will reach a peak during the construction phase, when there will be more intense site activity over a relatively prolonged period of time, during which many of the workers will be resident in the project area. The inflation rate is expected to drop off during the operations phase, when the bulk of the construction workers would have been potentially demobilized and moved out of the project area.

  ✓ **Increase in Social Vices:** The influx of people into the area (both the workforce and the followers), starting from the mobilization phase, will mean that mainly young men of different lifestyles will migrate into the area. The presence of such people could lead to various social pathological conditions such as increase in crime rate, fraud, prostitution, drug and alcohol abuse, etc. As is the case elsewhere in Nigeria, where construction work is going on, it is expected that there will be a significant influx of commercial sex
workers (CSWs) to take advantage of construction workers, many of who will come without their families. Although this trend will begin to be noticeable during the mobilization phase, it is during the construction phase that it will attain its peak, dropping off during the dismantling and decommissioning phases.

✓ **Stress on Existing Security Structures**: An influx of people into the area could cause an increase in crime levels and other social vices. Also the project may increase the risks of community unrest, sabotage actions and violent protests. These will further stress the existing security structures.

✓ **Shift from Traditional Occupation**: During the mobilization and construction phases, when it is expected that a considerable number of local citizens will be needed for non-skilled jobs, there is the potential for a shift from the traditional primary activities of farming and trading to other economic activities.

✓ **Increase in Community Unrest**: During all project phases, there would be an influx of people (job seekers, business persons, CSWs, etc). If the local citizens perceive that the immigrants would deprive them of job and/or business opportunities, it could lead to community unrest. During operations, the disparity in payments and conditions of service among workers may give rise to resentment that could lead to community agitation. The Okobo coalfield mining project would normally undertake some community development projects. Failure to meet up to the community’s expectations could lead to a strained relationship with the host community.

- **Potential for Erosion on and off the site**: Activities associated with construction (including land clearance, excavation and grading) in the proposed area would increase the potential for erosion. Once a catchment area has been levelled, the runoff (as a proportion of rainfall) is vastly increased. Therefore, during periods of heavy rainfall the volume of water carried by drains in levelled areas can be massive. The resulting rise in water levels can cause flooding and erosion. After construction and during operation and maintenance of the Okobo coalfield mining project site, there will be increase in the amount of impervious surfaces around the construction site. This exposed area is likely to increase the potential for erosion off the site. Extensive erosion could result in a change in the land use pattern of affected areas.

- **Soil degradation and Soil/Groundwater Contamination**: Construction equipment generates some volumes of waste oil. If fuelling, maintenance and servicing protocols for construction machinery at the worksite are not controlled, there is potential for impact due to leakage and/or spill. Improper discharge and/or storage, and leakage can result in the contamination of soils, surface water and groundwater. There is a potential for faecal coliform impact on the water from the shallow well located in the vicinity of the pit toilet. Possible contamination of groundwater due to project activities if not properly managed

- **Reduction in air quality**: Project activities like vegetation clearing, excavation etc. will impact on the air quality due to generation of dust and gaseous emissions from movement of heavy machineries. The particulate matter that would be released into the air could reduce visibility. The particles may settle on leaf surfaces thereby blocking stomata pores through which gaseous exchange occur during respiratory/photosynthetic activities. These impacts are, however, reversible and of short duration. Exhaust fumes from heavy machinery may contain gaseous hydrocarbons and noxious oxides like CO\textsubscript{2}, NO\textsubscript{2} and SO\textsubscript{2}. Gaseous discharges and dust particles from vegetation clearing, excavation and heavy machinery and vehicles during construction, if not controlled, could affect lung functions and may lead to aggravate respiratory disorders such as bronchitis and asthma. These impacts are direct and long-term.
- **Loss of Employment after decommissioning:** At the decommissioning phase of the facility, it is likely that workers and users of the Okobo coalfield mining project will lose their jobs and source of income and employment facility. This event could result in considerable hardship for the affected families. There is a potential for other types of economic activities to emerge.

