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**REPUBLICS OF NIGERIA, BENIN AND TOGO**

**CEB-NEPA 330KV POWER INTERCONNECTION PROJECT**

**SUMMARY REPORT ON ENVIRONMENTAL AND SOCIAL IMPACT  
ASSESSMENT**

**INFRASTRUCTURE DEPARTMENT  
CENTER AND WEST**

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**CEB-NEPA 330KV POWER INTERCONNECTION PROJECT**  
**SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)**

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# **NIGERIA – BENIN/TOGO CEB-NEPA 330KV POWER INTERCONNECTION PROJECT – SUMMARY OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**

## **1. INTRODUCTION**

1.1 Following a request from the Governments of Nigeria, Benin and Togo, the Bank expressed its interest in financing the CEB- NEPA interconnection Project. The proposed project is designed to supply electric power to CEB Power Network (Benin and Togo) via the Nigerian Electric Power Grid. The objectives of the project are to: (i) provide an alternative source of power supply to Togo and Benin to meet the shortfall in electricity imports from Ghana and Cote d'Ivoire and improve voltage on CEB transmission network; (ii) reduce power outages in Togo and Benin during drought years and thus limit economic and social hardships on the population of the two countries; and (iii) link the electricity grid to the already connected grids of Benin, Togo, Cote d'Ivoire and Burkina Faso to improve reliability of supply and optimize production costs within the sub-region. The project when completed will help to create employment opportunities and improve the socio-economic standing of the concerned countries viz. Nigeria, Benin and Togo.

1.2 Because of the nature, location, regional scope as well as its direct, indirect or induced impacts, the project is classified in the environmental category 1. In compliance with the Bank's environmental policy requirements and in conformity with the Nigeria, Benin and Togo environmental protection laws, an environmental and social impact assessment (ESIA) has been conducted.

1.3 The purpose of the ESIA is to identify the potential risks on the physical, biological and socio-economic environment of the proposed project area and subsequently propose measures that would eliminate, compensate for or mitigate any negative impact of the project on the environment. This report summarizes the ESIA of the Interconnection project. Copies of this ESIA have been placed at the Ministries of Environment of the Nigeria, Benin and Togo and the public were invited for comments.

1.4 The preparation of the ESIA was based on field trips to all the affected communities situated along the transmission line right of way (ROW) (strip of land 100m wide and 70 km long) on which the line will pass. The affected States, Local Government Areas, and Communities officials, Community Development Associations (including women and youths) were all consulted. Also, documents on related issues were referenced; relevant field samples were also taken and analyzed. The major issues addressed were: a) presentation of the project's technical objectives and stakeholders' comments on the issues raised; b) identification of the potential positive and negative impacts from field samples; c) proposals on the mitigation measures including compensation; d) consideration of all other ancillary measures to improve the project benefits.

## **2. PROJECT DESCRIPTION AND JUSTIFICATION**

2.1 The project component involves:

- a) construction of a 70 km long 330 kV overhead transmission line from Ikeja West 330/132 kV substation from Nigeria to Sakete in Benin Republic (16 km are in Benin Republic). The line is to be equipped with twin ACSR 380/50 conductors, one over head ground wire of 104-mm<sup>2</sup> steel and one optical ground wire (OPGW);

- b) expansion of the Ikeja West (Nigeria) substation switchyard transformers and other facilities to be fully equipped with 1 x 75 MVA, 330 kV reactor, associated telecommunication, protection, metering and other sub-station equipment;
- c) construction of a new 330/161 kV substation, transformers together with other facilities in Sakete in the Benin Republic section;
- d) supervision of works;
- e) implementation of environmental measures; and
- f) audit of the project.

The Bank is financing exclusively the Nigerian components. The Benin/Togo components are being financed by the West African Development Bank and the Economic Community of West African States.

2.2 The construction of the interconnection project is justified for the following reasons:

- i) it will generate employment opportunities among potential users of the energy for economic activities; ii) it is expected that the project will provide an alternative source of power supply to Benin Republic and Togo to meet the short fall in their electricity imports from Ghana and Cote d'Ivoire and also it will stabilize power supply on the CEB transmission network; iii) when completed, the project will drastically reduce power outages in Togo and Benin Republic during drought periods and thus limit economic and social hardships on the population of the two countries; and iv) it will also link the electricity grid of Nigeria to the already connected grids of Benin, Togo, Ghana and Cote d'Ivoire to improve reliability of supply and eventually optimize production costs within the sub-region.

2.3 The project design criteria incorporated the local and international experience and general practice for construction of energy projects and considerations as exchanged and developed by CEB and NEPA since 1984. The German code of "Planning and design of overhead power lines with rated voltages above 1kV" DIN VDE 0210 of December 1985, has been used as the general precept for the project design. The code contains particulars on equipment supply requirements, design and construction of power lines. Modifications to reflect the actual conditions of Nigeria and Benin and good tower practice in respect to engineering, environment and manufacturing were observed.

