1.0 Introduction

Environmental Management has become a new phenomenon in the Liberia society; there is a high level of concern about the environment for every project undertaken. Its benefits, though long term are beginning to be the concern of individuals and corporate bodies. Consequently, the cost of managing the environment must be incorporated into projects' operational budget.

As an ecosystem, the forest of Liberia constitutes the nation's largest single terrestrial reservoir of biological diversity. To sustain this rich national patrimony over a long term, it is imperative that Government establishes and enforces appropriate policies. Such policies must be developed to:

Ensure comprehensive land-use planning,

Improve timber concession agreement;

Encourage the increased use of agro-forestry practices;

Encourage the participation of local people in the benefit of timber harvestings

And protect and maintain a permanent forest estate.

Accordingly, the Liberia Government enacted the National Forestry Reforms Law of 2006, which embodies the mechanism for granting of Forest Concessions.

Under this new legislature dispensation the AKEWA Group of Companies was granted a Community Forest Management Contract (CFMC) BEYAN – POYE Community Forest covering a total area of 33,338 hectares (82,379 acres) in Gibi District, Margi County.

1.2 Purpose of Action

The prerequisite for obtaining a harvesting certificate to operate a Community Forest Management Contract (CFMC), the Contract holder must conduct an Environmental and Social Impact Assessment (ESIA) and prepare an Environmental Impact Statement (ESIS) approved by the Environmental Protection Agency. This instrument is prepared to certify the requirement as prescribed under the New Forestry Law of 2006 and the Environmental Management and Protection Laws of Liberia (EMPL) of 2003.

The Environmental Management and Protection Law of Liberia (EMPL) also mandate that an entity desirous of engaging in forestry operation conducts an environmental study.

It is based upon this background that the AKEWA Group of Companies hired the professional consultancy of Forest and Environment Research Institute Inc. (FERI) to conduct the studies and prepare this Environmental Impact Statement (ESIS) on its behalf.

1.3 Scope of the ESIA

This environmental impact assessment report is in conformity to the guidelines set out by EPA.

The scope of the ESIA report includes an assessment of the potential environment consequences of timber harvesting operations including impact on surface water and ground water quality, noise, odor, dust, air quality, aquatic and terrestrial life cultural resources and socio-economic condition.

This report describes those aspects of the physical, biological and socio-economic environment within the Community Forest Management Contract (CFMC) area. The assessment also identifies the project environment interaction during the implementation of the Community Forest Management Contract activities.

These reports also contain the mitigation measures predicted and associated cost. The project area considered by this ESIA is defined as the Community Forest Management Contract of 33,338ha.

2.0 Policy Legislative and Institutional Framework

2.1 Policy Framework

Several pieces of policy, laws and institution relative to environmental management can affect the harvesting of Forest projects and their processing. These include both national and international instruments. In 1992, at the United Nations Conference on Environment and Development (UNCED) held in Rio De Janeiro twenty-seven environmental Principles were outlined in an attempt to enshrine a charter for the protection of the earth in Agenda 21, a program of action for the 21st Century.

- Principle 1 states that human beings are at the center of concerns for sustainable development and they are entitled to a healthy and productive life in harmony with nature.

- Principle 3 mentioned that the right to development must be fulfilled so as to equitably meet development and environmental needs of present and future generation; and

- Principle 17 states that environmental impact assessment should be a natural instrument that shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment.

The above principles can be seen as a mechanism by which the international community will cooperate to promote sustainable development that can be mentioned indefinitely because it is socially desirable, economically viable and ecologically sustainable.

Within this context the government of Liberia has tailored its Environmental Policy to reflect the Principles of Agenda 21.

The national Environmental Policy of Liberia, 2002 has as its ultimate aim to ensure that improvement of the physical environment, present and future generation and to reconcile economic development and growth with the sustainable management of natural resource.

2.1.1 Policy AKEWA Group of Companies

The policy of AKEWA Group of Companies is in consonance with the National Environmental Policy. Accordingly, Akewa Policy and objectives anchored on the following:

A. Occupational Health and Safety

AKEWA Group of Companies is committed to the principles of sustainable development and continual improvement throughout all phases of its activities, from initial development, construction, operation and decommissioning; closure and post closure.

The company is also committed to developing a culture and management system that supports its Safety and Health Values by encouraging behaviors and implementing processes that ensure the safety and health of all employees, contractors, customers and communities associated with its operations. Further, AKEWA is committed to working closely with the local community and promoting independent sustainable economic development.

B. Employees Housing and Recreation

The employees shall be well housed with adequate utility and service that will guard against environmental degradation. Appropriate infrastructure for recreation and relaxation shall be provided.

C. Hazardous Waste Management

"Hazardous Waste" is a solid or liquid waste exhibiting one or more of the following characteristics: Flammability, corrosiveness; reactivity, and toxicity. Waste oil and solvents are included in this definition.

This Policy is designed to ensure that every effort is made to minimize the generation of hazardous waste and that all hazardous waste are properly managed and disposed. This policy is applied to all AGC (Akewa Group of Companies) employees and contractors who may generate hazardous waste including personnel in the harvesting operations and transportation.

The Office of Environment (OE) has oversight responsibility for the hazardous waste management program, including waste pickup, segregation, labeling, storage, disposal, inspection, road keeping and training. This department is responsible for properly managing its area. The department accumulation area must be carefully maintained and inspected weekly. Each area must be equipped with a containment tray or tub to separate incompatible waste streams.

Hazardous waste is collected by the OE and stored at central accumulation area. This area must be secured, marked with signs and inspected weekly. In the event of a spill or accidental release, spill kits are kept on site to facilitate a timely response and cleaning.

The OE shall conduct hazardous waste training for all AGC employees and contractors who may generate work with/or near hazardous waste. Each employee covered by this program must be trained annually.

Record is kept for all permits, licenses, hazardous waste shipping document, inspection logs, training documentation and agency correspondence. These documents must be kept on file for at least three years.

D. Petroleum Product Management

This policy is designed to ensure that Petroleum storage tanks maintained by the Management of AGC are managed to protect the environment and the people of the Community Forest Management Contract area. This policy applies to all underground and above ground petroleum storage tankers.

The Administrative Manager is responsible for tank installation, modification closure and removal of out-of-service terms in collaboration with the OE. The administrative manager is also responsible for the operation of all tanks including maintenance, repairs, annual inspections and record keeping. The office of the Environment is responsible for spill prevention and notifying the County Coordinator of the Environmental Protection Agency. The OE shall periodically conduct accident prevention briefing.

