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TECHNICAL ASSISTANCE AND CAPACITY BUILDING FOR THE WEST AFRICAN POWER POOL (WAPP)

LIGNE 330 kV VOLTA –
MOMÉ HAGOU – SAKÉTÉ
TRANSMISSION LINE

ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT (ESIA)
GHANA PORTION SUMMARY

SEPTEMBER 2006

This publication was produced for review by the United States Agency for International Development. It was prepared by CARDS under the direction of Nexant, Inc. under **Contract No. 624-C-00-05-00024-00**

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ECONOMIC COMMUNITY OF
WEST AFRICAN STATES



COMMUNAUTE ECONOMIQUE
DES ETATS DE L'AFRIQUE
DE L'OUEST

West African Power Pool

330 kV Volta-Momé Hagou-Sakété Transmission Line

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT, GHANA PORTION

SUMMARY



SEPTEMBER 2006

Environmental and Social Impact Assessment Summary

For

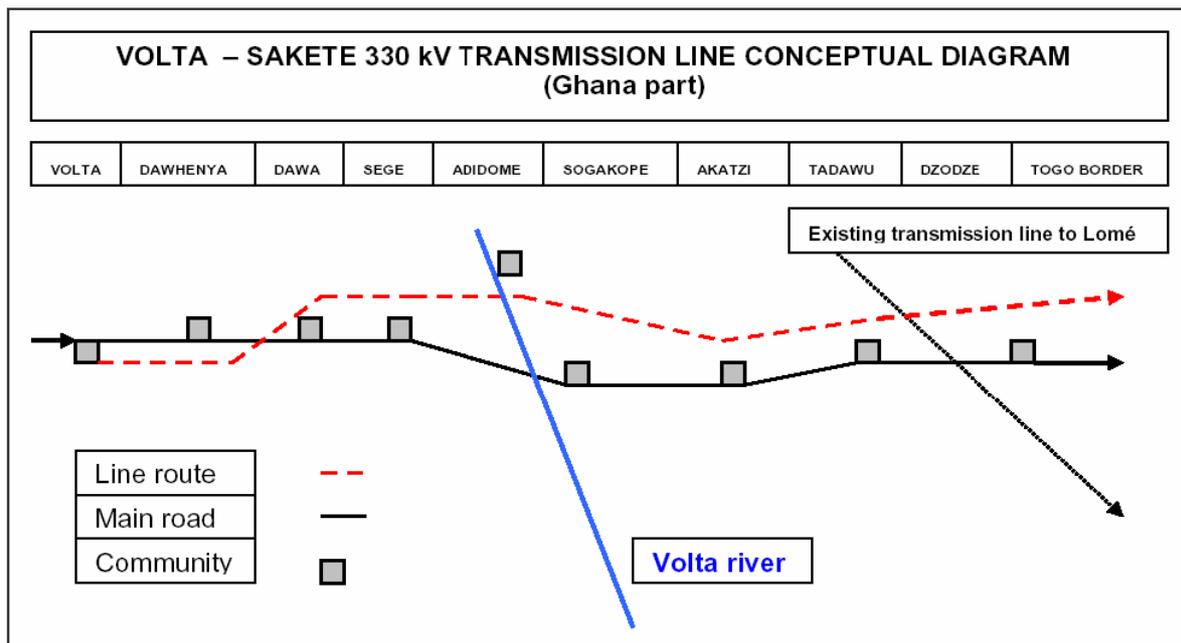
Proposed 330 kV Volta-Momé Hagou-Sakété transmission interconnection

Ghana portion: Volta to Togo border

1 INTRODUCTION

This ESIA summary concerns the Ghana part of the proposed 330 kV transmission interconnection Volta (Ghana)-Momé Hagou (Togo)-Sakété (Benin). The project will be financed by the utilities concerned (VRA and CEB) and by World Bank, African Development Bank and the West African Development Bank.

PROPOSED DEVELOPMENT	Construction of new 330-kV transmission line
NAME OF PROPONENT	Volta River Authority (VRA) / West African Power Pool (WAPP)
PROPOSED LOCATION	From the Volta substation in Tema in the Greater Accra Region to Tomu near Dzodze on the Ghana-Togo border (shown in the schematic diagram below).



This summary of the ESIA should be read in conjunction with the Environmental & Social Management Plan (ESMP) and the Resettlement Action Plan.

2 PROJECT DESCRIPTION AND JUSTIFICATION

The Volta River Authority (VRA) and Communauté Electrique du Benin (CEB) in Togo – Benin currently operate a 128 kilometre double-circuit 161 kV interconnection between Akosombo in Ghana and Lomé in Togo in the southern parts of the respective countries, which was commissioned in 1971. This interconnection has enabled CEB to meet a significant proportion of its energy and power requirements with imports from VRA and Côte d’Ivoire.

The interconnection is now operating at its limit and cannot meet the forecast demand because:

- The maximum power transfer capability of the existing line has been reached
- The transmission losses have increased
- The security of supply has reduced
- The demand of the Volta Region of Ghana, which derives its supply from this line, is growing

The implementation of this transmission project will ensure smooth power exchanges among the countries in the West African sub-region from Côte d’Ivoire to Nigeria.

