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CHAD/CAMEROON
PETROLEUM DEVELOPMENT AND PIPELINE PROJECT
ENVIRONMENTAL ASSESSMENT REPORT, MANAGEMENT AND
RESETTLEMENT PLAN SUMMARIES

1. Attached are (i) the Executive Summary for the Environmental Assessment Report, Chad portion; (ii) the Executive Summary for the Environmental Assessment Report, Cameroon portion; (iii) the Executive Summary/Overview for the Environmental Management Plan, Chad portion; (iv) the Executive Summary/Overview for the Environmental Management Plan, Cameroon portion; and (v) the Executive Summary/Introduction for the Resettlement Plan for the Chad portion (no resettlement is foreseen in Cameroon). The proposed project involves the development of three oil fields located at Doba in southern Chad, and the construction of a 1050 km buried pipeline to Cameroon's Atlantic coast and offshore off-loading facilities, including a moored tanker.
2. The assessment reports and management and resettlement plans were prepared by Esso Exploration and Production Chad Inc. (a subsidiary of the Exxon Corporation), the project implementing agency, in conjunction with the two borrowing countries, Chad and Cameroon. Circulation of these documents does not signify evaluation or endorsement by the Bank. These reports are subject to review and possible change before or during the appraisal process. Further studies will be undertaken which may significantly alter certain elements of project design. We expect to receive supplements and will distribute the summaries to the Board once available.
3. Questions may be referred to Mr. Benoit, ext. 81779, and Mr. Layec, Ext. 33231. The full reports and plans are also available from them, upon request.

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ENVIRONMENTAL

CHAD PORTION

ASSESSMENT - EXECUTIVE SUMMARY

Chad Export Project



ESSO Exploration and Production Chad Inc.

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION AND BACKGROUND

The objective of the Chad Export Project is to produce, transport, and sell oil from three oil fields in the Doba Basin of southern Chad (Komé, Miandoum, and Bolobo) to world markets in a manner compatible with the balanced environmental and economic needs of the people of Chad.

The proposed project includes the oil field development in Chad, and a pipeline transportation system originating in Chad that traverses Cameroon, including a marine terminal facility off the coast of Cameroon (Figures 1-1 and 1-2). This environmental assessment (EA) addresses the Chad portion of the project, including:

- Approximately 300 production wells and 20 water reinjection wells in the oil field development area
- A gathering system to transport produced fluids within the oil field development area
- A Central Treating Facility (CTF) in the oil field development area to produce export quality oil
- An Operations Center, consisting of the CTF, an airstrip, housing for 100 personnel, and a (100 MW) power plant to serve project needs
- A pipeline transportation system (including the pipeline and the pump station), 170 km long in Chad, contiguous with an 880 km pipeline transportation system in Cameroon
- Various infrastructure facilities and upgrades, including temporary storage areas, road system improvements, a satellite-based communications system, and an administrative office in N'Djamena, Chad.

The project is being considered by a consortium comprised of Esso Exploration and Production Chad, Inc., Société Shell Tchadienne de Recherche et d'Exploitation, and Elf Hydrocarbures Tchad (the Consortium). Esso will act as Operator for the oil field development. A pipeline transportation company, Tchad Oil Transportation Company (TOTCO) will be formed to operate the pipeline transportation system in Chad with equity participation of the Consortium and the Republic of Chad.

This EA has been prepared to meet the requirements of the project and to support funding applications from the Government of Chad to the World Bank and from TOTCO to the International Finance Corporation ([IFC] the private sector lending agency of the World Bank), international lending agencies, and export credit agencies. The EA responds to World Bank guidelines and Operational Directives and addresses project impacts on the

human, biological, and physical environments. A separate EA has been prepared with respect to the Cameroon portion of the project.

Expert and independent environmental advice has been an integral part of the preliminary engineering of the project, reflecting a key project development strategy of minimizing the adverse environmental impacts of the project by the early recognition and, where possible, avoidance of sensitive issues. Environmental and socioeconomic inputs to project development and preparation of the EA have been the responsibility of an international consulting firm with extensive experience in the environmental assessment of complex projects, utilizing an array of specialist organizations and individuals, including Chadians, as subconsultants. Consultations with affected groups, including the local population, nongovernmental organizations (NGOs), and relevant government ministries and agencies, have been undertaken and will continue throughout project development.

Both beneficial and adverse impacts are recognized in the EA. Mitigation strategies have been developed to address all significant adverse impacts.

1.2 PROJECT DESCRIPTION

The Chad Export Project is being engineered to avoid incidents that would cause adverse environmental impacts by the appropriate design, construction, operation, monitoring and maintenance of project facilities and the operation of a comprehensive program for safety and environmental protection. This program will ensure regulatory compliance; provide appropriate health, safety and personnel training; and ensure that project-generated wastes are reduced where possible and appropriately handled, treated and disposed of, where necessary.