E. Air Quality Control

The policy is designed to ensure that AGC air emission sources are operated to protect the environment and control air pollution. The Policy applies to all emission sources including: boilers, generators, heavy-duty machineries, vehicle and auxiliary activities.

The management shall take such steps as are necessary for the effective management of the natural environment so as to ensure its sustainability, promote the participation of the members of the public in the process of integrating environmental concerns in the planning of its operations and ensure that any activity which may cause an adverse effect on the natural environment be assessed before such activity is commenced and that such adverse effect be taken into account in deciding whether or not such activity should be implemented.

The policy of AGC embodies principles of environmental management such as:

- The "Precautionary Principle" where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.

- The "Avoidance Principle" is preferable to avoid environmental damage, as it can be impossible or more expensive to repair rather than prevent damage.
- The "State of Technology Principle" measures protecting the environment are restricted by what is technologically feasible and as technology improve, the improved technology shall be used to prevent and repairs environmental damage.

F. Environmental Education

The objective of this policy is to deliver effective and integrated environmental education that will build the capacity of people in the employ of AKEWA Group of Companies and the communities within the Community Forest Management Contract area to move towards more sustainable behaviors; to have an informed, aware and motivated staff with sufficient training to perform their duties in a way which minimizes risks to the environment.

G. Biodiversity

The policy objective here is to have integrity and diversity of the flora and fauna and the natural landscape of the Community Forest Management Contract Area sustainably managed.

2.2 Legislative Frame-Work

Several pieces of legislation specific to area of environmental management affect timber harvesting. As a matter of fact, the Environment Protection and Management Law of Liberia require an environment impact assessment for projects on the environment. The harvesting of timber as a developmental project is listed in Annex 1 of the Environmental Law as requiring an environmental permit. As such there is a statutory requirement for conducting an environmental impact assessment for this project.

The National Forestry Reform Law of 2006 outlines environmental requirement that a prominent of project in the forest sector must fulfill before commencement of any activity in the project area.

In addition to these two cardinal Laws, the following are relevant to protecting the forest environment:

There are also international protocols and agreement which have relevant to the development and implementation of a project in the area of environmental concerns.

1992 United National Conference on Environment and Development (UNCED); Agenda 21 contains 27 Environmental Principles.

2.3 Institutional Framework

The Environmental Protection Agency is the main agency and principal authority for the management of environment in Liberia. The key functions of the EPA are:

a) Coordinate, integrate, harmonize and monitor the implementation of environmental policy and the decision of the Policy Council;
b) Propose environmental policies and strategies to the policy council and ensure the integration of environmental concerns in the overall national;
c) Collect, analyze and prepare basic scientific data and/or information pertaining to pollution, degradation and environmental quality, resource use and other environmental protection and conservation matters; undertake research, prepare and disseminate every two years a report on the State of the Environment of Liberia.
d) Ensure the preservation and promotion of important historic, cultural and spiritual values of natural resources heritage and in consultation with indigenous authorities,

e) Enhance indigenous methods for effective natural resource management.
f) Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources;
g) Establish environmental criteria, guidelines, specifications and standards for production processes and the sustainable use of natural resources for health and welfare of future generations,
h) Review and approve environmental statements and environmental impact assessment;
i) Initiate and coordinate actions required in a state of environmental emergency or any other situation which may pose serious threat to the environment and public health.
j) Function as the national clearing house for all activities relating to regional and international environmental-related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments, and
k) Advise the State and participate in the process of negotiating, ratifying or acceding to relevant regional and international environmental agreements.

The EPA has a mandate to work along horizontal linkages with lined ministries and agencies and along vertical linkages with the local government. In order to ensure effective environmental management at the local government level the EPA Act provides for the establishment of counties and districts

environmental concerns in plans and projects of local government and the dissemination of environmental information.

Along the horizontal linkages the most important institutions, besides the EPA, dealing with the environmental matters is the Forestry Development Authority, FDA. It has the mandate to protect, manage and conserve forest resources and wild life on a sustainable basis (forests cover more than 45% of the total land area of Liberia). Other institutions include: The Ministry of lands Mines and Energy, Ministry of Agriculture, College of Agriculture and Forestry of the University of Liberia is a research center for the Soil Science, Forestry, Wood Science and Agriculture.

Other important stake holders in the management of the environment are the Ministry of Public Works, the Ministry of Health and Social Welfare, the Ministry of Commerce, the Ministry of Internal Affairs, the Ministry of Transport and the Liberia Water and Sewer Corporation.

3.0 Project Description

3.1 Statement of Needs

The AKEWA Group of Companies Community Forest Management Contract is located in the Beyan and Poye communities in Gibi District, Margibi County. The forest bloc is dominated by shifting cultivation and rubber plantations. The patches of forest between these land-use practices have significant amount of commercial trees which need to be harvested and removed before the area is completely converted to community land use practices. This operation will contribute to the National Socio-economic development: The reconditioning of the road network in the affected area, the maintenance and improvement of the availability of the Health Services and contribution to the local and central government revenue.

3.2 Project Component

The project shall be implemented in three components:

a) Forest Land Demarcation and Inventory;
b) Construction of roads camps and other facilities;
c) Timber harvesting and transportation.

3.2.1 Forest Land Demarcation and Inventory

About 30 km line will be cut to demarcate the project area. Within the project area forty-five (45) one hundred hectares block will be laid out. The AKEWA Group of Companies shall be guided by the operating procedure laid out by the Forestry Development Authority, FDA for "Block Maps and Stock Survey" as a requirement for its "Chain of Custody information System". The essence of this requirement is to establish the traceability of all logs produced in this Beyan – Poye Community Forest Management Contract in the Gibi District.

3.2.2 Construction Works for Logging

3.2.3 Roads

Roads provide needed access to the forest. At the same time, roads can produce significant amounts of sediment and can be one of the greatest adverse impacts on the local environment, on water quality, aquatic and wildlife. Roads can produce significant erosion, cause gullies, and have impact on ground water, wildlife and vegetation.

Roads should be well planned to minimize the sum of skidding and road construction impacts, which in turn will also lead to cost minimization. The most efficient spacing, of roads can be derived by looking at the cost tradeoffs between skidding distance and road spacing.

3.2.4 Road Classification

A. Primary Forest Roads

These are permanent, all-weather roads that provide access from public roads to the Community Forest Management Contract area. These should be capable of carrying log volumes of about 2,000m^3 (=cL60 truck loads) or more per week and may be in service during the entire logging operation of a 5-year management plan (CFMC) or during the operation of Community Forest Management Contract.