The proposed project is a linear one. The land-take required by the Right of Way (RoW) will be 5,400,000 m² plus 99,000 m² estimated for 22 access tracks. This gives a total land requirement of 5,499,000 m² (550 ha).

The proposed project will, among others, consist of the erection of steel transmission towers along the route. The height of the towers will be such as to provide a minimum of 7.5 – 8 m clearance between the lines and open ground and 8 m clearance for roads. Typically, as with the existing system, the towers will be about 35 – 40 m high.

3 LEGAL AND INSTITUTIONAL POLICY, AND ADMINISTRATIVE FRAMEWORK

An undertaking of this nature can only be carried out within certain legal and policy frameworks. Laws, regulations and policies of relevant agencies, departments and organisations, such as the EPA, VRA, Wildlife Division of the Forestry Commission, the Forestry Commission itself, the Ghana National Commission on Culture, Energy Commission, Land Valuation Board, Factories Inspectorate Department (for Occupational health and safety) are some of the frameworks expected to be considered in the implementation of the project. The following relevant regulations guide the implementation of the undertaking:

- Environmental Protection Agency, 1994, (Act 490)
- Environmental Assessment Regulations, 1999 (LI 1652)
- Volta River Development Act, 1961 (Act 46)
- World Bank's Operational Directive 4.01, “Environmental Assessment”
- International Finance Corporation, Environmental, Health & Safety Guidelines for Electric Power Transmission and Distribution
- World Bank's Operational Directive 4.30, “Involuntary Resettlement”
- Factories, Offices and Shops Act, 328 of 1970 (For Occupational health and safety).
- Energy Commission Act, 1997 (Act 541)
- Lands (Statutory Wayleaves) Act, 1963 (Act 186)
- Lands (Statutory Wayleaves) Regulations, 1964 (LI 334)
- Lands (Statutory Wayleaves) (Amendment) Regulations, (LI 334)

- Volta River Authority (Transmission Line Protection) Regulations, 1967 (LI 542)
- The Land Policy, 1999

The proponents have carried out a survey of the line route and have provisionally identified a potential route. To execute the project after all the relevant permits and licenses have been acquired, VRA will have to legally acquire the Right-of-Way (RoW) in the project area.

The Volta River Act empowers the Authority to acquire the Right-of-Way for constructing and operating power transmission systems. The provisions of the Lands (Statutory Wayleaves) Transmission Project Act, 1963 Act 186, provide the framework for the acquisition of the RoW. This activity can only be carried out with due consultations with the settlements, communities and District Assemblies within the proposed project's environmental sphere of influence. Sections 12 and 6 of Acts 46 and 186 make provisions for compensation payments to affected persons.

VRA will be responsible for addressing all matters relating to the prompt payment of adequate and fair compensation. VRA normally pays compensation for loss of land, structures that have to be demolished and crops to be destroyed during construction.

The World Bank Group OD 4.30 on Involuntary Resettlement is also applicable to this project. The main features of this directive are as follows:

- All viable alternative project designs should be explored to avoid or minimise the need for resettlement and when it cannot be avoided, to minimise the scale and impacts of resettlement
- Resettlement measures are to be conceived and executed as development activities providing sufficient resources to give the persons displaced the opportunity to share in project benefits. Assistance should be given to the community in their efforts to improve former production levels, income earning capacity and living standards or at least restore them to the levels they would have without the project
- Displaced persons should be:
 - Compensated at full replacement cost prior to the actual movement
 - Assisted with relocation
 - Assisted and supported during the transitional period
- Particular attention should be given to vulnerable groups
- Communities should be given opportunities to participate in planning, implementing and monitoring their resettlement
- Resettlement should be linked to the main project implementation schedule, so that project-affected people should be resettled and/or compensated before being affected by the construction or other activities
- There should be adequate monitoring and evaluation
- The proponent should be encouraged to offer replacement land. Cash compensation may be appropriate when residual land holdings are economically viable. For households who lose assets/income large enough to make the remainder unviable, compensation should be provided as if entire holdings had been taken.

4 DESCRIPTION OF THE PROJECT ENVIRONMENT

The proposed construction activities of the transmission line will be carried out across seven districts of the Greater Accra and Volta Regions of Ghana. The districts are as follows:

- Tema Municipal Assembly
- Dangme West District Assembly

- Dangme East District Assembly
- South Tongu District Assembly
- North Tongu District Assembly
- Akatsi District Assembly
- Ketu District Assembly

The project will be carried out within a narrow corridor of 40 m width that will span the districts named above (and some of their communities) for a distance of about 135 km. The project may therefore be termed a 'linear' one.

4.1 Geology

The area is generally underlain by pre-Cambrian rocks. The proposed line route traverses the following formations:

Dahomeyan formation. This is the oldest rock formation in the country and constitutes the floor of the Accra plains and the southern part of the Volta Region. Rocks of this formation are mainly metamorphic, consisting of gneisses and schists, and were probably formed from sedimentary rocks. The Dahomeyan formation is highly folded as a result of earth movements.