The project will be managed with the goal of preventing incidents that potentially cause adverse environmental or social impacts. Comprehensive risk assessments will be conducted throughout the design, construction, and operation of the project to reduce risk and mitigate the consequences of safety, health, and environmental incidents. Recognizing that accidents may occur, project policy will be to respond quickly and effectively to incidents resulting from operations while cooperating with industry organizations and authorized government agencies. Emergency response plans will be developed prior to startup and operation of the project to ensure that adequate resources are available in the event that an incident, such as an oil spill, should occur.

During project operations, oil, water, and limited gas will be produced by submersible electric pumps from wells in the three fields. These fluids will be transported by a gathering system to the CTF, where the gas will be used to satisfy a portion of the project's fuel needs for the generation of electricity. The water will be disposed of by pumping to the oil-producing horizons below ground, and the oil transferred to the pipeline transportation system. In addition to the CTF, the Operations Center includes a power plant to serve project needs, Pump Station Number 1, housing for 100 single status expatriate personnel, an airstrip, and various other facilities.

A major project component is a pipeline transportation system. This includes the pipeline and Pump Station No.1. The pipeline itself will be 760 mm in diameter and buried throughout its length generally with a minimum of one meter of cover. Cover will be increased for road crossings and other sensitive areas and reduced to a minimum of 0.5 m in rocky areas. The pipe will be protected with a corrosion protection coating and cathodic protection. Isolation valves will be installed at intervals for operational purposes and to minimize environmental impact in case of leaks. A combination of leak detection methods will be utilized for the pipeline leak detection system. The leak detection system will be fully automated and manned 24 hours a day.

Other project facilities include an administrative office in N'Djamena, a satellite-based communications system, upgrades to approximately 170 km of existing roads, and the construction of approximately 30 km of new road.

Construction of the proposed project facilities would result in a temporary change of land use for approximately 960 ha of land during construction in the oil field development area and a permanent land use change for another 920 ha of land for the life of the project.

Pipeline construction would involve the temporary clearing of a strip of land about 30 m wide along the pipeline route; digging a ditch to accommodate the pipeline; transporting and stringing pipe along the length of the route; welding the pipe; installing the pipe in the trench; backfilling the trench; and rehabilitating the cleared area along the pipeline route. Upon completion of pipeline installation, the area along the pipeline route will be returned to its prior use except for a 10 to 15 m wide area for maintenance and emergency response access that will be kept cleared of buildings and heavy vegetation but could be used for grazing or cropping.

Project construction would take place over 3.5 years and would involve a peak work force in Chad of approximately 4,000, of whom up to 60 percent are expected to be Chadian

nationals. During the nominal 30 year life of the project, up to 550 personnel (approximately 70 percent contractors) would be required in Chad. An aggressive plan to hire and train nationals and to replace expatriate personnel to meet these goals will be instituted as operations progress.

1.3 PROJECT ALTERNATIVES

A number of alternatives were identified and considered in development of the envisioned project, including:

- **Alternative Oil Development Scenarios in Chad**—The proposed development of crude oil from the Doba Basin was determined to be the most economically feasible option when compared to the alternatives of developing oil from the Doba and Doséo basins or the alternative of developing oil from the Doba, Doséo and Lake Chad basins.
- **Project Transportation Alternatives**—Principal transportation needs will be met by ocean shipping of cargo to ports in Cameroon, from where shipments to Chad will be via the Cameroon rail network and upgraded roads in both Chad and Cameroon, with limited use of air freight flights to the project airfield at Komé. Of the various road alternatives in Chad considered for upgrading, the selected alternative of constructing a bridge over the Mbéré River and upgrading existing roads (with limited new road construction) close to the pipeline route was found to be the most cost effective and environmentally preferred.
- **Alternatives to Pipeline Transport of Produced Crude Oil**—Alternatives such as various combinations of trucking, rail, road, river, and small diameter pipeline transportation of crude oil have been considered. The determination has been that the development of a pipeline transportation system from the Doba Basin directly to the Cameroon coast for subsequent export by tanker is the only feasible alternative to export the volumes of oil necessary to maintain the project's economic viability.
- **Alternative Pipeline and Facility Sitings**—The selected locations and routes were assessed to be the most economical and to be technically and environmentally acceptable. Individual field facilities have been sited to minimize costs and limit impacts to sensitive resources such as villages, water resources, and known transhumant corridors. Criteria considered in evaluating corridor alternatives included avoidance of certain features such as:
 - Areas of high priority for protection or exclusion by the government and other organizations
 - Parks, reserves, and other areas of importance
 - Villages, related structures, and areas inhabited by indigenous peoples.

Other criteria including landforms, infrastructure, and development were evaluated to identify preferred areas for pipeline routing, such as existing infrastructure, access routes, and disturbed areas.