### **3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

3.1 At the institutional level, the Environmental agency of Benin is responsible for the formulation of environmental policy and the management of the environmental resources. The environmental protection law has been adopted and promulgated on 12/2/99. Chapter 1 of this law deals with the procedures to undertake an environmental impact assessment. In February 2001, a sectoral guide has been elaborated for the preparation of an environmental impact assessment (EIA) for electricity projects. In 1992, the EIA decree was prepared by the Federal Environmental Protection Agency of Nigeria (FEPA), now the Ministry of Environment, and in 1995 the EIA procedural guidelines, including energy generation and transmission projects and ESIA sectoral guidelines were established.

3.2 The national environmental impact assessment decree No 86 of 1992 makes ESIA mandatory for all major public and private projects in Nigeria. The ESIA decree sets out to: i) consider the likely impacts of the project, and the extent to which these impacts will be affected the environment before starting the project activities; ii) promote the implementation of appropriate policy in all federal lands consistent with all laws and decision making processes through which the goal of this decree may be realized; and iii) encourage the development of procedure for information exchange, notification and consultation between organizations and persons when the proposed activities are likely to have significant environmental and social effects on state/communities or on the environment within the project areas.

3.3 These guidelines together with the regulations, guidelines and standards of Lagos and Ogun states, the corporate and operational policies of NEPA, CEB and also the ADB's procedures on environmental and social assessment of June 2001 were used. In addition, the relevant international conventions on environmental protection to which Benin and Nigeria are signatories (biodiversity, climate change, Kyoto protocol, etc), were considered.

#### **4. DESCRIPTION OF THE PROJECT ENVIRONMENT**

4.1 The project area is located partly in Nigeria (Lagos and Ogun States) and in Sakete and Ifangni in Benin Republic. The entire project area lies approximately between longitude 20° 42'E and 32'E and between latitude 6° 22' N and 6° 42' N. It stretches from Ayobo in Lagos State to Sakete in Benin Republic.

4.2 The relief is in the form of a plateau towards Sakete and the other parts characterizing a slightly rolling morphology. Towards Lagos, the relief is generally characterized by low coastal plains with a substantial part of the land lying below the sea level, with a slope towards the Lagos lagoon. On the Benin side the soil type is lateritic and sandy and sometimes hydromorphic. Towards Nigeria, the soil type is generally lateritic. Extensive limestone deposits, chalk, phosphate, high quality stone, gravels, gypsum and tar abound in Ogun State section of the project.

4.3 The climate of the project area in the Benin section is influenced by the Sudano-Guinea type. The plateau of Sakete and Ifangni experience a good rainfall, up to 1400 mm/year. The climate of the Lagos and Ogun states is tropical with high humidity, good rainfall and thick clouds all the year round. The monthly temperatures range from 24° C to 32° C, relative humidity (63% - 97%), rainfall 28 –100 mm (dry season) and 280 – 300 mm (rainy season). The rainy season begins in April, and peaks in June and decreases gradually to end in October. The dry season is between November and March. The wind regimes are South-West Monsoon winds that bring rains and the South East Trade winds that bring the Harmattan.

4.4 The Project Area is endowed with large expanse of forests, farmlands, trees, and fauna, in undisturbed natural settings. The vegetative cover indicates a diversity of species influenced by climatic variations, edaphic adaptability and anthropomorphic interference. The vegetative formation of the project area constitute herbaceous savannah, lowland rain forest with checkered vegetation, woody islets, fruit trees, palm trees and cocoa plantation. The riverbanks support luxuriant gallery forest. The plant species encountered are the Samba, Iroko (*Milicia excelsa*) or *Chlorophora excelsa* which are becoming rarer because of over-exploitation, the Ceiba (*Ceiba pentadra*), exploited for shuttering, the Kapok, *Bombax buenoppsens*, *Afzena Africana*, *Artocapus incisia*, *Artocarpus integrillis*. The commonly forest plantation species are teak, *Accacia auriculiformis*, etc.

4.5 The faunal species show an interrelated co-existence between those inhabiting the savannah and those inhabiting the forest galleries. However, in the project area, because of human activities most of the species have dwindled. Those commonly found are the squirrels, monkeys, rats, snakes and birds such as storks, herons, vultures, crows, etc

4.6 On the Benin side, the economy of the project zone is essentially based on agriculture which absorbs about 80 % of the labor, followed by animal rearing and fishing. The industrial activities concern small-scale units for the transformation of agricultural produce (manioc, palm oil, fruits), usually undertaken by women. On the Nigerian side, the inhabitants of the project are predominantly farmers and traders. They are noted for making mats, blocks and in cassava production, Garri and Fufu processing, tie and dye textile, horticulture, fuel wood production, vegetable farming etc. The rapid increase in population due to urbanization in the area has led to diversification of the economy. Many people are now involved in factory work and trading. Motor parts dealers, motor mechanics, electrical installation, masonry, electronics technicians, transportation, computers, business centers, hairdressing, beauticians, and other petty businesses are springing up in the few towns around.