Birimian formation. This covers more than three-fourths of the closed forest zone. The formation is divided into the lower Birimian which consists of such metamorphosed sediments as phyllites and schists and the upper Birimian which is the younger of the two and consists of rocks of the lower Birimian as well as metamorphosed lavas. Associated with the Birimian formation are extensive masses of granites, formed through the cooling of magma.

Togo Series. Rocks of this series were formed from eroded materials deposited in basins. They consist of sedimentary rocks and their metamorphosed versions, e.g., quartzites, schists, shale, and phyllites. These were strongly folded to form what are now known as the Akwapim – Togo Ranges.

4.2 Vegetation

Three main vegetation types are to be traversed by the line route corridor. The Coastal Savanna Grassland from Tema through Sege to Vume consists of grassland with isolated scrubland. Trees are mostly clusters of short neem trees with short grass grazed by cattle.

It is followed by the Guinea Savanna Woodland from just before Sogakope on the eastern side of the Volta river through Akatsi to Dzodze and Dedekope, consisting of tall grassland with isolated acacia, baobab and eucalyptus trees interspersed with mango and coconut trees, bamboo clumps and cassava and millet farms.

The Dzodze to Aflao part of the corridor passes through patchy growth mangrove swamps. Besides their obvious economic importance, most of the endemic species of the area may have some ethnobotanical importance.

The study area holds riverlets, ponds and tributaries of major streams and rivers. Wetlands including lagoons and estuaries are also found to occur in the proposed project area. Mangroves are the most dominant plant species found in the saline and brackish area and they are made up of species such as *Avicenia nitida*, *Rhizophora sp.*, *Phioxerus vermicularis* and *Paspalum portulacastrum*.

4.3 Fauna

The coastal savannah vegetation is known to support a diversity of animals including birds, small mammals and reptiles. These animals are not restricted to specific districts in the distribution within the proposed area. There seems to be a fair distribution of the fauna over the entire corridor.

Birds of ecological importance found in the area include the White-faced tree duck (*Dendrocygna viduata*), White fronted plover (*Charadrius marginatus*), Ringed plover (*C. hiaticula*) and the grey plover (*Pluvialis squatarola*). Others include Turustone (*Arenaria interpres*), Reshark (*Tringa glareola*), spotted redshark (*T. erythropus*), greenshark (*Tringa nebularia*), knot (*Calidris canutus*), and the little stint (*Calidris minuta*). The little egret (*Egretta garzetta garzetta*), reef heron (*Egretta garzetta gularis*), the grey heron (*Ardea cinera*) and the terns (*Sterna spp.*), are all known to perform significant functions in the ecology and recreation of the area.

The Togo hare (*Lepus zechi*) and the common rat (*Rattus rattus*) are the most common mammals occurring widely in the area. Reptiles that are very well represented in the proposed project area include the Agama lizard (*Agama agama*), the Nile monitor (*Varanus niloticus*), Orange flanked skink (*Matugu perotteltii*) and the Puff adder (*Bitis arietans*) all perform functions vital to the maintenance of the ecological set-up of this type of vegetation zones.

4.4 Industry

Tema Municipality has the country's biggest port and harbour facilities situated in Tema, the capital of the Municipal Assembly. Tema is also the leading industrial city in the country. Tema is thus the most important production sector of the country in terms of local revenue generation as well as employment opportunities with companies such as The Volta Aluminium Company (VALCO), Ghana Textile Printing Company (GTP), Ghana Ports and Harbours Authority (GPHA), and the Ghana Agro Foods Company Ltd. (GAFCO), each employing more than 1000 people. There are over 400 factories in Tema which have been categorized into 8 major areas – Chemical, Textiles, Food Processing, Engineering, Paints, Fish Cold Stores, Printing and Woodwork industries. One of the two cement manufacturing companies (Diamond Cement Company) in Ghana is located in the Ketu District.

4.5 Agriculture

The most important sectors of the economy are crop production, fisheries, livestock and industry. Although, outside Tema, agriculture dominates the local economies, the leading sectors in terms of provision of revenue to the District Assembly and remuneration to workers are the service sectors.

The farmlands encountered in the project area had either cash crops or food crops or both. The major food crops encountered included cassava, maize, groundnuts, sweet potatoes, rice, beans, okra, onions, tomatoes, cabbage, pepper, fruits, etc. The cash crops were mostly vegetables, oil palm, eucalyptus, etc. The prevalent cropping system is rotational, with fallow periods ranging from 2 to 4 years.

5 PROJECT ALTERNATIVE

In selecting the proposed route, the over-riding consideration has been the avoidance of environmentally sensitive areas and settlements and the minimisation of the destruction of property and farms. During the project planning stage, various alternatives were considered both in terms of equipment and the feasibility of the project itself. These included:

- **The “no development scenario”** - If the project is not implemented, the ever-increasing energy demands of the participating countries would not be met and system collapses would become more frequent, which may result in economic stagnation.
- **Possibility of the use of alternate mode of transmission (underground transmission)** - Other alternative means of transmission such as laying of underground cables over long distances is not practicable and might entail financial and environmental costs that might be too high to bear.
- **Selection of optimal transmission line route alignment** - A provisional line route has been chosen based on several factors, the major considerations being the need to avoid environmentally sensitive areas, communities and settlements. This was to ensure that resettlement of communities and the destruction of farms and other properties is avoided or

minimised as much as possible. This route will be further fine-tuned as the environmental studies continue.