- **Well Clustering Development**—Alternative well configurations and layouts have been assessed, including the use of vertical and deviated (including extended reach) wells. While the use of deviated wells would permit the grouping of more than one wellhead at some well locations, there are significant technical and economic difficulties associated with deviated well drilling in the project oil fields, and current project planning calls for the drilling of vertical wells. New technologies will continue to be reviewed to assess whether deviated well drilling becomes economically feasible in the future.
- **Discharge of Produced Water to Surface Drainages**—The alternative of surface discharge of produced water was considered and eliminated. This was due to the high costs associated with the likely need for treatment of large volumes of water to stringent water quality standards, the implementation of a comprehensive monitoring program, and the significant changes that would ensue to riverine ecosystems and flow regimes. Produced water will be returned to the producing horizons through reinjection wells. These wells will be designed using corrosion prevention measures and using tubing by casing isolation packers to maintain wellbore integrity to protect shallow groundwater aquifers. The quality of the reinjected water will be managed so as to protect deep groundwater resources.
- **The No Project Alternative**—Should the project not be developed, the benefits to Chad realized by local employment, increased government revenues, improved infrastructure, and enhanced business opportunities, would not occur, nor would the potential adverse impacts of the project. As indicated in the environmental economic analysis conducted for the project, the project has been shown to be of net positive benefit to Chad. The no project alternative would be detrimental to the country.
- **The Proposed Project**—The proposed project is the basis for project development and is fully described in this EA.

1.4 LEGISLATIVE, REGULATORY AND POLICY CONSIDERATIONS

It is established policy to comply with all applicable laws and regulations. The principal legislative and regulatory considerations to which the project will be subject are those of the Republic of Chad. The project also will be developed in compliance with various international treaties and World Bank guidelines. Where no appropriate legislation, regulations, or guidelines exist, the project will adopt international industry standards.

Relevant Chadian legislation includes:

- The Forest Code (addressing protection, conservation, enhancement and use of forests, botanical resources, terrestrial fauna, aquatic resources and fisheries, and identifying plant and animal species protected under Chadian law)
- The Water Code (regulating the use of all surface waters and groundwaters)
- Laws (numbers 23, 24, and 25) addressing land tenure; defining property owned by the state and property classified as public domain; the rules for the registration of private land; and the rules for the expropriation of land in cases that benefit the general public
- An ordinance (number 7) providing regulations and guidelines for oil and natural gas exploration, production, and transport.

Relevant World Bank policies and guidelines will be complied with including:

- World Bank Environmental and Occupational Health and Safety Guidelines
- World Bank policy on social issues (including Operational Directives on Indigenous Peoples and Involuntary Resettlement)
- IFC Environmental Analysis and Review of Projects
- World Bank Environment, Health and Safety Guidelines for Onshore Oil and Gas Development.

1.5 ENVIRONMENTAL SETTING

Human Environment

The project area lies in the southwest of Chad, a country with a population of 6 million and a Gross National Product per capita of about U.S.\$180 per annum. In Chad's economy, agriculture comprises 83 percent of the labor force, industry 4 percent, and services 13 percent.

The project will be located wholly within the prefecture of Logone Oriental (population 440,000), although the peri-urban population of 120,000 around the major regional center of Moundou in the prefecture of Logone Occidental will also be impacted. The oil field area had a population of approximately 28,100 in 1993, in the cantons of Béro, Komé, and Miandoum. The cantons of Timbéri, Gadjibian, Bessao, Mont de Lam, and Mbassay will be impacted by the pipeline transportation system and the upgraded infrastructure required for the project. Those cantons have a total population of about 63,000. The rural populations primarily engage in subsistence agriculture. Currently, the population density of the area is

increasing, and the traditional cycles of cultivation and fallow are becoming shorter. This results in decreasing fertility of the already poor soils, which itself leads to still shorter periods of fallow, and the conversion of more bush land to agriculture. Moreover, the traditional farming system in southern Chad integrates the bush as an active part of its productive system--the bush provides significant resources to the population and becomes diminished as the cycle of shorter fallows and conversion of bushland continues. Studies conducted for the EA estimated that without the proposed project, all village land in the project area would be under cultivation within 30 years.

The region has been characterized by civil strife and instability since precolonial times, and periodic civil disruption has inhibited economic growth. Most recently, Chad suffered civil war from the mid-1970s to the mid-1980s, and although the national government reestablished control in the project area in 1982, major hostilities continued until 1985, and occasional civil disruptions have occurred in recent years.

Civil unrest has had adverse impacts on the educational system in the project area, and although the local population is educationally motivated, difficulties result from a lack of resources such as buildings, educational materials, and the periodic non-payment of teachers' wages.

With the negotiation in 1996 of a peace agreement between the government and the rebels most active in the region, much desired stability has returned to the area.

The population of the project area is primarily Christian in religious belief, although animism is also widely practiced. The population in the center and north of Chad is predominantly Muslim, and Muslim herders regularly interact (and sometimes conflict) with the sedentary Christian population.

Relatively widespread animist beliefs are reflected in the presence of sacred sites in the project area. Such sites are not readily identifiable by outsiders and may constitute objects (which may be relocated) or landscape features (which are usually immovable).

Because of the almost total reliance of the local population on subsistence agriculture, land use and land tenure are critical issues, particularly in the oil field development area. National law in Chad is that all land belongs to the state unless the state confers ownership. Customary rights are recognized and may be enforceable within the community where they are exercised unless in direct conflict with written law or against public policy. Customary

rights arising from land use apply to cultivated land, uncultivated land (fallow or bush), rights over forest land, rights to water, and religious sites.