B. Secondary Forest Road

These are roads that provide access to a logging compartment, connecting feeder roads and log landing to primary roads. They will carry log volumes of about 1,000m^3 per week and will be serviced for 1-2 times year only. Secondary roads are often upgraded to primary roads as the logging operations precede.

3.2.5 Road Planning

In planning the location of roads the following shall be considered:

- Primary and Secondary forest roads shall avoid all protected and exclusion areas and their respective buffer strip.

- Roads shall be kept at least 40m away from the edge of buffer strips (e.g. 55m from the bank of creeks, the edge of a gullies), except at designated water course crossing point.

- Roads should be located on ridges as much as possible.

- Efforts should be made to minimize the number of water course crossing, and

- Road shall be located wherever possible on well-drained soils and slopes where drainage will move away from the road. Roads should, therefore, follow the natural terrain by conforming to the contour, rolling the grade and minimizing the use of cuts and fills.

3.2.6 **Road Widths**

Every effort shall be made to minimize the width of the forest roads. Road widths depend on the class of road, the type of soils, and the forest through which the roads are to be constructed.

The maximum road widths for forest roads on loam and clay soils are shown in the table below:

Road Class	Limit of Clearing meter	Limit Roadway meter	Limit of Road Bed meter	Limit of Travel way meter
Secondary Road	20	15	8	5
Main Road	25	20	9	6

Table: #1: Maximum road width for loam and clay soil

Road Class	Limit of Clearing	Limit Roadway	Limit of Road Bed	Limit of Travel way
Main Road	15	11	9	6
Secondary Road	15	10	8	5

Table: #2: Maximum road width for Sandy soil

- Primary and Secondary roads on clay and loam soils should have trees removed alongside the road to allow sunlight into the road to dry the surface quickly after rain. Road on white sand soils should be protected from rain and direct sunlight by limiting crossing to the roadbed and ditches to maintain traffic-ability.

- On primary and secondary roads, tree stumps should be grubbed on at least one side of the road to allow for movement of tractors and other heavy machinery that would damage the road surface.

- Passing spots should be provided on road with a roadbed narrower than 7m, at least every 500m and at bridge approaches and hillcrest.

Crossing of water Course: The AKEWA Group of Companies Area has more than five streams and creeks besides the NIA and Wiaya Creeks. The management will construct culverts on the creeks and streams.

The culverts shall be made of concrete ranging from one (1m) meter to two depending on the size of the stream/creeks. These culverts shall be used on the access and main roads soldered end to end two hundred (200) litters drums will be used on secondary roads as these roads will be used for short period of time.

Every culvert shall be placed on natural soil with good bearing capacity using non scouring materials that shall be carefully compacted; a proportionate larger of earth shall be placed over the culverts, i.e. 60cm of the earth for 100cm diameter culverts; 70cm earth for 200cm diameter culverts.

3.2.7 Road Maintenance

For all primary and secondary forest roads maintenance shall be carried out regularly and at least on annual basis. The crown of the road surface and road shape shall be maintained to allow effective drainage. Additionally:

- Surfacing gravel or loam should not be pushed to the road edge or into drains.
- Soil vegetation and other materials that would obstruct water flow shall be removed from ditches.
- Turnout drains, culverts and bridges shall be kept clear and in a good working condition at all times.
- Bridge decking, foundation and sidewalls should be checked regularly.
- Any debris that has been pushed into the watercourse shall be removed.
- Water should flow freely under bridges, and silt traps should be cleaned regularly.

3.2.8 Camps and other Facilities

The AKEWA contract has duration of 15 years therefore a camp will be constructed between Beyan and Poye towns. Few other towns within the company area will be improved to accommodate the company's needs. Hand pumps shall be installed in the towns as enshrined in the Management Agreement. Pits latrines shall also be installed more than 50m from a stream or water point and right above the water table. AKEWA offices, garages and workshops shall be located in their camps.

The company's storage facilities will provided in the garage and workshop. All chemicals and petroleum products will be stored. Special care will be put into place to prevent these products from polluting the water courses and surrounding areas.

3.3 Timber Harvesting and Transportation

3.3.1 Harvesting

The Management of AKEWA is cognizance of the numerous impact of timber harvesting on the forest ecosystem including:

- ✓ Forest structure – the population structure is changed directly by dysgenic selection, i.e. sound individuals of commercial species are taken out thereby decreasing their absolute and relative abundance and increasing the same for non-commercial species.

- ✓ Physical function of the forest runoff, percolation stream and storage discharge may change; change in runoff and infiltration may speed up nutrient loss from the soil. Large pulse of nutrients may be released from dead matter and a part of the nutrients in exported from the system in the form of logs. Additionally, due to the opening of the canopy, light tunnel, average temperature, soil structure and decomposition rate all change in specific manner.

- ✓ Wildlife Habitat – The availability of resources and habitat suitability and attributes are altered. AKEWA Management will adopt a controlled felling system during its timber harvesting operations:

- To avoid destroying potential crop trees and regeneration, to ensure maximum safety for the felling crew, to maximize use of felled trees and facilitate favorable log position for case of extraction.

The techniques for controlled felling involve:

- To decide whether a tree should be felled or not, the feller will have to identify potential crop tree and seed trees as reported by the inventory crew and avoid damaging them.

- Preparing the tree for felling; i.e. clear the area around the tree of all obstructions and cut all visible and accessible climbers around and next to the tree. Ensure safety of the felling crew.

- Determine the direction of the fall of the tree.

- Determine the felling height. Trees will be cut as close as to the ground as possible. Tree with small or no buttress will felled 30cm above the ground. Prove of buttress is necessary to obtain a cylindrical bole shape in order to enable the back cut to be completed before the tree starts to fall.

3.3.2 Transportation

Extraction is the first stage in the transport of logs from the stump to the saw mill/log yard.

It is the Extraction of logs, after topping and butt trimming from felling site to road side landing. This involves the dragging of the logs on the forest floor along a skid trail, which dimension may be a hundred to a thousand meters. Wheeled tractors will be used to clear the track to logs to be extracted but the soil will not be bladed for secondary skid trails, the main skid trail will be bladed.

Large area/landings will be created for stock piling of logs for onward transportation. They shall be at least 60m away from water courses and where mud, debris from cross-cutting and other waste will not reach the water courses. Of the 33,338 hectares, there shall not be more than four landings, each not exceeding 0.1ha (25m X 40m).

The final stage of log transport will involve the evacuation of logs from the landings to a place or point of destination. AKEWA Management will use trailers for this purpose.

Materials and personnel including equipment, fuel, and lubricants will be transported from integrated villages to the site of operation including forests and saw mills.