- **Alternative tower design** - VRA has opted for the erection and use of lattice steel towers for its transmission network based on the required strength, heights, safety and security. Wooden towers would not provide the same level of safety, security and strength required. In addition the use of wooden poles would entail the utilisation of a lot more wooden poles than the number of steel lattice towers for the same length of line due to the weak strength of the wooden poles.
- **Alternative route** - A route selected in 1986 has been abandoned due to the now heavily built up nature of some sections. The new route has been provisionally established which seeks to reduce the possibility of resettlement.

6 POTENTIAL IMPACT AND MITIGATION MEASURES

6.1 Constructional phase

The constructional phase of the project will involve activities such as construction of access and tower corridor tracks, clearing and excavation of tower base areas, clearing of tower base buffer and RoW, cutting of trees, transportation of equipment and materials, erection of towers and the stringing of transmission lines.

These activities have the potential to impact significantly on the physical, biological and socio-cultural/socio-economic environments within the project's area of environmental influence. The key potential issues relating to this phase of the proposed project have been identified through field visits and surveys, literature study and consultations with stakeholders. The significant potential impacts are discussed below.

Table 1 – Impacts during Construction Phase

Type of Impact	Description
Noise	<p>Noise due to construction machinery during clearing and grading of access and tower corridor tracks, clearing and excavation of tower base areas, clearing of tower base buffer and RoW, cutting of trees, transportation of equipment and materials and the conversational shouts of construction workers will increase ambient noise levels in the immediate vicinity of the project area. This potential rise in noise level could have impacts on some local communities, fauna along the RoW, and on the construction crew.</p> <p>Some of the local communities likely to be affected by ambient noise increases are Tema, Dawhenya, Dawa, Sege, Adidome, Sogakope, Akatsi, Tadawu, Dzodze.</p> <p>It is however expected that impacts on fauna will be temporary and will not be significant.</p>
Air quality	<p>Constructional activities, including vegetation clearing, excavation, grading and haulage of construction equipment and materials could cause the release of particulate matter into the air resulting in potential adverse impacts on air quality in the immediate environs of the proposed project. Air quality can also be affected by soot in exhaust fumes of the construction machinery. This potential impact will be short-lived or temporary.</p>
Erosion	<p>Clearing and grading of access and tower corridor tracks, excavation of tower base areas and the construction of access tracks during the constructional phase will expose the disturbed ground surface, which will at least be temporarily unprotected, to the agents of soil erosion such as heat, wind and rain.</p>
Clearing of vegetation	<p>During construction, the removal of vegetation for access tracks, the tower corridor track and the tower base areas will result in permanent loss of vegetation in these areas and lead to potential faunal displacement.</p> <p>Other sections of the RoW outside the tower corridor track will also be partially cleared of vegetation up to a height of about 1.25 m. In addition, trees, which are located just outside the RoW and are considered to threaten the safety of towers and transmission lines, will be felled. As stated earlier, this action of vegetation clearing could have potential adverse impacts on flora and fauna.</p>

Type of Impact	Description
Cultural and historical / archaeological sites / items	<p>Although the constructional activities will not involve much earthmoving, it is possible to make cultural and/or archaeological 'chance finds' during the constructional phase of the project, such as:</p> <ul style="list-style-type: none"> ▪ Sites of cultural significance such as sacred woods or trees or rock outcrops which the local residents may have not mentioned at the survey stage ▪ Archaeological heritage which may have remained unnoticed in the past <p>Issues regarding cultural properties and the possibility of cultural and/or archaeological 'chance finds' are considered to be significant requiring mitigation.</p>
Effect on local communities	<p>Only about 25% of the construction work-force (during the peak of constructional activities), which is expected to be skilled labour, will be recruited from outside the local communities. The skilled workers from outside the local communities will be accommodated at the work camps established along the RoW during the constructional phase of the proposed project. Contractors will, in addition, exploit the option of renting properties within the communities for accommodation purposes.</p>
Traffic	<p>Transportation of equipment and materials on public roads may result in some road safety problems. The potential hazards include vehicular-vehicular conflicts, vehicular-pedestrian conflicts and falling of improperly secured equipment and materials on roads. The potential for vehicular traffic conflict situations exists especially at the points where access tracks join the main roads. The proposed transmission line route crosses public roads such as the Tema – Aflao, Dawhenya – Prampram, Denu – Dzodze, etc. The stringing of transmission lines across these public roads may cause temporary traffic disruptions.</p>
Water pollution	<p>Clearing and grading of access and tower corridor tracks, excavation of tower base areas and the construction of access tracks during the constructional phase will expose the ground surface to the agents of soil erosion. High sediment loads of run-offs from these areas could be discharged into nearby water bodies such as the Gyrokorgyor, Dawhe, Polupolu. Volta, Tohwi, Tordzie, Etu, Rivers, causing high turbidity conditions and subsequently possible siltation of these watercourses. The potential for water pollution by oil, lubricants and paints also exists.</p>
Waste disposal	<p>Solid wastes in the form of vegetative matter, damaged cables and conductors, rags, excavated materials and packaging materials such as paper cartons, wooden crates and empty containers will be generated. Also, the potential for the generation of liquid wastes due to spent oils, water from excavations and accidental spillage of fuel and paint exist. These wastes must be properly handled to avoid or minimise adverse effects on the environment.</p>

6.2 Operational Phase

The main impacts during the operational phase result from the visual impact, control of vegetation and periodic repair and maintenance.