Biological Resources

Vegetation of the project area consists primarily of wooded savanna, most of which has been heavily grazed, cultivated for cotton and subsistence crops, or is in various stages of fallow. Some gallery forests (forests along water courses in areas otherwise largely devoid of dense stands of trees) and floodplain wetlands are present and are important resources for seasonal agriculture and grazing.

Wildlife resources in the project area have suffered from extensive hunting and poaching, which has been particularly severe because the civil unrest of the past two decades has introduced many automatic weapons to the area and reduced law enforcement activities. Similarly, fishing in the area has been adversely affected by over exploitation, drought, the conversion of floodplains to grazing and agriculture, and the disruption of aquatic ecosystems by the elimination of large animals such as the crocodile and hippopotamus. Some mammal species whose status is considered sensitive on the regional scale have the potential to occur in the project area (including a number of antelope species and the elephant), as well as a recently discovered bird species, the River Prinia. However, the project is not expected to have a significantly adverse effect on the wildlife of the project area.

Several areas of biological significance, such as designated and proposed reserves and areas containing important biological resources and sensitive habitats, occur near the project area, including:

- Timbéri Forest Reserve
- Laramanay Reserve
- Logone floodplain
- Areas of bamboo.

As a result of early recognition and avoidance of such areas, none are expected to be impacted by the project.

Water Resources

The water resources of the project area are of great importance at the local, regional, and national levels. Surface drainages eventually discharge to the Logone River, which joins the Chari River at N'Djamena, the national capital. The Chari discharges into Lake Chad.

Most of the population in the project area obtains drinking water from hand-dug (and some drilled) wells which exploit the shallow aquifers of the Doba Basin, although some surface waters are also utilized. Groundwaters of the basin are considered to be unconfined and subject to substantial flow from recharge areas to the south of the project area to discharge areas to the north.

Because of the importance of water resources in the project area locally, regionally, and nationally, the project has been and will continue to be designed and developed to minimize risks of water pollution by incorporating measures such as disposing of produced water back into the oil reservoir.

Topography and Soils

The topography of the Doba Basin is generally flat with no distinct physical features. To the southwest the terrain becomes first rolling and then hilly towards the Cameroon border, although the hills tend to be isolated and have been avoided in pipeline route selection. Soils of the Doba Basin are sandy with scattered occurrences of laterite. Soils to the southwest, underlain by shallow bedrock, are more varied and more readily erodible.

Meteorology and Air Quality

The climate of the project area is dominated by a hot dry season which extends from November to May and a cooler wet season. The annual rainfall ranges from 1,000 mm in the north to 1,300 mm in the south. Because of the lack of industrial development and the low usage level of other potential sources of atmospheric pollutants (such as motor vehicles), the only significant contribution to air pollution in the project area is considered to be particulate matter from agricultural activities (dust and smoke from agricultural burning) and from dust storms.

Public Health

Chad, in common with most of sub-Saharan Africa, is characterized in public health terms by high rates of fertility, mortality, malnutrition, and infectious diseases. Important person-to-person infectious diseases include: acute respiratory infections; meningitis; and tuberculosis. Food, water and soil borne infectious diseases include: schistosomiasis; cholera; and food-borne illnesses such as salmonellosis and hepatitis A. Insect vector infectious diseases include: malaria; onchocerciasis; leishmaniasis; trypanosomiasis; and yellow fever. Animal borne infectious diseases and emerging diseases include: rabies; brucellosis; and antibiotic resistant strains of a variety of diseases such as malaria, cholera, dysentery and pneumonia. Sexually transmitted diseases, AIDS and Hepatitis B/C represent a serious and growing problem in Chad, exemplified by the quintupling of the reported annual incidence of AIDS over the five years to 1995.

Oil Exploration Activities

The environmental setting for the project has been modified by the effects of past exploration activities in the project area. These include the clearing of seismic survey lines, the drilling of a number of exploration wells, and the construction of various infrastructure items such as roads, airstrips, and camps. These past exploration activities were the subject of an environmental audit which found no serious threats to the environment.

1.6 ENVIRONMENTAL IMPACTS AND MITIGATIONS

The potential impacts of the proposed project have been classified into four categories:

- Beneficial
- Less than significant
- Significant but mitigable
- Significant and unavoidable.

Environmental Economic Impacts

World Bank guidelines advise that environmental costs and benefits should be quantified to the extent possible and economic values attached, if feasible. Economic values of impacts in the following nine major categories were estimated:

- Agriculture

- Forestry and bush products
- Livestock
- Petroleum production
- Job search
- Housing
- Health
- Transportation
- Multi-industry (multiplier) impacts.

Most cost categories are determined by changing current land use to uses related to petroleum production. Most benefit categories are determined by infrastructure investments and direct and indirect revenue flows.

The aggregate present value of the estimated impacts to Chad over the life of the project is a range of positive net benefits between 237 and 629 billion FCFA (U.S.\$0.47 to 1.3 billion). Consistent with World Bank guidelines, the environmental economic impact analysis indicates that after taking into account estimates of environmental costs and benefits, the proposed project is a net positive benefit to Chad.