4.7 The last population census carried out for the Sakete and Ifangni, Benin regions in 1992, indicate 4627 persons in the project area. The ethnic groups are the Nago, Yorouba, Goun Torri and Fons. The people are very much attached to their local traditions and in each village at least one hectare of religious/cultural forest is preserved and venerated. In Ogun state the ethnic groups are Yorubas and other groups as well as expatriates. Where as in the Alimosho Local Government Area of the Lagos state, the ethnic tribes are the Aworis, who were the early settlers, the Yewas, the Egbas and the Ijeshas. The entire area has rich culture in the form of masquerade festivals that take place in some settlements at certain times of the year. There are traditional shrines such as Shango (god of Thunder) in Egan and Ajasa Town and that of Oro in Ishefu, Egan and Egbe. There are many paramount traditional rulers in the Project Area. They are very important as far as Land/Compensation matters are concerned.

4.8 On the Benin side, the majority of the infrastructural services encountered are located in Sakete. These include bus stations, banks, motels, central administrative services, hospitals, health centers, clinics, petrol pumps, shops, bars butcher's shops, schools, churches, mosques, youth centers, etc. On the Nigerian side, due to the rural nature of many of the settlements, a paucity of the infrastructural facilities is evident. There is one borehole at Aparadija and one at Lafenwa. Electricity is available at Alaari, Ihunbo, Idi-Ota, Ajilete, Oja-Erin, Sabo Ago Ilobi, Awuko Alongbon and Owode. Other infrastructures found in the study area are health centers, primary schools, secondary schools, post offices, pipe-borne water, maternity centers and police station.

## **5. PROJECT ALTERNATIVE**

5.1 A thorough investigation was carried out to align the proposed route so as to give the least environmental and social impact that should be structurally and economically acceptable. After all considerations, the earlier route which was recommended for change in alignment near Ashipa, because of forest reserve, was no longer necessary as the forest has been cleared. In fact, the originally planned route now remains with minor alterations at certain points to avoid passing through structures that may require expropriation and subsequent heavy compensation.

5.2 The preliminary considerations indicated that the line route should remain as far as possible as presently proposed. The procedure for the choice of the transmission line route included the selection

of the shortest length that is environmentally and socially acceptable during construction and operation and avoidance of passing through environmentally sensitive areas. Easy accesses to construction and operation sites, low pollution level and favorable geotechnical conditions for the stability of foundations were also taken into account. The selected route avoided as much as possible passing through heavily built-up areas. The best Project technical design alternatives and standards were equally incorporated in order to improve the sustainability of the project.

## **6. POTENTIAL IMPACTS AND MITIGATION MEASURES**

### **6.1 Positive Impacts**

6.1.1 On the whole, the socio-economic impacts of the interconnection project will be beneficial and widespread. In fact, the project will contribute to improving energy security within the benefiting countries. Furthermore, it will generate employment opportunities among potential users of the energy for economic activities. It is expected that the project will provide an alternative source of power supply to Benin and Togo and will contribute to meet the short fall in their electricity imports from Ghana and Cote d'Ivoire and to stabilize power supply on the CEB Transmission network. When completed, the project will drastically reduce power outages in Togo and Benin during drought period and thus limit economic and social hardships on the population of the two countries. It will also link the electricity grid of Nigeria to the already connected grids of Benin, Togo, Ghana and Cote d'Ivoire in order to improve reliability of supply and eventually optimize production costs within the sub-region.

6.1.2 From the ecological perspective, the project will help to check the reduction of forest resources, as more people will now be using electricity. In addition, it will also contribute to increased availability of time for attending to other important activities, time which were used to travel long distance in search of fuel woods. Incidentally, a control in the clearing of forest vegetation will concomitantly bring down the incidents of erosion. As more people would switch over to electricity for cooking, less dangerous emissions of gases, into the atmosphere, as a result of wood burning will ensue, thus, improve air quality within the project influenced areas.

### **6.2 Potential Negative Impacts During Construction**

#### **Clearing of right of way and construction of access road**

6.2.1 The building of an overhead power transmission line requires the clearing of a corridor (the right of way). The vertical clearance between the lowest conductor and vegetation/houses to avoid flashover are considered. The 330 kV line requires a minimum ROW width of 50 meters. In the case of this project, where the trees up to 35 meters high are found near the proposed line, the ROW width had to be extended to 100 meters because of future expansion. (In Nigeria, to give room for future expansion, the standard ROW is 100m). In addition to the ROW that has to be cleared a number of access roads have to be built to bring in the equipment. Furthermore, a 3-meter tract along the line for inspection purposes would be built. These would require a sizeable extent of land.

#### **Loss and fragmentation of natural habitats**

6.2.2 In the wooded and forested areas, the building of the overhead power line would have a significant effect on the natural habitat. The clearing of the forest would create forest edges that in many cases would cause an increase in densities and diversities of certain birds and other wildlife. Besides the loss of wild life, forest could also be fragmented, thus causing a severe negative impact on

forest associated communities. This access might also encourage new opening of farmlands and deforestation.

### **Impacts and nuisances on landscape and people**

6.2.3 The impact of the project on soil concerns mainly the induced effects of erosion in the sensitive areas (tower bases, borrow pits for filling access roads, embankments, etc.), and the effects of the abandonment of borrow pits that could, in particular, create marshlands. This could disfigure the landscape destroy the vegetation and create ponds which would be the potential niche for the breeding of mosquitoes and thus affect the health of the people who live within the area and its vicinity.