Table 2 – Impacts during Operation Phase

Type of Impact	Description
Visual intrusion	<p>The local visual characteristics and expressions of the RoW will be affected by the presence of the transmission towers and lines.</p>
Clearing of vegetation	<p>In wooded areas, the safe operation of the overhead power lines will necessitate the maintenance of unobstructed lanes. Vegetation control measures will therefore have to be applied during the operational phase of the project to manage vegetative growth within the RoW. The method to be used will be physical or mechanical clearing of vegetative growth for the maintenance of the RoW. RoW maintenance could also result in opening-up effects especially the activities of hunters and fuel-wood harvesters. These potential effects are not considered to be significant since much of the area is already extensively farmed and 'opened'.</p>
Disposal of solid wastes	<p>Solid wastes may be generated during repair and maintenance in the form of vegetative matter, packaging materials, damaged or broken cables, conductors and insulators.</p>
Disposal of liquid wastes	<p>Washing of equipment will generate some liquid waste, but it is not anticipated to be in significant quantities. Although infrequent, rust treatment and painting of towers could cause pollution of nearby rivers and streams such as those mentioned above. Accidental spillage of oil, fuel or paints will need to be managed.</p>

Type of Impact	Description
Electromagnetic field (EMF) effects	According to the World Environmental Library, WEL 1.1, information derived from prolonged observations and experiments in numerous countries indicate that the electric and magnetic fields around power transmission and distribution facilities exhibiting frequencies between 50 and 60 Hz have no harmful effects on human health. Magnetic field strengths below 0.4 mT at these frequencies induce no detectable biological reaction in humans. Magnetic fields below overhead lines develop maximum field strength of only 0.055 mT at ground level. Hence potential effects of EMFs on human health are non-existent according to current knowledge. However, mitigation will be required to address the notions that EMFs may cause cancer or harm children and the resulting fear and possible panic among the local populations.
Socio-economic	Potential socio-economic issues such as land ownership, land-use conflicts and compensation issues are expected to persist during this phase of the project.
Effects on birds	No specific breeding grounds of birds have been identified within the RoW. The potential dangers of birds flying into or colliding with transmission lines and interference in the navigation of birds can only be regarded as residual hazards.
Fire hazards	There is the potential for fire hazards as a result of bush fires and electrical faults during this phase of the proposed project. The bush fires could either originate from VRA operations during RoW maintenance or through the activities of farmers, hunters and palm wine tappers.

6.3 Loss of buildings and land ownership issues

The Volta River Authority (Transmission Line Protection) Regulations, 1967 LI 542 prohibits activities such as mining, construction of buildings, crops cultivation and farming in the RoW. This potential adverse effect on land ownership and land-use requires mitigation measures to minimize the impact on individuals, communities and stools.

Loss of livelihoods through the loss of farmlands within the project corridor and poor resettlement and compensation packages were the main concerns of community members.

The acquisition of the RoW and access tracks has the potential to adversely affect land ownership and land-use characteristics, as land will have to be acquired from some individuals, communities and/or stools. The land to be affected by the implementation of the proposed project has the following categories of land-uses:

- Agricultural lands
- Potential agricultural lands (or fallow agricultural lands) and
- Residential lands (affecting buildings and residential plots)

The tables below show the numbers of people and the types of properties to be affected by the proposed project.

Table 3 – Number of PAPs by region and type of property

Property type	Greater Accra Region	Volta Region	Total
Field crops	262	163	425
Houses	32	58	90
Plots for Building	20	0	20
Total	314	221	535

Table 4 – Number of affected community properties by region

Community Property	Greater Accra Region	Volta Region	Total
Shrines	0	5	5
Cemeteries	0	1	1
Primary School	1	1	2
Teachers Bungalow	1	0	1
Church	0	1	1
Total	2	8	10

6.3.1 Demographic Characteristics

The demographic characteristics have been determined from the 2000 Ghana Population Census and Household Survey. The following table shows population, population growth and area of each of the districts that would be affected by the line.