Beneficial Impacts

A variety of significant beneficial impacts will result from development and operation of the proposed project. Plans are being developed to focus benefits, such as employment and purchasing of goods and services, on groups and communities that would be in the vicinity of the project. The proposed project will also provide substantial financial revenues to the Government of Chad from royalty payments. The Government of Chad recognizes that these benefits will need to be equitably and effectively distributed by mechanisms such as: the financing of devolved Decentralized Territorial Communities from proceeds generated from the exploitation of subterranean resources in their territory; the continuation of a range of projects designed to address weaknesses in the Chadian administration associated with revenue collection, expenditure, and economic policy formulation; and the implementation of measures to ameliorate the negative impacts of the sharp and sudden rise in government revenues. Other benefits include:

- Provision of employment to Chad nationals during project construction
- Long-term employment of Chad nationals during project operations
- Provision of training for the Chad project work force
- Purchases for the project of locally sourced goods and services

- An increase in the overall level of economic activity in Chad as a result of project development and operations
- Upgrades to and maintenance of roads and other infrastructure needed for the project
- Upgrade of environmental health and infrastructure, particularly water, sanitation, and housing
- Increased disease surveillance and treatment for both vector-borne and sexually transmitted diseases.

Minimization of Adverse Impacts

The early and extensive integration of environmental inputs to the preliminary engineering of the project has resulted in the avoidance of many potentially significant adverse impacts and the reduction of many others to less-than-significant levels. It has also resulted in the incorporation of project design measures into the project which prevent or minimize adverse environmental effects.

Examples of impact avoidance by the integration of environmental inputs and incorporation of project design measures include:

- Pipeline corridor and route selection to identify and, where feasible, avoid potentially sensitive resources and locations
- Use of existing infrastructure and disturbed areas for facility siting and pipeline routing
- Early identification of environmental and socioeconomic issues
- Review of the Terms of Reference for the EA with the Government of Chad and the World Bank
- Consideration of environmental effects in the analysis of project alternatives such as the disposal of produced water
- Incorporation of drainage, erosion, and sedimentation control measures to protect water resources
- Preferential use of freshwater-based drilling muds
- Adoption of a well casing design to protect shallow groundwater resources
- Incorporation of an Occupational Health and Safety program
- Incorporation of sanitation, housing, vector-control, food and water supply, and workplace safety guidelines for the project
- Avoidance and minimization of potential waste management impacts by the early development of an integrated project waste management strategy and incorporation of a Waste Management Plan

- Development and implementation of a consultation and participation process with NGOs and local peoples that allowed for the identification of issues significant to the affected population.

Those impacts considered to be significant but mitigable or less than significant with implementation of a project design measure are listed in Table 1-1, as are the design measures and mitigations. Three issues predominate in Chad: potential impacts on the human environment, water resources, and public health.

Human Environment Impacts and Mitigations

- Changes in existing uses of land as a result of the project have the potential to result in isolated instances of displacement of the local population. Project development activities have included a variety of measures designed to minimize the necessity for displacement. While the exact numbers of people that would require resettlement cannot be determined at this stage of project planning, it is anticipated to be in the range of 60 to 150 households. A larger (as yet undetermined) number of households would be impacted at a level that would not require resettlement but would necessitate some form of compensation, for example, as a result of temporary changes in land use during construction. Mitigation for these impacts is the development and implementation of a comprehensive compensation plan which will include a resettlement plan to satisfy Government of Chad legislative requirements and World Bank Operational Directive 4.30, *Involuntary Resettlement*, and will involve compensation mechanisms such as: cash payments and in-kind replacements to compensate for short-term crop losses; technical assistance to improve agricultural productivity; direct assistance (in the form of land, building materials, etc.) to help displaced residents re-establish themselves; and community level compensation.
- The beneficial impact of employment generation has the potential to be reduced by the perception of inequitable distribution of jobs. Mitigation for this will be the implementation of a recruitment and training plan that will be based on matching the numbers and skills of workers with project employment needs in a cost-effective manner maximizing socioeconomic benefits to the project area. The plan will emphasize employment among impacted villages in the vicinity of the project. The recruitment process will be conducted in an open (transparent) manner to demonstrate fairness.
- Inflationary effects on area residents and the development of a boom-bust syndrome are potential negative aspects of another beneficial impact of the project (the generation of

local business opportunities) and will be mitigated by the development of a process to distribute project purchases across a broad geographic area and to more than one supplier.

- The potential disruption of transhumant movements during the project construction period will be mitigated by consultation with nomadic group leaders and others such as veterinarians and village residents to provide adequate advance notice of project activities so that appropriate temporary adjustments to traditional migratory routes can be made.

Water Resources Impacts and Mitigations

- The impact of increased peak flows in the vicinity of cleared areas on sedimentation and erosion in minor water courses will be mitigated by the implementation of erosion control plans and design of appropriate drainage systems.
- Potential disruption to existing water supply wells from the development of project water supplies will be mitigated by locating project wells so that they do not interfere with village wells. In the event impacts do occur, alternative water supplies will be provided to impacted villages.
- Impacts on water quality will be mitigated by a variety of measures, including: treatment of sanitary wastewaters to World Bank effluent guidelines, reinjection of produced water to the oil-producing horizons from which it originates, and implementation of erosion and sedimentation control plans.
- Comprehensive risk assessments will be undertaken, and the potential effects of oil spills will be mitigated by incorporation of a variety of measures to prevent spills from occurring. The development of emergency response and spill control plans with the associated commitment of training, equipment, and infrastructure will mitigate impacts of any spill of fuels, chemicals, or oil in either the construction or operations phases.