6.2.4 In the built up areas, during the construction period, transient obstruction of accesses to residences and social infrastructures, disruption of certain routine activities, nuisance caused as a result of dusts, vibration, accident risks are foreseen. Negligence during the construction phase could also cause accident, electrocution and corporal harm. If the working periods were extended beyond the normal working hours, the residents could be seriously disturbed.

6.2.5 The construction works of the line, road, towers and other electric systems might cause some pollution of the surroundings areas. This could be due to the spillage of fuel, oil and other toxic materials, which might lead to the contamination of soil and water bodies.

6.2.6 The expropriation of land, damage to structures, plantation, fruit trees during the construction of the towers and the line would cause hardship and impoverishment to the affected people. If this issue is not properly attended to, it might cause socio-economic upheavals thereby jeopardizing the whole project.

### **Impacts on settlements, demography and population**

6.2.7 Wherever unavoidable, the proposed transmission line would cross over human settlements, and would therefore require relocation of the inhabitants from their locations to areas outside the transmission line right of way (ROW). In addition, the construction of access and permanent roads for the servicing of the line may bring about new human activities that could increase the pressure on the forest. Construction of the transmission line could also lead to an influx of job seekers in the area, thereby increasing the population pressure in the area during the construction stage and thereby increasing the pressure on the available facilities.

### **Impact on social infrastructures**

6.2.8 The project would not have any permanent negative impact on the existing physical infrastructures. However, it might be necessary for NEPA/CEB to execute some ancillary works in the area, such as provision of water to needy villages, electricity supply and rehabilitation or extension of some school blocks. These might create a positive effect on the inhabitants, thereby reducing incidents of vandalizing the power line.

### **Impact on health**

6.2.9 The influx of laborers, particularly outsiders, during the construction period, might impact on the health and cultural values of the locals. Such intermixing could increase the prevalence of HIV/AIDS and other sexually transmitted diseases (STD).

### **Impact on religion, culture and custom of the host communities**

6.2.10 The project would not impact substantially on religion, culture and customs of the host communities, if the project workers are properly sensitized on the harms that could be caused. The linear nature of the project makes the stay of the project workers in specific areas along the transmission line route too short for them to impact on the culture and religion of the host communities. However, if the project workers are not well briefed about the customs of the host communities, they might unwillingly commit sacrilege, which might cause a general resentment and revolt of the people against the intruders. For example, women are not supposed to witness “Oro” sacrifice, sacred shrines and graves. These facts should be taken into consideration.

### **Impact on economic activities**

6.2.11 The project can have negative impacts on the economic activities of the area. For example, some affected farmers would be prevented from farming on the portion of their farms that fall within the transmission line right of way (ROW) during the construction period, even though they would be adequately compensated for this. The farmers may however be allowed to go back to use the land for farming purposes, after the completion of the project, under certain conditions.

## **6.3 Impacts During Operation**

### **Visual amenity**

6.3.1 The presence of the towers and cables might have visual impacts and might cause visual obtrusiveness of the aesthetic quality of the landscape within the project ROW, if the structures are not integrated in the natural environmental cachet.

### **Electrical effects**

6.3.2 People or animals that stay temporarily under or close to overhead high power transmission lines are not exposed to any danger. However, contact with a live conductor would normally be fatal. Electric power transmission lines create electromagnetic fields. Exposure to electromagnetic fields is suspected to cause health risks. The electric fields around conductors and insulators cause ionization of the surrounding air to form transmission line corona. The corona is present during all types of weather, but increases in intensity in moist conditions and during rains. The corona produces audible noise and radio interference.

### **Impacts on birds**

6.3.3 Birds are mostly affected by the operation of an overhead transmission line. The large birds such as the storks, vultures, herons and other birds of prey would be the most affected. Another problem that could ensue would be the electrocution of large birds by contact with the live conductor when landing on the towers.

### **Impacts caused by the maintenance of ROW and the transmission line**

6.3.4 To avoid flashovers, the vegetation in the ROW has to be kept low. The vegetation would be cut down either mechanically or herbicides would be sprayed to keep vegetation re-growth in check. If

care is not taken, the use of inappropriate or excessive dose of herbicide could cause great harm to the natural environment, particularly the pollution of the watercourses.

### **Spilling of transformer oil during sub-station maintenance**

6.3.5 During the maintenance of the transformers in the sub-stations, accidental spilling of the transformer oil could occur. Such spills could contaminate the environment and pose a threat to the health of those who would mishandle it. In addition, improper storage of the oil and mishandling of dangerous chemicals for power transformers during project operations, could also pose serious risk to the health and safety of those in contact.

## **6.4 Mitigation Measures During Construction**

### **Clearing of ROW and access**

6.4.1 Where the overhead transmission line impinges upon or interferes with human activities/settlements, species and habitats of local vegetation, flora and fauna, ESIA recommends that appropriate and suitable protective measures should be implemented as prescribed in the ESIA to remedy the negative impacts. All the ROW will be aligned taking environmental and technical factors into consideration, in a manner that will minimize, to the extent possible, the need for physical alteration and the impact on sensitive natural environment, cultural resources, agricultural lands and residential and commercial areas.