Table 5 – Demographic characteristics of districts affected by the proposed transmission line

District	2000 pop.	pop. growth % per year	area km ²
1 Tema Municipality	511 459	2.6%	396
2 Dangme West	96 809	2.1%	1 442
3 Dangme East	93 112	2.1%	909
4 South Tongu	64 811	1.4%	820
5 North Tongu	126 834	3.0%	1 460
6 Akatsi	93 477	2.5%	906
7 Ketu	237 261	1.7%	1 130

6.3.2 Compensation

The 1992 Constitution of Ghana by Article 20 prescribes that fair and adequate compensation should be paid to all persons affected by state acquisitions. The procedures used by VRA to ensure that all persons affected by the transmission line project are catered for are outlined below:

- Referencing of all properties, land, crops and buildings, by officers of the Land Valuation Board (LVB) to be monitored by Estate Surveyors from the Estates Department of VRA.
- Assessment of the compensatable values by the LVB and the valuation advice forwarded to VRA.
- The assessed report would be vetted and corrections effected where necessary to ensure that the amounts are accurate and fair to both claimants and the Authority. These would then be processed for payment.
- Offers would be made to the claimants on the basis of the LVB's advice.
- Claimants dissatisfied with the offer have a right to petition for reconsideration.
- In this regard, such claimants are required to submit counter proposals supported by valuation opinion prepared by private valuers of their choice. The private reports are considered by VRA in conjunction with the LVB to ensure that claimants are treated fairly.

- Where necessary, dissatisfied persons would be invited to negotiate and arrive at acceptable figures.
- Project affected persons may resort to legal action in order to have their grievances addressed.

6.4 Cost of environmental management

The proponents will finance the environmental aspects of the transmission line from the project implementation cost. A total amount of US\$ US \$3,823,446 has been earmarked for the implementation of environmental management programmes, mainly for compensation payments made during the first year of implementation of the proposed project. A breakdown of the budget estimates is presented in the Annex.

7 ENVIRONMENTAL RISK MANAGEMENT

Environmental risk management will be implemented through the Environmental & Social Management Plan. The plan describes the risks, the mitigation measures to be employed, and how they will be implemented and monitored. The environmental and social monitoring programme is described in the next section.

The Project Implementation Unit for the project will include a Project Environmental Coordinator (PEC). The Environmental Coordinator for the project will be responsible for all environmental issues in connection with the project and will report directly to the Project Director. He will work closely with the other members of the Project Implementation Unit.

The PEC is responsible for:

- Monitoring all environmental and social programmes for pre-construction, construction and operational phases of the project, including those related to biophysical and socio-economic/cultural components
- Working closely with project contractors to ensure that all monitoring and mitigation guidelines, recommendations for the project are strictly adhered to. This includes compliance with all health, social and safety guidelines outlined and following strictly the authorities environmental policy guidelines
- Working closely and coordinating efforts with the EPA and other enforcement bodies to ensure full compliance with all legal and regulatory requirements
- Organising activities to motivate and maintain the interest of the project staff in environmental and social issues and assisting to increase project staff awareness of environmental issues through training programmes and review meetings
- Coordinating investigations into/of all types of accidents
- Conducting environmental and social audits in accordance with project monitoring guidelines
- Serving as liaison between project contractors, the Authority and relevant regulatory agencies
- Developing a work plan for the implementation of the ESMP
- Establishing and running a reporting system on progress (or otherwise) in implementing mitigation measures (including contractors' obligations), training, etc

The Project Environmental Coordinator will be assisted by a Project Environmental Assistant.

8 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

A monitoring programme has been developed to determine impacts on the physical, biological and socio-economic/cultural environments within the project's area of influence. The monitoring results are expected to indicate whether the predictions of potential environmental impacts are accurate and also whether the mitigation measures proposed for the management of the impacts are appropriate and adequate. The programme will also serve as an early warning system by revealing unforeseen impacts and allowing additional corrective measures to be implemented to arrest the situation and ensure that irreversible damage is not caused.

The programme is also expected to provide useful guidance for the successful planning and implementation of future power transmission line projects that will be undertaken by the VRA.

The monitoring programme is summarised in the table below.

Table 6 – Monitoring programme

Impact	Monitoring activities
Noise pollution	Noise pollution levels will be measured once every month close to the areas where construction activities are being carried out including settlements such as indicated earlier.
Water quality of rivers/streams	At any point during construction the rivers and streams close to the site(s) where constructional activities are being carried out will be sampled and analysed monthly at locations just before and just after the river or stream crosses the RoW. During the maintenance phase monitoring will be carried out twice yearly. The relevant parameters that will be considered for analysis are: <ul style="list-style-type: none"> - BOD - pH - DO - Turbidity - Total suspended solids - Conductivity - Total coliform
Vegetation clearing	During the constructional phase, clearing of vegetation cover within the tower corridor and access tracks and the tower base areas will be monitored carefully to ensure that the minimum area requirements are not exceeded. Individual tree felling activities will be monitored to ensure that environmental and safety measures proposed under mitigation are fully implemented. Clearing of vegetation and cutting of trees within the RoW but outside the tower corridor track will be monitored to ensure that the specified height of 1.25m is complied with. <p>Monitoring will also ensure that fire is not used for vegetation clearing. These measures, apart from the clearing of tower base areas, are also relevant for vegetation maintenance during the operational phase.</p>
Transportation effects	The following parameters/activities will be monitored: <ul style="list-style-type: none"> ▪ Speed limits of vehicles especially within settlements. Random checks on speed limits of vehicles will be carried out daily. ▪ Loading of vehicles. Vehicle loading procedures will be monitored at all loading points to ensure that materials and equipment are properly secured in truck/vehicles. ▪ Covering of vehicles conveying dust-generating materials. Random checks will be carried out daily on vehicles. ▪ Trucks/vehicle conditions and maintenance (i.e. road worthiness of vehicles). Daily checks on conditions of vehicles. A monthly check will also be conducted on vehicles to ensure that maintenance schedules are adhered to. ▪ Vehicular accident records. All vehicular accidents or dangerous occurrences relating to vehicles will be recorded in the accidents record book or register.