Public Health

The project would affect six environmental health areas:

- Respiratory disease
- Vector-related disease

- Sexually transmitted disease
- Water and food-borne disease
- Accidents and injuries
- Exposure to potentially hazardous materials.

Associated environmental health impacts occur in four subsectors:

- Housing
- Transportation
- Water and sanitation
- Telecommunications.

Impacts arising from the linkage between the affected environmental health areas and the four project subsectors would be mitigated by a series of project design measures, Government of Chad public health strategies, and community outreach programs. These mitigation measures and programs build upon the inherent link between health outcome and infrastructure improvements in housing, transportation, and water supply and sanitation. Public health impacts are of greatest concern during construction of the project due to the influx of construction workers.

1.7 CONSULTATION WITH AFFECTED GROUPS

Business will be conducted in a manner that is compatible with the balanced environmental and economic needs of the community, including communication with the public on environmental matters. A program to effect consultation, coordination, and interaction with affected groups, NGOs, and government agencies has been developed and it includes:

- Identifying relevant government ministries and NGOs
- Canvassing key issues during preparation of the EA Terms of Reference
- Conducting fact-finding meetings in major regional towns
- Reviewing the TOR with the Chad government and the World Bank
- Consulting relevant ministries, NGOs, and groups within affected communities during EA development
- Reviewing the draft EA with government ministries
- Reviewing the draft EA with NGOs and the communities.

EA consultation, coordination, and in-country fact-finding meetings have been conducted in English, French, and local languages since November 1993. This has included government

officials, NGOs, and affected groups in N'Djamena and near the pipeline route and project facilities. Information has been gathered directly or indirectly by allowing these entities to provide information of direct interest or concern to them. This approach, conducted during initial project planning, encouraged participants to contribute freely when project plans were still at an early stage of definition. This was followed (beginning in 1995) by significant communication and consultation with affected communities and NGOs during the human environment field program. This program was conducted by a team experienced in conducting field work in the project area and using local languages. A wide geographic area, including the entire administrative region around the production facilities, was surveyed.

In all, more than 600 questionnaires for individual local inhabitants have been collected, and in excess of 10,000 persons have had the opportunity to be consulted at pre-announced meetings in more than 50 project-area villages. In addition, more than 20 NGOs have been consulted, some at more than one location within Chad, and more than 10 NGOs with an interest in Chad have been consulted internationally.

Key issues identified in the consultation process leading up to EA development are related to land use, compensation, employment opportunities, and water resources. Specifically, accessing land and determining land ownership have been identified as areas of concern. Additionally, the hiring process and compensation in terms of openness and fairness is also of significant interest to the population. The project has been developed to address these issues. For example, project land requirements will be minimized to the extent feasible, a comprehensive compensation plan is being developed and implemented, a plan is under formulation to ensure equitable employment practices are adopted, and project design and mitigation measures will minimize impacts to water resources.

Continuing consultation is planned beyond finalization of the EA. This is an important component of the project to integrate public opinion and to promote understanding of potential impacts and proposed mitigation measures.

1.8 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING SYSTEM

The project is committed to conduct its operations in compliance with applicable laws and regulations and to design, construct, and operate project facilities to high standards. An Environmental Management Plan (EMP) is under development that will describe measures and actions that are planned to be undertaken during the design, construction, operation, and decommissioning of the project to eliminate or reduce key impacts to acceptable levels.

In order to accomplish this goal and function as an implementation plan for the project's environmental management actions, the EMP will:

- Denote the project's key biophysical, socioeconomic, and health topics and their associated issues/impacts
- Provide summaries of specific biophysical, socioeconomic, and health-related issues/impacts mitigation and monitoring actions planned for the Chad portion of the project
- Define and discuss the roles and responsibilities of the key project participants (i.e., the Consortium's designated operator, Esso; TOTCO; and the Government of Chad)
- Outline project and government oversight organizations as they relate to environmental matters
- Summarize the costs associated with these environmental oversight organizations
- Provide a milestone schedule that features important environmentally-related milestone linkages to project execution
- Introduce environmental management tools that are envisioned for the project and key activities/studies that will assist in the crafting of these tools.

The EMP will contain those measures to which Esso, as the Consortium Operator, TOTCO, and the Republic of Chad are committed to undertake.

1.9 CONCLUSIONS

The Chad Export Project is incorporating environmental inputs in all phases of project development. The early recognition of environmental issues and incorporation of project design measures which prevent or minimize adverse environmental effects has avoided many prospective adverse impacts and allowed others to be reduced to less-than-significant levels. Consequently, substantial beneficial impacts will be generated such that after taking in account estimates of environmental costs, the project is a net positive benefit to Chad.