6.4.2 The locations and opening of accesses shall be made to cause minimum disturbance to the social and natural surroundings. Access track surfaces will be trimmed with grader. Any bridges, culverts, grids and existing access roads will be inspected to ensure that they are adequate and safe for the project construction. Every arrangement and payment of all costs necessary for improving affected structures will be taken care of.

6.4.3 As far as practical, crossing of natural reserves will be avoided. asphalt or impervious materials would not be used for the covering of access route so as to facilitate vegetal growth at the end of the construction activities.

6.4.4 Furthermore, it is recommended that controls be conducted (by the authorities) on the itineraries and frequency of lorries, temporary road signs be installed to allow vehicles to ply on the road safely. To reduce dust, construction materials and the road will be regularly watered during the dry season. It is highly recommended that at project start-up and even after, information and sensitization campaigns be organized on safety measures for inhabitants living along the road, drivers using the road, particularly the drivers of heavy lorries.

### **Landscape and people**

6.4.5 The ESIA recommends that the contractor should submit to the site engineer for approval, a worksite plan that complies with environmental guidelines and an environmental mitigation plan. The environmental plan should specify, in particular, the location of borrow pits and disposal areas before any excavation, the recommended measures for reducing erosion and sedimentation, and the species required for recolonisation of the borrow pits and disposal areas so as to restore the sites after the works, to an acceptable level. No disposal area will be authorized within the urban area, so as to

protect the urban environment and thereby avoid problems relating to sanitation, congestion, nuisance, insecurity, dust, expropriation, etc. Furthermore, the engineer shall install of appropriate drainage systems in the borrow pits and disposal areas. In some cases, it could be necessary to construct drainage structures at the top of slopes to reduce the flow rate of running water on cleared surfaces, and thereby avoid gullies. These networks will discharge into natural drains without being obstructed by mud deposits, thereby avoiding the creation of ponds.

6.4.6 Land acquisition will be carried out in accordance with the prevalent laws of the countries and as per the ADB guidelines on resettlement, which require identification and quantification of any impacts on land-based livelihood, and adequate compensation to landowners and people relying on the land for their livelihood. The compensation would be paid, before the start of works. The effective payment of the compensation would be one of the loan conditions.

6.4.7 The ESIA also recommends that for the repair and maintenance of machinery and vehicles special areas should be earmarked, with provisions of appropriate facilities for the storage of pollutants so as to avoid any accidental discharge that would pollute water resources. Physical measures should be taken to ensure proper storage of fuel, oil and bitumen in containers. Ditches and dykes shall be constructed for the discharge of oils, grease and other polluting liquids from maintenance workshops, washing and loading areas and kitchens.

6.4.8 The ESIA recommends the sensitization of staffs and workers on the problems related to the illegal exploitation of forest resources and the inclusion of these offences in the contract of the employees. The project provides for several sensitization campaigns on HIV/AIDS, sexually transmissible diseases, cultural values and environmental protection, to be undertaken by a local NGO.

## **Settlements, demography and population**

### **Hydrological Properties and Drainage Protection**

6.4.9 The ESIA recommends that longitudinal ditches and other running water discharge channels and drains should be of appropriate dimension. The authorities concerned should ensure its regular maintenance. Measures to reduce erosion of the embankments concern the design of slopes and earthworks, re-vegetation of cleared areas and the construction of temporary and permanent drains to avoid risks of erosion and slipping of ditches at the top of slopes. Excavation materials and excess earth will be kept at appropriate sites approved by the competent authority. These sites will be designed and constructed in such way as to facilitate natural water discharge.

### **Noise Control**

6.4.10 Noise levels shall be established for each noise source. The project personnel as well as the environment that will be affected by any established noise source shall be provided or equipped with appropriate gears to protect against any high noise effect. All vehicles will be adequately maintained to avoid any unnecessary breakdown or pollution of the environment. Feasible administrative and engineering controls, including sound-insulated equipment and control devices should be used to reduce noise level in normal working areas.

## **Health and safety of workers**

6.4.11 The contractors and staff shall be sensitized and trained on the health and safety measures. All facilities shall be designed to enhance safety planning. All activities shall be executed according to the relevant Nigerian and Benin and Togo relevant legislations, requirements of the Ministry of Environment (MENV) as well as stakeholders' interests. The contractors shall provide adequate health care services as well as site 'First Aid' services for its workforce. The 'First Aid' services shall be extended to all authorized visiting personnel.

6.4.12 All project activities shall be properly managed through careful planning and the application of relevant NEPA/CEB safety policies including the following:

i) use of permit to work (PTW); ii) job hazard analysis and toolbox meetings before embarking on a job ; iii) wearing of protective equipment in designated areas; iv) prohibition of alcohol in the project areas; v) proper journey management; vi) regular emergency drills; and vii) prohibition of smoking in designated areas. Contingency plans shall be developed in line with the existing NEPA/CEB contingency plans.