### 6.2 Mitigation Measures

In addition to enhancing the positive impacts, Zuma Energy Company has designed mitigation measures and options for all the potential and associated negative impacts identified with the project implementation to either completely eliminate or minimize their effects. The mitigation measures proposed for the predicted medium and high-ranking impacts arising from this proposed power plant project would recognise the following: (a) environmental laws in Nigeria, with emphasis on permissible limits for waste streams FMENV (formerly FEPA, 1991); (b) best available technology for sustainable development; (c) feasibility of application of the measures in the country; (d) concerns of stakeholders during consultation meetings and focus group discussions with the socio economic/health teams.

In general, the proposed impact mitigation measures focused on (i) avoiding the impacts altogether by not taking a certain action or parts of an action; (ii) minimizing the impacts by limiting the degree or magnitude of the action and its implementation; (iii) rectifying the impact by repairing, rehabilitating or restoring the affected environment; and (iv) compensating for the impact by replacing or providing substitute resources. For each of the identified negative impacts, the measures include:

- **Community displacement due to land acquisition:** Resettlement of the community, guided by the Resettlement Action Plan (RAP) developed for the Coal-fired Plant shall be undertaken in concert with the people of the community

- **Increase in road traffic volume and risk of accidents/injury:** Effective journey management plan shall be ensured and pre-mobilization inspection of all vehicles shall be ensured. In addition, visible warning signs shall be placed on roads and speed breakers installed at sections of the road traversing communities.

- **Increase in noise nuisance:** The mining project Management shall ensure that all construction equipment is in proper operating condition and fitted with factory-standard silencing features, if required. A haul route which designates short haul distances to construction site and as far as possible from sensitive receptors will be constructed. No night-driving policy shall be enforced by all the contractors. Contractors shall plan activities such that World Bank noise limit shall not be exceeded around the communities, especially at night. In addition, communities shall be consulted prior to periods of expected peak noise levels.

- **Reduction in air quality:** Water will be sprayed to reduce dust in air during construction in the dry season. Operators of construction equipment must wear appropriate PPE e.g. nose masks during dusty operations. The mining project Management shall ensure that all mobile and stationary combustion engines are properly maintained.

- **Soil degradation and soil/groundwater contamination:** The mining project Management shall ensure contractor provides containment for any chemicals and liquid discharges. The company’s waste management policy shall be enforced in cases of domestic waste, scrap metals, non-plastic combustible packaging materials, plastic packing materials, drums and containers as well
as medical wastes. A controlled fuelling, maintenance and servicing protocol for construction machinery at worksite would be established and followed.

- **Potential for erosion on and off the site**: Land clearing would be done during dry season so as to put in place appropriate erosion-control facilities before heavy rainfall begins. A storm water pollution prevention plan for erosion control shall be put in place, during construction.

- **Increases in runoff water/decreased quality**: To reduce potential increase in water runoff, the mining shall ensure that the impervious area is minimized. Runoff water shall be captured at the point of impact. The mining project Management shall ensure that any non-paved area is re-vegetated. Vegetated areas are essential to filter the water before it enters the watershed.

- **Change in type and increase in the rate of waste generation**: The mining waste management policy for this project shall be enforced. Health awareness campaigns within the workforce to improve hygiene and good housekeeping shall be encouraged.

- **Increase in community unrest**: Established channels of communication with communities shall be maintained. The project management shall take the needs of the host communities into account with a view to assisting whenever possible, and a Community Relations Officer (CLO) shall be appointed, to liaise with the host communities on issues of concern. The coalfield mining project Management shall abide by all agreements reached with the communities such as (a) giving preference to and recruiting unskilled labour from the community and (b) promoting recreational activities and maintaining regular dialogue with the communities.