**TABLE 1-1
PROJECT IMPACTS WITH PROJECT DESIGN AND PROPOSED MITIGATION MEASURES**

| IMPACT DESCRIPTION | | PROJECT DESIGN MEASURE OR PROPOSED MITIGATION MEASURE |
|---|--|--|
| HUMAN ENVIRONMENT | | |
| Land use requirements of the project causing temporary or permanent displacement of the local population | | Develop and implement a detailed compensation and resettlement plan |
| Potential boom-bust syndrome as workers are released from construction | | Provide open communication during the recruitment process as to the temporary nature and duration of jobs on the project |
| Labor recruitment and the potential for inequitable distribution of jobs | | Develop a plan for worker recruitment, with the following key attributes: <ul style="list-style-type: none"> • Ensure the employment of Chadians preferentially • All Chadians can apply • Applications will be accepted at local employment and business offices • No hiring at project work sites • Hiring preference given to candidates who meet job criteria and are directly impacted by the project • Compliant with Chadian laws and regulations |
| Inflationary effects on area residents from purchase of local goods and services for the project | | Distribute purchasing to more than one supplier |
| Potential boom-bust syndrome for local suppliers as purchasing requirements for the project decline at the end of the construction | | Distribute purchasing to more than one supplier |
| Dust generated by project activities resulting in unsafe traffic conditions and nuisance to local populations | | Implement dust control protocol at appropriate project facilities |
| Disturbance to burial sites and sacred places and objects | | Consult with village and religious leaders and local residents to identify areas to be avoided and/or to negotiate compensation for disturbance |
| Interference with transhumant migration patterns causing encroachment on neighboring landholdings or increased competition for food and water | | Inform transhumant group leaders, veterinarians, and herders of interruptions to migratory routes |
| Migration of people to the project area increasing demand on existing social infrastructure and resources | | Public information campaigns to ensure that: key information such as the number and timing of job opportunities, and that no hiring will take place at project work sites, are widely known; and control worker recruitment so that no encouragement is given that employment is available on the project other than through authorized hiring processes |