## **Site Clearance**

6.4.13 All site clearance works shall be carried out within defined perimeters and only when necessary. The maximum permissible time lapse between site clearing and initiation of construction operations shall be reduced to a minimum. Vegetation along the ROW shall be kept to the barest minimum to permit safe operation. Trees felled from site shall be re-utilized for the benefit of the host communities or as otherwise requested by NEPA/CEB in consultation with the communities. Areas cleared in excess of operational requirements during construction shall be restored with indigenous species and maintained for at least three years.

## **Clean-up and Restoration**

6.4.14 All plants, building, equipment, rubbish, concrete forms and other materials will be removed from the vicinity of the work sites after construction. Restoration shall be effected for the following: All irrigation facilities will be restored to the condition existing before arrival on site; any fences, gates, access roads etc., which have been damaged during construction will be restored to original state;

6.4.15 At the expiration of the life span of the facilities, a complete restoration plan shall be developed and reviewed with Ministry of Environment. In the course of development of this plan, contact shall also be made with representatives of the host communities and regulatory agencies. In areas where facilities or infrastructures will be left for other uses, recipients shall be properly trained on safe operating methods as well as appropriate care and maintenance of the structure shall be outlined appropriately.

6.4.16 All cement, steel or wood installations meant for recovery shall be dismantled and removed. All pits and holes shall be cleaned and filled to ground level and all oil and contaminated soil shall be removed, treated appropriately and land-farmed. Facilities shall be abandoned in accordance with the applicable NEPA/CEB codes and specifications. Finally, abandoned locations shall be replanted with indigenous plant species selected from the same or similar locality.

## **6.5 Mitigation Measures During Operation**

6.5.1 All the substations will be properly sited and will be integrated in its natural cachet to improve the visual amenities. As far as practical, green spaces shall be created. Electrical and magnetic fields will be monitored to comply with the national regulatory standards. The line and towers will be regularly maintained. Anti climb and anti vandalism devices will be installed and warning sign will be placed on towers. Regular patrols will be effected and awareness campaigns would be undertaken to sensitize residents not to tamper with the lines.

6.5.2 The towers will be designed in such a way that the cables will be placed below the cross arms design. This will permit the larger birds to land on the tower without touching the conductors. In addition, in certain specific areas, frequented by birds, the cables will be marked with reflectors in order to improve bird's vision thereby deterring them from colliding against the cables.

6.5.3 The ROW will be manually cleared as far as practicable so as not to cause unnecessary damage to the forest resources. Use of herbicides will not be encouraged in the environmental sensitive zones.

6.5.4 Transformers or equipment containing polychlorinated biphenyls (PCBs) or PCB-contaminated oil will not be installed. Processes, equipment and central cooling system, raw and in-process materials, solvents, wastes and finished products will be designed with secondary containments to prevent spill and contamination of the soil, ground water and surface water.

6.5.5 Prior to entry and occupancy, all confined spaces (tanks, sumps, vessels, sewers, excavations, etc.) must be tested for the presence of toxic, flammable and explosive gases and for the lack of oxygen. Adequate ventilation must be provided before entry and during occupancy of these places. Observers/assistants must be stationed outside of confined spaces to provide emergency assistance, if necessary, to personnel working inside these areas.

6.5.6 Personnel required to work in areas of high temperatures and/or high humidity should be allowed to take frequent breaks away from these areas.

6.5.7 Pre-employment and periodic medical examinations should be conducted for all personnel, and specific surveillance programmes instituted for personnel potentially exposed to toxic materials.

6.5.8 Shield guards or guard railings should be installed at all belts, pulleys, gears and other moving parts. Elevated platforms, walkways, stairways and ramps should be equipped with handrails, toe boards and non-slip surfaces. Employees involved in climbing towers must be provided with non-slip footwear, gloves, helmet, face protection, leggings and other appropriate protective equipment.. Eye protection should be worn by personnel when in areas where there is a risk of flying chips or sparks, or where intense light is generated.

6.5.9 Employees should be trained on hazards, precautions and procedures for safe storages, handling and use of all potentially harmful materials relevant of each employee's task and work areas. Training should incorporate information the Material Safety Data Sheets (MSDSs) for potentially harmful materials.

6.5.10 Personnel should be trained in environmental, health and safety matters including accident prevention, safe evacuation, the use of MSDSs, safe chemical handling practices, and proper control and maintenance of equipment and facilities. Training should include emergency response, including

the location and proper use of emergency equipment, procedure for emergency notification to response teams, command and control procedures and proper response actions for each foreseeable emergency situation.

6.5.11 The proponent should maintain records of significant matters, including monitoring data, accidents and occupation illness, and spills, fires and other emergencies. This information should be reviewed and evaluated to improve the effectiveness of the environmental, health and safety programme. A bi-annual summary of the above information should be provided to the Bank.

6.5.12 All these measures shall be specified in the technical specifications of the contract documents and the successful contractors shall be liable to scrupulously follow them.

## **7. ENVIRONMENTAL HAZARD MANAGEMENT**

During the implementation and operation of any project possible hazards irrespective could be encountered by a contractor, despite his good intention and will to avoid same. The ESIA recommends that all the necessary plans and measures to ensure compliance with standards, and specifications for the operation and maintenance associated with the development of this project must be adhered to. Probable causes of accidents in the execution of this type of project are equipment failure, negligence and sabotage. Contingency plans for electrocution, conflagration, work place accident etc will therefore be developed to handle such emergencies and accidental situations and mock drills will be regularly performed to verify the efficiency of the plans.