3.3.3 Primary Timber Processing

The Management will install a small scale "mighty-mite" saw mill in the contract area. This mill shall have a capacity of producing 10-15$M^3$of saw lumber per 8 hour shift. The input to the mill shall be an assortment of logs amounting to 30M^3 8 hour shift. During the contract period the mill will process at least 10,000M^3 of logs for local consumption and the export market.

To install the plant, AKEWA, will undertake an initial capital investment of 500,000 USD. This includes the procurement of the appropriate type of machineries.

The efficient operation of a sawmill requires skilled labor force including technicians hence available trained technician will be engaged to operate the machines and local community members will be employed and trained on the job.

The installation of the mill ensures a fuller utilization of the timber species of the contract area. It will also contribute towards socio-economic improvement and enhance poverty reduction through employment of community members of the contract area and its environs. Self-employment will also be engendered by ventures such as charcoal production from by-products of the mill.

Furthermore, the selective harvesting of high-grade timber species for the export market with little consideration for the local markets which has induced the "pit sawing phenomenon" will be minimized in the district, when this mill is brought into operation.

3.3.4 Equipment and Machineries

The activities of AKEWA including construction of roads, timber harvesting, camp maintenance and transportation, will require the following equipment and machineries:

1) Earth moving/Logging Equipment

- D6……1 piece
- D7……2 pieces
- D8……1 piece
- 980B……1 piece

- 528……1 piece
- Motor Grader……1 piece
- Trailers……..10 pieces

- Generator……(250-500)…. 2 pieces
- Chainsaws…… 10 pieces
- Vehicles…(4 wheel drive pickups)…… 5-10 pieces
- Mighty-mite (12-12 and 9-12) Saw…… piece
- Fuel and Lubricant…… Assorted
- Spare/accessories…….. Assorted
- Tools and materials……..... Assorted

3.4 Project Location and Size

The AKEWA Group of Companies CFMC is in Margibi County and lies within latitudes (380980 735592) north of the Equator and Longitude (381112709530) West of the Greenwich Meridian and located in Margibi County, which covers an area of 33,338 hectares.

3.5 Description of Present Land-Use of the Project Area

The communities of the Project Area are mainly engaged in Agriculture mainly Rain-fed Agriculture, the main produce being rice. Some rice is grown in swamps while others grown on upland. The upland rice is grown in a mixed with cassava, which is a staple food of the communities and some other vegetables. Rudiments (goats and pigs) and fowls (chicken and ducks) are also raised as sources of proteins augmentation of cash income and ceremonial purposes.

Rubber Plantations play a major role in the contract area. This may have its influence from the Firestone Plantation Company just on the other side of the Farmington River. Hence, there is several small rubber plantations scattered all over the contract area. After harvesting the upland rice and cassava farms, rubber are later placed at the same spot the subsequent year or later.

People in the community engaged in Non-Forest Timber Products (NTFPs) harvesting for furniture production. Small scale hunting and fishing is also practiced. Oil Palm (Elais guineansis) is collected for production of oil for family consumption and for commercialization (sold at the Worhn Town market).

4.0 Description of the Affected Environment

4.1 Physical Environment

Liberia is situated on the West Coast of Africa and has a surface area of 111,370km^2. It is bordered by Guinea on the north, Sierra Leone on the west and Cote d'Ivoire on the east (figure: map:1). The border with Guinea is about 563km, Sierra Leone 306km and Cote d'Ivoire 716km. Liberia has coast line of about 560km long characterized by unbroken sand strips and is dominated by lagoons and marches. The hinterland is made up of dissected plateaus and Low Relief Mountains. The highest mountain (Mt. Nimba) is located in the northeast and rises to an elevation of about 1400m a.s.1. Liberia has population of about 3.5 millions.

4.2 Geographic Features:

Liberia has four Topographical regions at different altitudes, each with distinct physical features: along the sea coast is the coastal plain of 560km. This is followed by a belt of undulating plateau, then a belt of high lands in the north and finally rolling hills in the northwest.

Most mountains are located in the northern part of the country and include the: Bong, Nimba, the Putu, Mano, Wenigizzi, and Bomi Ranges.

The major rivers in Liberia derive their source from the mountains in Northern Highlands. Meandering slowly over the plains and widens near their estuaries. The major rivers basins drain the country in general in a northeast to southwest direction to the Atlantic Ocean. The major exception to this pattern is the Cavalla and Dugbe in the East of the country which flow parallel to the coast in the middle reaches.

4.3 Climate:

The equatorial position and the distribution of low and high pressure belts along the African continent and the Atlantic Ocean determine the climate of Liberia. Because of this position, and the moderating influence of ocean, fairly warm temperatures with high humidity are common throughout the year. The country experiences low humidity usually from the end of December to January and sometimes till February, during this time dry dust with wind from the Sahara Desert reach Liberia; carrying considerable amount of dust and fog with low cool temperatures especially during the nights. The sun is over head at noon throughout the year giving rise to intense insulation in all parts of the country. The temperature over the country ranges from 27-32 degrees Celsius during the day and from 21-24 at night. The highest temperature occurs between January and March and the lowest is between August and September each year. The country experience two seasons: the rainy and the dry seasons. The rainy season lies between May and October while the dry runs November to April each year.

The wettest month over the 9 years is September; it had an average of 27.54 inches. While the driest month of the same period is January, which had an average of 1.29 inches. More rain fell in 2007 (172.17 inches) than the previous 8 years. The lowest rainfall of the period was recorded in 2002 (129.98 inches).

4.4 Water Quality

The Contract Area is transverse by more than a dozen creeks and streams. The major one is the Glor River which crosses the area at its center in a West East direction.

Baseline water quality analysis was carried out for three creeks of the AKEWA Group of Companies Contract Area using the latitude) Merck Quant Test Kit and Hach Lang GMBM spectro photo meter. The pH of the sample from the creeks was 7.4 and 6.2 which are within the standard range for drinking water. The Analysis did not show the presence of lead, a heavy mental normally from the motor oil.