- **Pressure on existing infrastructure e.g. roads**: Appropriate maintenance of the roads with a view to improving its functionality, shall be ensured, as well as functional telecommunication network, electricity, water facilities etc. Sustainable community development projects during project execution shall be undertaken.

- **Increase in local population and alteration in age-sex distribution**: Contractor shall make available a detailed housing plan for contract staff to the mining project Manager prior to mobilization. Prior to commencement of the construction phase, available construction jobs will be advertised, to discourage unqualified personnel from moving into the project area, thus reducing the rate at which population will grow. Qualified members of the host communities, particularly women, will be employed as much as possible.

- **Change in employment and income levels**: The mining project Management shall assist local communities as appropriate. Where job loses occur, contractors shall provide severance package in line with conditions of service and Nigerian labour laws. The mining project Management shall investigate the possibility of some staff retention by new operator(s) in handover agreement, as well as encourage contractors to provide counselling for staff in preparation for the disengagement.

- **Increase in cost of living/inflation**: Skill development and enhancement programmes shall be supported in the communities. Contractors shall submit a catering plan to the mining project Management Manager for approval prior to mobilization.

- **Increase in social vices**: Intensive enlightenment campaign and health education for the abatement of abuse of drugs and alcohol shall be carried out in the communities and among workers throughout the life of the project. Alcohol and drug policy for staff will be enforced. The mining project Management shall support public health lectures with emphasis on common communicable diseases such as malaria, TB, STIs including HIV/AIDS. Condoms will be provided for construction workers. Social and health awareness programs for all workers at induction and on a continuous basis throughout the life of the project, shall be conducted. Sporting activities will be supported, and the mining project Management shall engage and support local security systems.
- **Increase in communicable diseases:** The mining project Management, in collaboration with State Ministry of Health, shall support immunization. Training of health practitioners and community health workers to strengthen primary health care in the project area shall be undertaken, including community-based training on the prevention of common communicable diseases, water protection/purification techniques and basic sanitation. The mining project Management shall enforce expatriate malaria policy and immunization. Activities of the State Action Committee on Aids (SACA) to reduce the incidence of HIV/AIDS shall be supported. In addition, the use of insecticide treated nets (ITN) by work force shall be encouraged.

- **Increase in respiratory diseases:** Nose masks shall be worn by site workers during (dusty) operations. Water shall be sprayed on construction site to reduce dust levels especially during dry season. Inspections and regular maintenance of equipment shall be conducted, while the mining Management’s guidelines for health shall be implemented. Construction workers shall be compelled to wear PPEs.

- **Injury/fatalities in workforce/communities:** Ensure adherence to safe work practices and provide appropriate training to appropriate personnel. To prevent electricity-related injuries, the management shall ensure that electrical connections are inspected and tested before use. It will also ensure insulated hand gloves are used by personnel during welding activity, and ensure regular maintenance of tools and equipments. There will be compulsory medical fitness test for the mining project Management and contractor personnel shall be enforced. There will be First Aid training of workforce. Emergency response procedures shall be put in place and enforced, while safety awareness training for workforce and representatives of host communities will be undertaken.

- **Stress on existing security structures:** A high level of security consciousness both within and outside the work area shall be developed. Security reports shall be reviewed by the mining project Management Project Manager. Special security force shall be established and deployed for the project. This shall include deploying some of the mining project Management security personnel to strengthen security in the area. The mining project Management shall establish a liaison to foster partnership with the community so as to guarantee security for the project. Safety workshops shall be organized, as required, identifying, evaluating and recommending contingency plans for all security risks.

- **Introduction of impacts not assessed/mitigated:** All major facilities or industries to be established by any investor, even if it be the proponent of mining, shall statutorily have its impacts assessed and mitigated and an EMP developed in concert with the preparers of this EIA Report which shall be the basis of such additional EIAs. The management shall ensure that wastewater and sewage are treated to FMEnv limits prior to discharge and their discharges in line with FMEnv requirements.