## **8. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME**

8.1 The ESIA recommends that a monitoring programme that will lead to a sustainable project environmental management be strictly operated. The monitoring programme shall commence from the pre-construction stages through operation stages to keep track of the entire project development activities and performance. The programme is expected to provide information on the impacts compared in time with the prediction and, by so doing, provide advanced warning on any adverse changes in the ecosystem.

8.2 Operators shall comply with the Ministry of Environment regulatory controls as well as monitor specific environmental/social parameters at the various phases of the overhead transmission line project activities. The table below presents the monitoring programme and the environmental parameters to be monitored.

### Project Monitoring Programme

Environmental Components	Indicator Parameters	Frequency	Location	Activity By
Noise	Vehicle noise levels	Monthly	*	NEPA/CEB
Electro-magnetic field	Induced electrical and magnetic Fields	Yearly	*	NEPA/CEB
Biological components wildlife, vegetation erosion along the line	Diversity and abundance stress	at the end of the project construction and later on a 3 yearly interval	*	NEPA/CEB
Socio-economic	Population, health status, safety and security, infrastructure	Twice every year	*	NEPA/CEB

\* To be defined with the contractor in consultation with the relevant authorities before start of construction/operation phases

#### Socio-economics Monitoring

8.3 The following social indicators shall be monitored: i) number of employees drawn from the host communities; ii) social amenities being executed by NEPA/CEB; iii) interaction between NEPA/CEB management and workers with host communities; and iv) residual or indirect effects of the project on the socio-cultural behavior of the host communities.

#### Post-Construction Monitoring

8.4 Post construction monitoring for the project will be maintained with the following objectives: i) to monitor alterations in the existing physical, chemical, biological and social characteristics of the environment ; ii) to determine whether any detected changes in environmental components have been caused by the project or by natural occurrences; iii) to monitor emissions and discharges and ensure compliance with local, national and international standards; iv) to determine the effectiveness of the ameliorating measures; and v) to provide early warning for any potentially serious problems.

#### Environmental and Social Audit

8.5 The ESIA recommends that an external environmental auditor performs an environmental and social audit of the project yearly in accordance with the regulatory requirements and standards. This audit shall check the predictions of the ESIA and assess the general performance of the project to ensure that environmental and social standards are maintained. Each environmental audit shall be geared towards achieving the following: i) examine compliance with regulatory requirements; ii) identify current and potential environmental problems; iii) examine line management systems, transmission line operations, monitoring practices and data management, procedures and plans; iv) check the predictions of the ESIA in order to ensure that its recommendations are being implemented; and v) eventually recommend areas of improvement in operation management to appropriate authority.

## **Reporting**

8.6 Reporting of all incidents is mandatory to the regulatory agencies and supervisory bodies (NEPA/CEB, FMENV and other relevant authorities) as they occur. The report/findings of each environmental and social audit shall also be submitted to the authorities concerned as well as other regulatory agencies and environmental pressure groups.

8.7 The total cost of the mitigation measures, training and sensitization campaign and the payment of compensation for the expropriation on the Benin side are estimated at N 42.6 million. This cost will be defrayed by the CEB. For the NEPA, the cost of the mitigation, monitoring and the compensation for the expropriation of properties and crop trees are estimated at N 217.3 million (cf annex 1). The Nigerian Government will pay the total cost for compensation, which amounts to N 195.7 million. The cost relating to the ancillary works, environmental improvement, rehabilitation of quarry sites, stabilization of slopes, etc. are included in the overall cost of the construction works.

8.8 To ensure close monitoring of the mitigation measures, the ESIA recommends the implementation of the Environmental and Social Management Plan (ESMP). The ESMP shall be incorporated in the loan documents signed between the respective Governments and the Bank. The ESMP comprises an institutional component for implementing the plan, staff and equipment, including two environmental experts and a technical component for the definition of technical specifications, as follows:

1. At the institutional level, environmental technical assistance will be recruited for the control mission. It will be responsible for drafting environmental measures, managing the worksites and carrying out specific works, recommending solutions for specific environmental problems, defining strategies for sensitizing the local population on health and safety problems, organizing consultations at key stages with the operators so as to optimize implementation of the measures, identifying the criteria, procedures, periodicity and monitoring organs in relation with maintenance programmes, as well as controlling and supervising implementation of the plan. These activities will cover 20 months (one month before the start of project and one month after the end). The environmental expert will also be responsible for the training of the environmental staff of CEB and NEPA. One environmental expert from CEB and one from NEPA will also be recruited to monitor mitigation measures for 20 months.
2. The technical component comprises the works proper, the mitigation measures, environmental and social monitoring and follow up and the specification of the environmental ancillary to improve the living environment and conditions of the population.