Impact	Monitoring activities
Occupational safety and health issues	<p>Proper and sufficient supervision of workers will be monitored. The use of low quality components, inadequate sizing of cables, negligent execution of works and general non-observance of safety rules will be monitored regularly.</p> <p>The availability and use of personal protective equipment will be closely monitored continuously during both the constructional and operational phases. All employees who refuse to use the protective equipment provided will be properly sanctioned. To ensure that personal protective equipment is always readily available, all defective equipment will be promptly replaced.</p> <p>Regular safety tests as recommended by manufacturers will be conducted on equipment such as cranes and winches.</p>
Fire hazards	Construction work will be monitored continuously to ensure that the execution of works is done adhering strictly to technical specifications relevant to electrical safety.
Dewatering operations	Dewatering of tower base excavations will be monitored to ensure that de-silting of the wastewater is achieved to minimize the potential impact of polluting water bodies with suspended earth matter.
Waste management	<p>The collection and use of wooden wastes as fuel wood by the local communities will be monitored on monthly basis. Also, the collection and sale of scrap metal to dealers will be monitored monthly to ensure that metal wastes are managed efficiently. The management of other solid wastes will be monitored on weekly basis to ensure that the wastes are collected promptly and disposed of at appropriate public waste dumping sites.</p> <p>The clean up of accidental spills of oil, fuel and paints whenever they occur will be monitored to ensure that the clean up is promptly and properly done.</p>
Transmission lines	Transmission lines will be monitored annually through aerial inspections for signs of damages and/or deterioration of insulators and accessories. Replacements of any such damaged parts will be promptly carried out.
Accidents	Occurrences of accidents involving transmission lines and structures that affect public safety or worker safety will be monitored and recorded whenever they happen. The frequency and severity of such occurrences will be recorded. This will eventually indicate whether additional mitigation measures are required to make the system safer.
Identification of project-affected persons and compensation payment	Monitoring of project-affected persons will be carried out for two years to ensure that all affected persons have been identified and payment of adequate compensation duly effected without further delay.
Cultural/archaeological 'chance finds'	During constructional phase, cultural/archaeological 'chance finds' - sites of cultural significance such as sacred woods or trees or rock outcrops and historical or archaeological heritage/items or sites which the local residents may have not mentioned at the survey stage – will be monitored to ensure that such sites or items are properly managed to the satisfaction of both the local communities, the EPA and/or the Museums and Monuments Board.

9 PUBLIC CONSULTATION AND DISCLOSURE

During the social and environmental impact appraisal exercises, some traditional authorities, communities, opinion leaders, District Assemblies were consulted to initiate the sensitization process to the seven District Assemblies (DAs) in order to:

- Introduce the socio-economic and survey teams;
- Introduce the project, in particular, purpose, benefits, likely environmental risks; mitigating issues, etc.;
- Discuss and articulate concerns of DAs and community members;
- Obtain available documentation, information, census and socio-economic data on the districts district/community development/action plans, etc.; and

- Hold discussions with DA officials and, in a participatory manner, identify villages/hamlets not captured on the project map with assistance DA officials.

The Volta-Momé Hagou-Sakété 330 kV Transmission line affects communities in seven districts in Greater Accra and Volta, two of the administrative regions of Ghana. The seven districts affected are the Tema Municipal Assembly, Dangme West, Dangme East, South Tongu, North Tongu, Akatsi and Ketu District Assemblies.

The office of the District Assembly functions as the secretariat of each District, and wields the highest political, administrative, deliberative and executive functions. The office of the District Assembly is headed by the District Chief Executive (DCE) and the District Coordinating Director (DCD), who together with the Heads of Department provides the technical support and advice to the Assembly. The office of the District Assembly also cooperates with Non-Governmental Organizations as well as the Traditional Councils, which revolve around the chieftaincy institution.

All the officials contacted said they were aware of the project, though not necessarily in much detail. Officials had no objection to the project as it is a national project. Moreover, they believed the advantages of the project outweigh the disadvantages. Loss of land and livelihood and respect for cultural heritage sites were their major concerns amongst others but this could be mitigated through discussions with the District Assemblies in order to facilitate the acquisition of lands and the prompt payment of appropriate compensation for all lost properties to the affected persons.

10 CONCLUSION AND RECOMMENDATIONS

The construction of the proposed 330 kV transmission line Volta-Momé Hagou-Sakété is necessary for the economic development of Ghana and the rest of the sub-region, especially Togo and Benin.

The environmental and social impacts of the construction and operation of the line have been identified and are manageable. VRA is committed to building the line in a socially and environmentally responsible manner, taking all necessary steps to ensure the protection of the environment and the health, safety and well-being of construction workers and people from the local communities affected by the transmission line during construction and operation.