Table 4: Water samples analysis of three creeks in the AKEWA Contract Area

Parameter	Sample 001- Nia Creek	Sample 002- Wiaya Creek	Sample 003- Gbar River
Ph	7.4	6.28	6.2
Chlorine	Not detected	Not detected	Not detected
Chloride	Not detected	Not detected	Not detected
Hardness	40 ppm	40 ppm	40 ppm
Nitrite	0.026mg/L $N0_3$	0.016mg/L $N0_3$	0.019mg/L $N0_3$
Nitrate	Under measured	Not detected	Not detected
Ammonium	0.105 mg/L NH_4	0.063mgL NH_4	0.083mg/L NH_4
Total Iron	0.506mg/L Fe	0.327mg.L Fe	0.235mg/L Fe
Sulfate	Not detected	-14.8mg/L $S0_4$	Not detected
Arsenic	0.0mg/L As	0.0mg/L As	0.0mg/L As
Copper	0.0mg/L Cu	0.0mg/L Cu	0.0mg/L Cu
Nickel	0.0mg/L Ni	0.0mg/L Ni	0.0mg/L Ni
Lead	0.0mg/L Pb	0.0mg/L Pb	0.0mg/L Pb
Aluminum	0.652mg/L Al_3	0.598mg/L Al_3	0.600mg/L Al_3
Conductivity	12.50uS/Cm	21.03uS/Cm	19.64uS/Cm

4.5 Geologic Aspect

Liberia is divided into 10 quadrangles and named according to principal settlements within the quadrangle. The project area falls within the Monrovia quadrangle lies between 7-6 degrees north (latitude) and 9-10 degree 22mm west longitude.

The Monrovia quadrangle is with the Guinea shield of West Africa and it includes parts of the Pan-African 350 Million years) Liberian (2700 million years) age provinces (White and Leo, 1970). Metamorphic rocks show a range in grade from lower amphibolites to granulite facies and consist predominantly of silicic gneiss; subordinate rocks are mafic gneiss, amphibolites, schist, quartzite and iron formation, Jurassic dikes and still-like bodies widespread. Upper Precambian to Cenozoic sedimentary rocks is present along the coast and off shores.

The AKEWA Contract Area is within the Todi Shear Zone and contains Leucocratic gneiss in the north which structure trends are less regular and magnetic anomalies are more subdued; it also contains amphibolites which are dark-gray medium-grained schistose to nearly massive rock consisting of approximately equal amount of plagioclase and hornblende.

The area is undulating with valleys and hills/the Gibi Mountain. The slope inclination between the valleys and the hilltops can reach up to 40%.

4.6 Biological Environment

Liberia is within the Upper Guinea Biodiversity Hotspot which extents between Guinea to Togo.

Liberia has about 43% of the forest cover with in this region. The forest can be classified into four types namely, the costal mangrove swamps, the tropical evergreen forest, the fringing forest and the transitional deciduous forest.

The forest ecosystem can further be divided into four classes:

a) primary dense forest
b) climax secondary forest

c) young secondary forest; and
d) other mix vegetations

Biologically, Liberia is exceptionally diverse with high rate of endemism and many species that are nearly extinct outside the country. Liberia is home to approx. 150 Mammal spp. 162 native fish spp. 74 reptiles and amphibians and more than 1000 insect spp. 600 birds species. Liberia is also thought to contain over 2,900 flowering plants including 240 timber spp. And other unclassified biological forms.

Few trees are found in the larger girth class while there are several trees in the smaller girth classes. Notwithstanding, the trees with in the larger girth classes are mostly commercial/timber species, especially Parkia, Pentadesma, Aniegre, Black gum, Uapaca, Pynanthus, Niangon, Lophire, tetra, etc.

4.7 The Human Environment

An abridge Participatory Rural Assessment (PRA) technique was adopted during Environmental Impact Assessment in the Beyan-Poye Community Forest Management Contract (CFMC).

Prior to the holding of a town hall meeting, an informal discussion was held with town chief to ascertain in his comments and concern relative to the operation of the logging company in the area. The chief was asked about the infrastructure development and cultural practices of the community.

At the town hall meeting the participants were asked to express their concerns about the operations of the up-coming company.

The socio-economic status of the five (5) communities sampled in the Beyan-Poye Community Forest Management Contract (CFMC) and the results shows that none) of the 5 villages are accessible by motor road, no public transportation. None of the villages have primary school, latrine, shrines and hand pump. None of the community has a health post & market. All the seven villages sampled have taboos.

5.0 Impact Prediction and Evaluation

Timber harvest has a wide range of impact on the environment. Some of the environmental factors and timber harvesting impacts are presented in the impact matrix below:

Table 3: Impacts Prediction Matrix

Environmental factor from logging	Activities	Negative impacts	Magnitude	Permanence/ cumulative/ reversible
Soil and land form	Selection logging - Line cutting - Log construction - Road construction	- Slope bank or shore instability - Gullies or shore erosion - Loss of nutrients - Decrease or alteration of micro-flora and fauna - Soil compaction - Laterrization - Excessive erosion and sedimentation	- Placement of proper turn out during road construction	Cumulative & Reversible
Water Resources	- Road construction - Camps - Logging skidding - Timber harvesting	- Increased storm water runoff - Increased turbidity - Contamination of water with hydrocarbon - Increased effects on channel stability - Effect on aquatic life	- Installation of culverts of the appropriate sizes of water crossing points	Reversible
Climate and Air-quality	- Road construction for logging and camp facility - Creation of landing	- High ground temperature - Release of C02	- The entire AKEWA will be affected as the result of this activity	Reversible

Vegetable	Road, camp landing construction skidding - Stock survey - Boundary demarcation	- High forest may not regenerate itself - Some species may become extinct - Influx of persistent weed - Adjacent uncut forest may damage by machinery	Throughout the CFMC (AKEWA)	Reversible
Wildlife	Logging operation, road, camps, landing establishment - Timber harvesting	- Some animal may be killed outright - Nesting trees, including hallow trees may be eliminated or damage - Felling and breeches ground of animals may be eliminated - Animals may be displaced as the result of human activities or presence	In the entire Beyan-Poye Community Forest Management Contract, (CFMC)	Cumulative & Reversible

Environmental factor from logging	Activities	Negative impacts	Magnitude	Permanence/ cumulative/ reversible
Log Hauling by road	Movement, transportation of log	- Source of accidents - May interfere with local traffic - May destroy wildlife	- In the entire TCS (AKEWA)	Cumulate &Reversible
Logging Camp	Clearing and construction of the camp	- May require additional forest removal apart from actual logging operation - Generate solid and liquid wastes - May be a source of friction with local residents	- Around camp site in the Beyan-Poye Community Forest Management Contract (CFMC) (AKEWA)	Reversible
Sawmilling	- Wood processing and transformation of wood product	- May cause dust ay generate or other particulate emission - May generate solid waste - May damage aquatic habitats with improper disposal of saw dust and other waste - Source of fuel spillage - Noise hazard	Within the Beyan-Poye Community Forest Management Contract (CFMC) (AKEWA)	Reversible