## **9. PUBLIC CONSULTATION AND DISCLOSURE**

The ESIA of this project was duly carried out with the in-put of all the concerned institutions, local authorities, stakeholders, NGO, village heads and the public in general. The project technicalities were explained and their comments were incorporated into the report. The measures taken in order to protect the environment were equally explained so as to allay their fears. The host communities used the consultation meetings to familiarize themselves with operations of power lines. The consultation process will be regular during project construction period and also through out the project life span. Meanwhile, the ESIA will be submitted to the Regulators (Ministry of Environment) who will display

the report for 21 days) at different locations, and in different State's environmental offices for their further comments. After this, the report will be reviewed publicly and if the project is seen to be sustainable, a license will be issued for the project to commence.

## **10. COMPLIMENTARY INITIATIVES**

10.1 In the Nigerian side the National Electric Power Authority (NEPA) is the major stakeholder in the 330kV CEB interconnection project. As a complimentary initiative NEPA will ensure that the project-affected people are adequately compensated before the start of works, in accordance with the laws of the Federal Republic of Nigeria and the authority's resettlement and compensation policy and the ADB, policy on resettlement. The effective payment of compensation is one of the loan conditions specified by the ADB.

10.2 On the Benin side, 234 proprietors, living in 51 houses located on the earmarked ROW and on the proposed site of the sub stations, would be displaced in the immediate vicinity, some 10 to 12 meters away from the ROW. In the rural areas 72.8 ha of land and in the urban areas 4.8 ha of land would be expropriated, for a total sum of 138,000,000 FCFA (N 26,220,000). All these compensation will be paid by the CEB before the start of works.

10.3 On the Nigerian side the construction of the new 330 kV power transmission line will require the acquisition and expropriation of 540 ha of land, involving 181 houses. The total amount evaluated for compensation is estimated at N 180,227,987.60. In addition, N 15,168,157 would be paid to 806 proprietors for the damage to their crops. The Nigerian Government, before the start of works, shall pay all these compensations. This will be one of the loan conditions. A resettlement plan has been prepared, in consultation with the affected owners and the authorities concerned. This resettlement plan will be submitted to the Bank as a separated document. The concerned proprietors are satisfied of the amount and the terms of payment of their expropriated properties.

## **11. CONCLUSION AND RECOMMENDATION**

The environmental and social impact assessment conducted for the CEB/NEPA 330 kV power interconnection shows that the project would have positive environmental and social impacts. However, during construction and operation some negative impact could ensue. These impacts would be easily mitigated by the implementation of the measures described in the ESIA and through a strict environmental monitoring program. These measures have been discussed with the authorities concerned (NEPA, CEB, Ministries of Environment and other relevant organisations) and agreed upon and a firm commitment has been obtained from them to implement same. The implementation of this project is recommended, subject to the strict adherence to and the implementation of the mitigation and attendant measures as specified in the ESIA. This summary of the ESIA of the power interconnection project and the related mitigation measures is being submitted to the Board of Directors of the African Development Bank for their information and favourable consideration.

## SUMMARY COST OF THE ENVIRONMENTAL AND SOCIAL MEASURES

ITEM	DURATION OF THE ACTIVITY	COST EST. (N)
Preparation and inclusion of environmental and social specification in the technical specification of the bidding documents	2 months	600,000
Training and capacity building (4 nos. staff)	1 month	1,000,000
Compensation for crops	3 months	15,200,000
Compensation for structures	3 months	180,500,000
Monitoring of construction works	20 months	2,500,000
Environmental and social supervision, including safety during construction and operations		5,000,000
Supplementary social measures including sensitisation campaign on STD/AIDS, hygiene, cultural values alcoholism and Environmental protection	20 months	2,500,000
Ancillary works, environmental improvement, rehabilitation of quarry sites, stabilization of slopes, etc.	20 months	*
Logistics support (vehicles and materials)		10,000,000
<b>Grand Total</b>		<b>217,300,000</b>

\* The cost relating to the ancillary works, environmental improvement, rehabilitation of quarry sites, stabilization of slopes, etc. are included in the overall cost of the construction works.

**LIST OF DOCUMENTS CONSULTED**

1. NEPA Environmental Policy, 2002
2. NEPA Safety Policy, 2001
3. ESIA, ESMMP, R &CP document for the CEB – NEPA interconnection project, July 2002
4. LAGOS A Tourist Dream (1999) - published by African Newspapers of Nigeria (PLC) and the Lagos State Government of Nigeria. Overhead transmission lines. Draft report. 52 pp.
5. CIGRE. 1992a The effect of Environmental Impact Legislation on Right of Way Utilization. CIGRE 22-202
6. CIGRE, 1992b. Construction of large-scale overhead transmission lines in urban environments. CIGRE 22-203.
7. DANIDA, 1994. Environmental Impact Assessment, Power Transmission Line from Owen Falls to Kampala.
8. DANIDA, 1994. DANIDA Guidelines on Environmental Assessment for sustainable development. Danida 37 pp.
9. Gates, J.E & Gysel, L.W. 1978. Avian nest dispersion and fledgling success infield forest ecotones. Ecology 59: 871-883.
10. IUCN, 1992. Protected Areas of the World: A review of national systems. Volume 3:
11. ADB environmental and social assessment procedures, public sector operation, June 2001.
12. Plan de recasement/réhabilitation/relocalisation, projet d'interconnexion CEB –NEPA, mai 2001.