Part of the financial resources already committed to mitigation measures for its Coal-Fire Plant will be used to address various mitigation measures to ensure environmentally friendly operations. In addition, ZUMA will be in position to finance the cost of rehabilitating the site at an estimated cost of about US$2m spread across the following activities in table ES1:

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<tr>
<th>Table ES1: Estimated Cost of Okobo Coal Mine Rehabilitation</th>
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<tr>
<td><strong>Domain</strong></td>
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<td>Site infrastructure</td>
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7. ENVIRONMENTAL HAZARD MANAGEMENT

A mining plan with a number of checks to minimize disaster occurrence has been developed for the mine. The mining plan selected by Zuma 828 Coal Limited is based on the utilization of shovels, trucks, dozers, and scrapers to strip the overburden from the coal seam. Initially, the topsoil is generally removed by scrapers or dozers, and the sub-soil by dozers, and then the rock overburden will be drilled and blasted before loading with shovels. In this mining plan, all of the rock overburden is considered to be blasted before being loaded by shovels, because stripping shovels are designed to load fragmented rocks, and not to dig unblasted rock. The stripping and mining will be done in a series of long 50 meter wide parallel panels. Stripping begins with an initial box cut that will provide access to begin a parallel panel sequence. It is located where the overburden is thin and the coal is thick, thus lower mining costs to improve cash flow when mining is initiated. Final reclamation will involve backfilling the previously mined areas to eliminate the highwall and generally return the area to the original topographic relief (Return-To-The-Original-Contour-Reclamation). The prevention of workplace accidents and incidents during the construction and operation of the proposed project shall be achieved using a good hazard analysis procedure. Contingency plans that shall address emergency situations, including, but not limited to serious injury or illness, mining and weather related disasters, as well as land vehicle mishaps will be developed and implemented for the coal mine Management and contractors.

8. MONITORING PROGRAM

**Effective implementation of the recommendations of the ESIA and its management plan:** The project has developed detailed impact mitigation and monitoring plan that for the effective implementation of the recommendations of the ESIA and its management plan. The implementation of the plan will ensure that all the identified significant impacts from the project are mitigated to as low as reasonably possible.
and that key performance indicators are monitored periodically to track how effectively mitigation measures are implemented. It specifies the mitigation measures, monitoring requirements, duration and frequency of the monitoring, and the action parties to manage the biophysical, social and health environment at the various phases of the project. In the implementation of the plan, care will be taken to ensure that the project Management complies fully with relevant regulatory control measures and international best practice and self-imposed.

**Scope of Monitoring:** Regular environmental monitoring shall be undertaken to (i) obtain baseline data so as to identify project impacts on environmental components and impacts of the environment on the proposed project; (ii) develop future predictive models from the baseline data obtained; and (iii) develop integrated pest management and erosion control programmes, using trained personnel.

**Environmental Audit:** Environmental audit will be conducted on regular basis for all operations throughout the lifespan of the project. The audit scope would include periodic compliance monitoring plan. The audit process shall be used to monitor prediction in the ESIA process, assess the environmental performance during the operation phase of the project development and ensure that environmental protection and management procedures as specified in the ESIA are implemented.

9. **PUBLIC CONSULTATIONS AND PUBLIC DISCLOSURE**

9.1 **Public Consultations**

Consultation activities were undertaken with a broad spectrum of community stakeholders including the Royal Father (Gago of Okobo Okpiko), village council members, representatives of the youths, women and social groups (e.g. Okobo Okpiko Development Association; Okobo Okpiko Youth Development Association and Pillar Club – an association of young men and women). The key objective of the consultation was to notify the stakeholders of the nature, scale and timing of the proposed mining project. The process was also used to facilitate information gathering between the state government and the other stakeholders. These series of activities gave a profound insight into the mindset of the landlord of the proposed project while expressing delight at being considered to host the proposed project. They needed clarification with regard to the exact nature of the proposed project.