		- May impose fire hazard		
Noise	- Roads, bridges, camps construction - Transportation, felling of log	- May cause hearing disability to employees constantly expose to noise at high pitch - May lead to wildlife disturbance and displacement in the Beyan-Poye Community Forest Management Contract (CFMC) (AKEWA)	Within Beyan-Poye Community Forest Management Contract (CFMC) (AKEWA)	Reversible
Waste Management	- Camp and office maintenance - Timber harvesting - Operation management	-	Within the Beyan-Poye Community Forest Management Contract (CFMC) (AKEWA)	Temporal Reversible

6.0 Environmental Management Plan (EMP) and Mitigation Measures

6.1 Mitigation Measures

1) Road Construction has the widest range and greatest magnitude of impacts. It impacts the vegetation, fauna (wildlife), surface water, aquatic resources, health and safety of personnel and noise level. It serves as a catalyst for other negative impacts, i.e., it provides access to the forest for poaching and settlement which involves forest clearing.

   The primary mitigation action of road construction is to limit the amount of road (km).

   Recognizing that AKEWA will construct new road when it is absolutely necessary (not more than 15km of new road). It will recondition the Kakata road to Worhn town. All other secondary roads will be connected to these pieces of road.

2) Documentation and Stock Survey:
   This requires cutting of lines of about 1000km which ranges from 1-2m during these activities

3) Timber Harvest: This reduces wildlife nutrition and breeding ground especially for primates and birds. Birds and primates feed on the fruits/seeds. The chimpanzees make their nest in the upper canopy of trees when these trees are felled, this basic resource is lost.

   AKEWA will preserve and protect seed trees that may be useful (1-2 trees per ha) to protect the wildlife population and that may not be exceptionally valuable for timber.

4) Skid Trail and Construction: This project envisage the construction of 5 log landings, the principal logging road and about 20km of skid trails perpendicular to the logging road. These have the propensity to impair the surface water bodies. There are more than 6 bodies of river and creeks in the Beyan-Poye Community Forest Management Contract (CFMC) Area. Culverts and bridges shall be placed at all water crossing and all landing shall be placed more than 50m away from a surface water to prevent situation and the entering of debris into the water that could lead to the growth of a large bacteria that could, in turn lead to dying (decimation) of aquatic life form. Aquatic life forms are also impacted by petroleum products, maximum care shall be taken to prevent/minimize the spillage of petroleum products at the landing.

5) Transportation: The major impact of transportation includes dust emission of sulfate (sox), Nitrate (Nox) and particulate matter into the air (air pollution). Emission of Sox Nox and particulate matter from petroleum products shall be minimized by regular and adequate maintenance/servicing of vehicle in order that their fuel combustion capacity is enhanced.

   The speed of vehicle does not only emit dust but also poses a risk of accident. This can both affect the personnel; the community surrounds the contract area and the nation at large. Hence stringent regulation shall be put in place to minimize the risk of accident and dust emission during the transportation of personnel and goods including logs.

The measure shall include cataloging the distances from major operating sites to common point of destination and the time requires covering such distances. Each vehicle shall carry a log book to indicate time of departures and line of arrivals.

Communities which are normal/regular traffic routes shall be encouraged reporting to Management the behavior of vehicle operators especially trailer operators. In these communities awareness and education activities shall be conducted on the danger and risk associated with vehicle movement most especially trailer carrying logs.

6) Operation Management: The offices, garage and the camp significantly impact the environment as they are sources of wastes. These include water borne waste. It will incinerate/born its solid waste in a concrete bin. Waste from the clinic shall be given special treatment; they shall be burned as it may contain human parts. They shall use double walls, above ground storage tanks for its petroleum products. They shall be properly installed and checked regularly. Measures shall be taken to prevent over filling. The tanks shall be installed at the operational site (where the garage and office are).

7) Wood Processing: This impacts the environment by the generation of waste such as saw dust and other wood parts and by the emission of NOx. Sox and particulate matter from fuel. AKEWA shall encourage community members in production of charcoal from the un-milleable wood parts for their income generation and the saw dust for heat energy source for cooking etc. The saw mill shall be serviced regularly so that its fuel combustibility will be optimized.

6.2 Monitoring Plan

The environmental Monitoring Plan of the AKEWA Contract Area shall be integrated into the normal operations and will encompass the following:

- Vegetation
- Surface and underground water
- Air quality
- Community and personnel safety and Health
- Waste Management

The Plan shall serve as a fulcrum in the operations of AKEWA Contract Area. Hence the tracking of environmental parameter shall be contained in the daily routing Monitoring & Evaluation (M & E) and shall provide information on the level compliance with legislation and regulation of the Environmental Protection Agency, forming the base for corrective actions.

Table 5: Impact monitoring Matrix

Location/Source	Environmental factors	Indicator	Actions	Frequency	Personnel
Road, skid trails and landing	Terrestrial Resources	• Wildlife population stable • Vegetation recovered at landings and skid trails • Soil faunal population increased	• Wildlife and vegetation concurrently • "no hunting" policy will be enforced through check-points established at the access point to the COMMUNITY FOREST MANAGEMENT CONTRACT (CFMC) (AKEWA) • Production of other sources of animal protein encouraged • Surface soil returned to landing and skid trail ripper	Annually Permanently Continuously	Forest Biologist Logging Engineer
Forest	Water resources	Target compounds BOD and physical protection of water at acceptable level as shall be prescribed by EPA no report or reduction in	Sample of surface water (from Nia and Wiaya Rivers) and ground water from existing wells and hand pumps will be	Annually	Environmental Officer

		quality of drinking water and aquatic fauna	recollected and analyzed for the presence of target compounds, and physical properties annually		
Warehouse	Hazardous material	No disparity between the material safety data sheet value and actual stock ins warehouse	• Material safeties data sheet kept ensure that impervious surface is not breached ensure that all material is used for the purposes intended.	Continuously	Warehouse/Supervisors/ Operational Manager
Transportation and Road	Air quality and dust	• No report of new incidence or respiratory disease amongst personnel and members of communities along transportation route • No report of motor accident by AKEWA vehicle and equipment	• Equipment will be adequately and regularly maintained to enhance their efficiency. • Road will be monitored to ensure excessive dust is not emitted from surface • Stringent regulation is put in place to control speed limit • Educational	Continuously	Operational Manager

			awareness activities are conducted in communities along transport routes and for operators of heavy-duty equipment and log trucks.		
Offices and camp	Solid Waste	• Less requests by AKEWA personnel for medical service • Less incidence of infectious disease amongst population of riparian communities	• Ensure that septic tanks and pit latrines are constructed on firmed soil • The effectiveness of compacting of saw dust from saw mills to be used in local agricultural activities will be monitored. • Ensure that adequate and timely disposal of garbage are carried out	Continuously	Operational Manager

6.3 Contingency Plan

The contingency Plan (CP) of the AKEWA Company's timber harvesting and wood processing operations presented herein include strategies and actions to deal with specific variances to assumptions resulting in a particular state of affairs. It is intended to help the management recover from serious incidence in the minimum time with minimum cost and disruption. The CP defines responsibilities and procedures for unusual and unexpected state of affairs that may occur during the implementation of its harvesting and wood processing operations.