The Environmental & Social Management Plan and Resettlement Action Plan must be fully implemented to ensure that the effects of the identified impacts are mitigated and properly managed.

Table 7 – Summary of Impact, Mitigation, Net Effect Analyses and Monitoring

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
Line route survey & Construction	Loss of crops	Almost entire RoW & access tracks	Prompt, fair compensation payment	Negligible	During construction & operation
Construction	Loss of structures	Certain parts of line route	Prompt, fair compensation payment for resettlement	Removal from historical / ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
Construction	Loss of land	Entire RoW & access tracks	Prompt, fair compensation payment	Removal from historical / ancestral roots	Monitoring during construction & operation to ensure all PAPs are adequately and fairly catered for
Construction	Noise impacts	As indicated in report	Avoidance (as much as possible) of work at night	Minor disturbance during daytime	Noise pollution levels will be measured once every month
Construction	Air quality	As indicated in report	Spray the exposed soil surfaces of the tower corridor track as and when needed	Negligible	Monitoring - none
Construction	Potential soil erosion	Entire RoW & access tracks	Limit land clearance to minimum area required and early revegetation	Negligible	Monitor land clearance
Construction & operation	Public safety 1. Open excavations 2. Potential electrocution 3. Potential collapse of towers 4. Others	Entire RoW & access tracks	Tower base excavations in or near settlements or farms will be clearly marked. All towers will be clearly marked with a red inscription on white background - "DANGER – 330,000 Volts" to warn off trespassers, etc.	Negligible	Routine inspections of towers during operational phase
Construction & operation	Flora and Fauna	Entire RoW & access tracks	Limit clearance of vegetation	Negligible	Monitored carefully to ensure that the minimum area requirements are not exceeded
Construction & operation	Occupational safety and health	Entire RoW & access tracks	Provision of personal protective equipment. All work to be done according to corporate safety rules of VRA	Negligible	Availability and use of protective equipment.

Project Activity	Potential Impacts	Location	Proposed Mitigation	Net Effects	Monitoring
Construction	Impacts on cultural and historical / archaeological sites / items	Cultural / historical / archaeological chance finds	Chance finds to be reported to appropriate authorities	Negligible	Areas of chance finds will be monitored and secured in order to be handed over to Museums and Monuments Board.
Construction	Public health-STDs / HIV AIDS	Mainly settlements along RoW	Education of workers to avoid casual sex	Potential single mothers, transmission of STDs / AIDS	None
Construction	Traffic impacts	Relevant roads indicated in report	Use of traffic wardens to control traffic at road crossings	Negligible	Presence of traffic wardens at all times during construction.
Construction	Water pollution from excavations and accidental spillage of oil, fuel and paints	Rivers indicated in the report	Minimize erosion and manage excavated materials, wastewater	Negligible	Streams close to the site(s) of construction to be sampled and analysed monthly. During the maintenance phase monitoring will be carried out twice yearly.
Construction & operation	Solid Waste generation	Entire RoW & access tracks	Trees, tree stumps and wooden containers to be given out to the local communities as fuel wood. Metal wastes to be collected and disposed of appropriately and / or recycled	Negligible	Collection and disposal of solid waste to be monitored
Operation	Effects of rust treatment and painting of towers	Tower locations	Spilt paint to be quickly mopped up with rags and / or sawdust. Used sawdust and rags will be disposed of at appropriate public waste dumping sites.	Negligible	No monitoring
Operation	Micro shock from a spark discharge	RoW	Minimized by multiple earthings	Negligible	Monitor earthing cables
Operation	Fire hazards	RoW	Public education on hazards of bush burning	Negligible	Routine patrols to discourage bush burning
Construction & operation	Employment generation and incomes	Settlements along RoW	Encourage contractors to engage local labour	Standard of living improved	None

Table 8 – Environmental & Compensation Budget

Nº	ITEM	US \$
1	Environmental Impact Assessment study	80,000
2	Review & Disclosure of Environmental Impact Assessment Report	6,000
3	Cost of preparing RAP and ESMP	30,000
4	Environmental Monitoring	110,000
5	Training of environmental management team in-house	20,000
6	IEC (including HIV/AIDS Programmes ¹)	100,000
7	TOTAL ESTIMATES FOR ENVIRONMENTAL WORKS	346,000
9	CROPS COMPENSATION	72,786
	Estimated constructional damages @ 10%	7,280
	Permanent land for towers	173,378
	Add-on amounts for vulnerable project-affected persons	12,000
10	BUILDINGS/STRUCTURES	2,393,513
11	UNDEVELOPED PLOTS FOR RESIDENTIAL PURPOSES	43,478
12	ACCESS TRACKS	87,000
13	PURIFICATION RITES	14,700
14	Contingency allowance of 20% to cater for the effect of probable increases in property values.	507,738
15	Professional fees, reimbursement for permits, etc	165,573
16	TOTAL ESTIMATES FOR COMPENSATION WORKS	3,477,446
17	GRAND TOTAL FOR ENVIRONMENTAL AND COMPENSATION WORKS	3,823,446

¹Cost of IEC services for the constructional phase of the project cycle. This cost reduces to about US\$30,000 per year for all subsequent years as discussed in Section 8.13.1.

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