The consultation process was implanted at three levels. The first level of consultation identifies the social and economic issues in the project area that will have to be addressed by the project management. The second level streamlines the issues and makes plans for specific actions. This level recognizes various phases of engagements between the project proponent, host community, village council, women/men’s groups, and youth organizations. The third level ensures regular communication with stakeholders throughout the project’s life; the second and third levels of consultation commence at project inception and continue through the life span of the project.

The proponent shall continue to consult with the regulatory agencies, the host community, all stakeholders and other relevant parties concerned with or are likely to be affected by the project at all stages of project development.
9.2 Summary of Disclosure

The disclosure procedure adopted during the ESIA preparation is not explicitly stated. Nevertheless, the ESIA summary shall be disclosed on the AfDB’s website for 60 days.

9.3 Community’s Demands

The people of Okobo Okpiko are of the opinion that if the proposed Coal mining project is to be of immense benefit to the human and physical environment, project proponent would have to address the following concerns:

- Provision of necessary social infrastructures/amenities like pipe borne water, access road to Okobo Okpiko village;
- Enhancing employment opportunities for educated indigenes of the area in the proposed project as both junior and management staff in accordance with standardized procedures;
- Empowerment of Okobo Okpiko women, including provision of soft loan and grants and setting up of a craft and vocational centre in the study area;
- Construction of a modern market in the project area by the project proponent;
- Establishment of modern and more equipped hospitals in Okobo Okpiko to check mortality and morbidity in the project area;
- Provision of standard and well equipped primary and secondary schools for Okobo Okpiko indigenes; and
- Rehabilitation and provision of more classrooms, teaching aids, library and technical infrastructures (laboratory, introductory technology workshop etc) in the only primary school in the area, which is already overpopulated by pupils.

9.4 Corporate Social Responsibility

Zuma 828 coal will have a corporate social responsibility budget estimate of about US$11million, which will be decided on the quantity/tonnage of coal concentrate derived in the area, to support all approved projects. The budget will be reviewed annually as part of the company’s annual strategic planning processes and will be based on the profitability or financial performance of the company. Funds obtained from external parties may be utilized to increase the scope and strengthen the impact of Zuma 828 coal programs on the condition that the objective of such fund aligns with the policy focus areas outlined above. Table ES2 shows the proposed activities, timeframe and proposed amount.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time Frame</th>
<th>Proposed Annual Budget (per ton of coal concentrate) – US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and Empowerment</td>
<td>Progressive</td>
<td>5</td>
</tr>
<tr>
<td>Socio-economic development</td>
<td>Progressive</td>
<td>1</td>
</tr>
<tr>
<td>Environment and enterprise development</td>
<td>Progressive</td>
<td>3</td>
</tr>
<tr>
<td>Arts, culture, sports and recreation</td>
<td>Progressive</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td>Progressive</td>
<td>1</td>
</tr>
</tbody>
</table>

Table ES2: Budget for project activity per ton of coal concentrate
10. COMPLEMENTARY INITIATIVES

Zuma Coal-Fired Power Plant (ZCFPP) (about 125 km from project site) and Ajaokuta 330KV DC Power Transmission Line Project. ESIsA for the ZCFPP and the Power Transmission Line Project have already been prepared and approved by the Federal Ministry of Environment, Nigeria. They have also been submitted to the Bank.

11. CONCLUSION

If the proffered mitigation and monitoring measures are followed, the Zuma Coal Mining Project Management is of the view that the proposed power project can be implemented and operated without significant adverse impact to the environment.

12. REFERENCES

The main documents consulted to prepare the Summary are:

1. ESIA Report for the Okobo Coal Mining
2. AfDB (2001): Environmental and Social Assessment Procedures
3. AfDB (undated): Environmental and Social Assessment Procedures Basics
4. World Bank (2005), Environmental Impact Assessment (EIA) and Safeguard Policies.