- Accident during felling operation even if all the cautions are taken, such as allocating felling areas radius equivalent to twice the length of the tree to be felled and prohibiting any other person beside the felling crew in the felling area; ensuring that the wearing of personnel protective equipment is done and the chainsaw have all the safety devices, an accident could occur at the felling site. These may include kick back from the tree being felled, felling of broken branch or widow maker on an individual. If such a situation arises, the affected person shall be taken immediately to the foreman of the felling operation who shall carry out a first aid treatment and further evacuate the individual to the nearest health center.

- Spillage of fuel. If there is a fuel/or spill at a log landing or on a hauling road, prompt action will be taken to contain the leakage or spillage and all combustible/ignition sources as running engines, likely to result in fire will be removed from the vicinity of the spill; anyone in the area will be advised to stay up wind direction of the spill.

- Absorbent material on the transport vehicle will be used to cover small spill. Larger spills will be contained by constructing break around the spill area to control run off to surface water.

- All soil impacted by the spill will be excavated from the spill area and disposed off in accordance with AKEWA Timber Company hazardous waste management procedure. All people downstream of the nearest river to the spill, the EPA, the MLME, the CFDC and the FDA will be advised of the discharge.

Logging activities increase risk of bush fire during dry season due to the introduction of flammable material and spark sources and the increase of dry organic residues accommodated during harvesting. Due to the flammable nature of raw materials and high levels of dust, wood processing plant sites may represent a fire hazard. Uncontrolled fire at wood processing plant and log landing may not only destroy the business but also causes significant damage to neighboring properties and habitat.

7.0 Conclusion and Recommendation

The AKEWA Beyan-Poye Community Forest Management Contract is situated in a degraded Forest land that is subject to huge anthropologic influence including shifting cultivation and understandable harvesting of biological resources. The population is in a state of abject poverty. The people obtain their drinking water from stream and creeks. There are no schools or medical facilities. More than 70% of the people are without any formal education.

In the wake of the above, AKEWA was granted license to harvest and remove the timber knowing that the process will contribute to the reduction of poverty in the area and the nation as a whole.

Timber harvesting has tremendous adverse effect on the environment i.e., it alters forest structure and composition, causes displacement and decline in wildlife population, it improves the hydrological system. Notwithstanding, it also has positive impacts, i.e. it improves the socio-economic situation of rural people by providing better means of communication, transportation, education and health services.

To maintain the integrity of the contract area including the physical, biological and human environment i.e to mitigate any negative environmental impact that could arise as the result of the operations of the AKEWA in its contract area, the management will pursue the environmental Statement. It is particularly recommended that:

- During the construction of the roads, vegetation clearing will not exceed 15m and that not more than 10km of new road is constructed.

- During the demarcation of block and stock survey activities, optimum care is exercised to avoid destruction of regeneration and poles of IUCN Red List of timber species.
- Trees of ecological importance be reserved and protected, especially when those that do not have exceptional timber value.
- There are no more than 5 log landings, each of which be not more than 0.1ha (40m by 25m) and placed not less than 50m away from a water body.
- All vehicles be regularly serviced to maximized their fuel combustion capacity and minimized their fuel combustion capacity and to reduce the commission of sulfate, nitrate and particulate matters into the air.
- Stringent regulation on vehicular speed is put into place to minimize the risk of accident and dust emission during the transport of personnel and goods including logs.
- Double walls above ground storage tanks are to be used for its petroleum products and all latrines septic tank be constructed on firmed soil, to minimize the risks of underground water pollution.
- Communities inform the AKEWA Supervisor of the sacred places of the communities in order to avoid their desecration.
- Socio-economic parameters of the local communities' safe drinking water, health services, education, and employment are given optimum consideration.

- Maximum care is exercised to avoid destruction of tree crops (rubber, cocoa, coffee, etc.) established within the contract area.
- Ambient working conditions including wearing of suitable protective gadgets by workers regulated and enforced.

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Appendix I
Map showing AKEWA- Margibi Concession

Appendix II

Concerns of The affected Communities

Within the Concession

Appendix IV

Photos of some areas within Beyan-Poye Community Forest Management Contract (CFMC)

Appendix V

Resume of Individual Performing the Environmental & Social Impact Assessment (ESIA)

Chowolo, Dickson Joe

BIODATA

Name : Chowolo, Dickson Joe

Place of Birth : Tawarken, Tuobo, River Gee County

Marital Status : Married (licensed)

Nationality : Liberian

QUALIFICATION

A. EDUCATION

B.Sc. : General Forestry, 1998, College of Agriculture& Forestry, University of Liberia

Post Diploma : Forest Management, 1988 -1989
Cyprus Forestry College
Republic of Cyprus

Diploma : General Forestry, 1979,
Union Forestry Training Institute
Mano River Union, Liberia

OTHER

1. EIA Evaluator Licensure, Environmental Protection Agency, Liberia - May 2007

2. EIA Evaluator Licensure, Environmental Protection Agency, Liberia - June 2009

WORKING EXPERIENCE

Oct., 2004 – present	:	Executive Director, Forest Cry Liberia, Inc., Private Consultant, Environmental Impact Assessment
Achievement	:	Displace camps rehabilitation (Salala, Maimu, E. J. Yancy, Brewerville, VOA, etc), EMP Island Hospital Waste water extension, Chen Compound, EIS For Tarpeh Timber Company and Liberia Tree Trading Company.
2000 – 2001	:	Divisional Superintendent (Contract) Firestone Plantation Company Margibi County, Liberia
1979	:	Forest Ranger (Plantation Establishment, Forest Research);Supervising Ranger (Urban Forestry) Coordinator, Urban Forestry

Zwuen, Sormongar Sarday

BIODATA

Name	:	Zwuen, Sormongar Sarday
Place of Birth	:	District #1, Grand Bassa County, Liberia
Marital Status	:	Married
Religion	:	Christianity (Baptist)
Nationality	:	Liberian

QUALIFICATION

A. Academic Qualification

1. Graduate Certificate: Research Methods in Forestry 1987
   Oxford Forestry Institute, University of Oxford, U.K.

2. M.Sc. Degree: Forestry (Silviculture and Forestry Influence), 1985
   College of Forestry, University of the Philippines at
   Los Banos (UPLB)

3. B.Sc.: General Forestry, 1980 College of Agriculture and
   Forestry, University of Liberia

B. Other Achievements

1. EIA Evaluator Licensure, Environmental Protection Agency, Liberia May 2007

2. EIA Evaluator Licensure, Environmental Protection Agency, Liberia - June 2009

WORKING EXPERIENCE

A. **POSITION**
Private Consultant, Environmental Impact Assessment, Monrovia, Liberia

January 2008- Present

Achievement

- Prepared Environmental Management Plan for Chen Guangzen Civil Engineering Compound

  CongoTown, Monrovia, Liberia

  August 2008

- Prepare Environmental Impact Statement for Tarpeh Timber Company's Timber Sale Contract

  District #1 Grand Bassa County, Liberia, October 2008

- Prepare Environmental Statement for Liberia Tree and Trading Company's Forest Management Contract
  River Cess County, Liberia

B. **POSITION**

Manager, Environmental Protection and Urban Rehabilitation, Forestry Development authority,

June 2004 – November 30, 2006

Achievement

- Conduct National Reconnaissance survey for the preparation of the National forestry Policy
- Prepared the National Forestry Policy
- Conducted Rapid Assessment Program (RAP) along with international Scientists in Biological Diversity Science

C. **POSITION**

National Consultant, National biodiversity Strategy Action Plan Protect, United Nation Development Program October 2003 – March 2004

Achievement

- Development of National Mission and Vision Statement;
- Development of Goals and Objectives and preparation of strategic actions and programs

D. **POSITION**

Assistant Professor, Forest Research Methods, Mensuration and Inventory, College of Agriculture and Forestry, University of Liberia; October 2001 to present

Achievement

- Conduct Lectures and practical exercises and provide guidance to students;
- Prepare and implement forest research projects of the Department of General Forestry.

E. **POSITION**

Sectional Heads, Forestry Research, Forestry Development Authority,

July 2000 – June 2004

Achievement

- Developed and established the first network of Bio-Monitoring program in the Sapo National Park;

- Conducted biological surveys of four proposed National Park

F. **POSITION**
Research Consultant, Society for the development of Forestry Plantation,

Ivory Coast, May 1, 1991 – April 30, 2000

Achievement

- Conducted growth studies in natural Forestry and Plantation Eastern Cote D'Ivoire under a GTZ/Ivoire Forest Management Project

G. **POSITION**
Senior Research Officer/South East Liberia, Forestry Development

Authority, April 1986 – June3 1990

Achievement

- Established continue Forest Inventory Plots in Natural and Plantation Forest in Southern Liberia

References:

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Morlee Mendscole

Acting Dean

College of Agriculture and Forestry

University of Liberia

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Robert D. Boakai, Snr.

NAME	**Robert D. Boakai Snr.**
Address	Area F, Hs. # 34
	Barnesville Estate, MontserradoCounty
	Monrovia-Liberia
E-mail	rdboakai1@yahoo.com
Contact	+2316551127
NATIONALITY	Liberian

Age	43yrs
MARITAL STATUS	Married with five Children

EDUCATIONAL BACKGROUND

2010	BSc Degree, Civil Engineering Stella Marie Polytechnic Catholic Mission Monrovia, Liberia
1984	Certificate; Aircraft Mechanic Israel Aircraft Industry Ben-Gurion Airport, Israel
1980 - 1983	Associate Degree in Mechanical Engineering Technology in Applied Science, Harper, Maryland County

WORKING EXPERIENCE

2006 Feb- June	Operations and Maintenance Manager P A E- Team Darfur Darfur, Sudan
2001-2005	Safety Health & Environment/Operations Superintendent

	Mobil Oil Liberia, now Total Liberia Inc.
	Bushrod Island, Monrovia
1999-2001	Environmental Health &Safety/Terminal
	Superintendent
	Mobil Oil Liberia
	Bushrod Island, Monrovia
1998-1999	Aviation Supervisor
	Mobil Oil Liberia
	Bushrod Island, Monrovia
1986-1995	Generator Mechanic
	Liberia Electricity Corporation
	Bushrod Island, Monrovia
1984-1985	Aircraft Mechanic
	Air Liberia
	James Springs Payne Airport
	Monrovia, Liberia

YEAR	**TRAINING/WORKSHOP DESCRIPTION ATTENDED**	**VENUE**
2009 June	E I A Evaluator Licensure	**Environmental Protection Agency**

		Monrovia, Liberia
2004	Tank Entry Training	**Exxon Mobil**
		Dakar, Senegal
2004	Smith Defensive Driving Training	**Exxon Mobil**
		Monrovia, Liberia
2004	Permit to work	**Exxon Mobil**
		Monrovia, Liberia
2004	First Aid Training	**Exxon Mobil,**
		Monrovia, Liberia
2004	Fire Drill Training	**Exxon Mobil**
		Monrovia,
		Liberia
2003	Work Control Training	**Exxon Mobil**
		Accra, Ghana
2002	CS Fleet Road show	**Exxon Mobil**
		Abidjan
		Cote D'Ivoire
2002	Product Control Manual Training (PCM)	**Exxon Mobil**
		Accra, Ghana
2002	Product Control Manual Training (PCM)	**Exxon Mobil**
		Abidjan, La
		Cote de' Ivories
2002	Fleet Row show OIMS- CS	**Exxon Mobil**
		Abidjan, La

		Cote de' ivories
2001	Defensive Driving (Smith Systems)	**Exxon Mobil Monrovia, Liberia**
2000	Operations Integrity Management Systems Training	**Exxon Mobil Abidjan, La Cote de' Ivories**
2000	Operations Integrity Management Systems Training	**Exxon Mobil Abidjan, Cote de' Ivories**
2000	Delegation of Authority Guide Training	**Mobil Liberia Monrovia, Liberia**
2000	Defensive Driving	**Mobil Liberia Monrovia, Liberia**
1999	Aviation operations workshop	**Mobil Senegal Dakar, Senegal**
1999	Environmental Health and Safety Training (EHS)	**Mobil Ghana Accra, Ghana**
1998	EHS-Basic Fuels/Lubes Operations	**Mobil Egypt, Cairo, Egypt**