**TABLE 1-1
PROJECT IMPACTS WITH PROJECT DESIGN AND PROPOSED MITIGATION MEASURES**

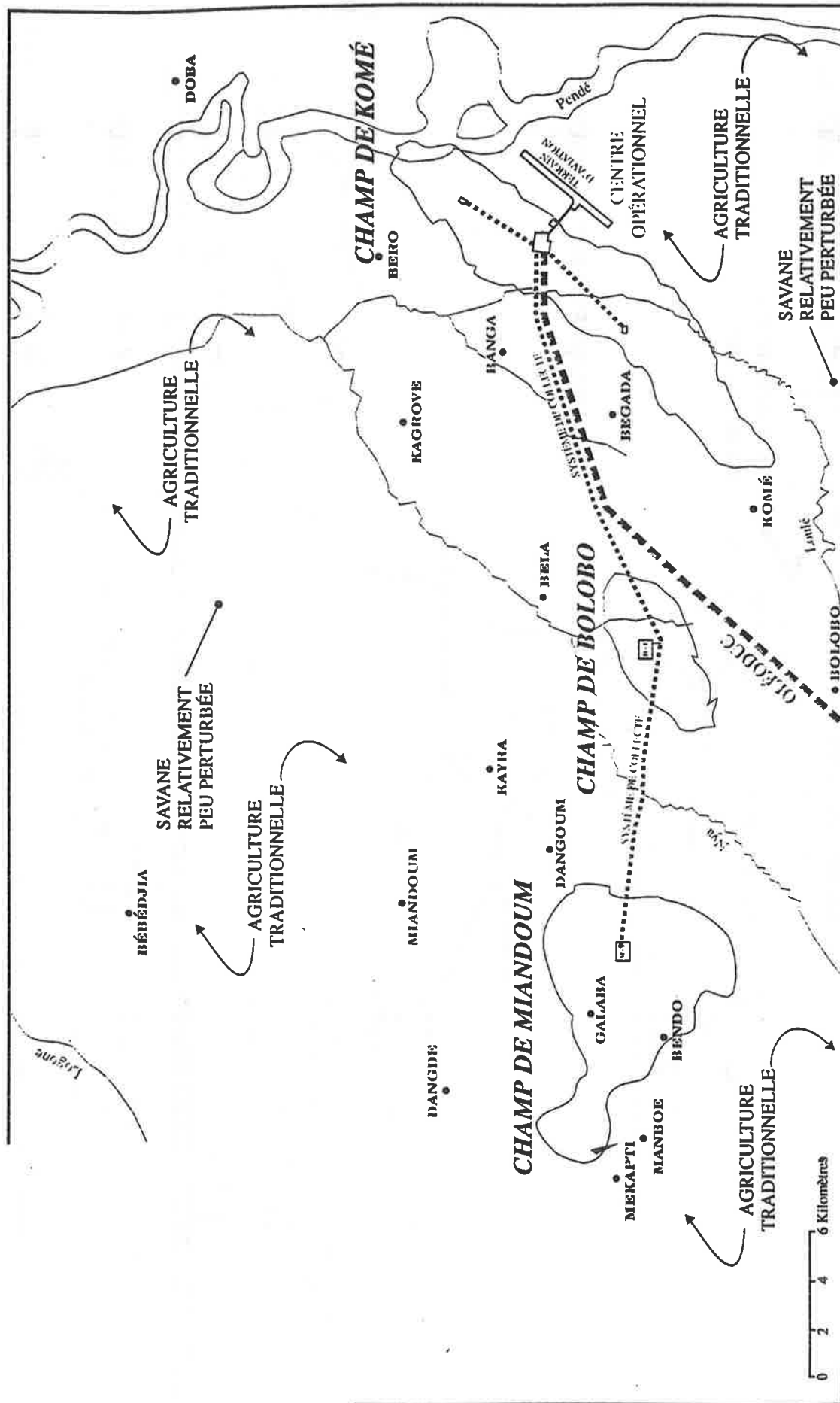
| IMPACT DESCRIPTION | | PROJECT DESIGN MEASURE OR PROPOSED MITIGATION MEASURE |
|--|--|--|
| BIOLOGICAL RESOURCES | | |
| Movement, mixing, and compaction of soils by heavy equipment resulting in loss of topsoil and essential nutrients and other soil components | | Incorporation of a soil erosion and sedimentation control program |
| Removal of vegetative cover and shade canopy increasing soil surface temperature, decreasing moisture content, killing soil organisms, and increasing potential for erosion in the oil field development area and along the pipeline | | Provide buffer zones around sensitive areas |
| Increase in soil surface temperatures directly above the pipeline where it exits Pump Station 1 | | Extra depth of burial would be provided for the pipeline near Pump Station 1 |
| Increased turbidity and reduced visibility impacting food gathering activities by aquatic organisms | | Incorporate erosion and sedimentation control plan |
| Potential disturbance to aquatic resources from minor spills of diesel, gasoline, hydraulic, brake, transmission, and other equipment fluids or chemicals | | Incorporate project safety and environmental measures and spill response plans for construction and operations phases |
| Damage to botanical, wildlife, and other aquatic resources and contamination of surface water bodies resulting from oil spills | | Incorporate project safety and environmental measures and an oil spill response plan, associated training, equipment, and supporting infrastructure into the project |
| Induced access to relatively undisturbed wooded savanna and riverine vegetation during construction and operations leading to reduction in natural resources due to hunting, fishing, collecting of plant materials, etc. | | Control unauthorized use of pipeline route during construction; provide work force with resource conservation/protection briefing and communicate that hunting or trade in bushmeat would result in instant dismissal; reinstate natural barriers after construction |
| HYDROLOGY AND WATER QUALITY | | |
| Increased peak flows and sediment loads of small unnamed tributaries or drainages in the immediate vicinity of cleared areas | | Design drainage systems to drain surface runoff to more than one tributary or in a manner that minimizes erosion |
| Disturbance to existing local supply wells caused by continuous withdrawal of project water supplies | | Stagger project water supply wells to reduce the effect on nearby wells; provide alternative supplies in case of disruption to existing wells |
| Reduced water quality caused from wastewater discharge to relatively small tributary streams | | Treat or dispose of sanitary wastewater in compliance with World Bank effluent guidelines |
| Decrease in water quality from surface runoff potentially contaminated with drilling muds | | Incorporate erosion and sedimentation control plan and project waste management plan |
| Decrease in quality of groundwater in the potable near-surface aquifer due to casing leak | | Injection well integrity program |

**TABLE 1-1
PROJECT IMPACTS WITH PROJECT DESIGN AND PROPOSED MITIGATION MEASURES**

| IMPACT DESCRIPTION | | PROJECT DESIGN MEASURE OR PROPOSED MITIGATION MEASURE |
|---|--|---|
| GEOLOGY, SOILS, AND SEISMICITY | | |
| Increased potential for wind and water erosion from ground disturbing activities | | Incorporate soil erosion and sedimentation control plan |
| Increased potential for sedimentation in streams intersected during pipeline construction | | Incorporate soil erosion and sedimentation control plan |
| Potential for erosion, scour, and changing bottom profiles to expose the pipeline | | Assess scour potential in support of pipeline design |
| Potential for differential settlement and blasting induced localized slope instability causing structural damage to buildings or facilities | | Incorporate recommendations of geotechnical engineering evaluation |
| METEOROLOGY AND AIR QUALITY | | |
| Generation of particulates from earthmoving activities | | Implement dust control protocol at appropriate project facilities |
| Compliance with World Bank NO ₂ guideline values | | Confirm modeled NO _x ground level concentrations meet guidelines with final design input parameters, or amend final design accordingly |
| PUBLIC HEALTH AND SAFETY | | |
| Increased incidence of respiratory diseases | | Implement measures in project housing, transportation, water and sanitation, and telecommunications; implement village-based education programs which address the recognition and prevention of respiratory diseases |
| Increased incidence of vector-related diseases, such as malaria, schistosomiasis, filariasis and onchocerciasis | | Implement measures in the areas of project housing, transportation, water and sanitation regarding the prevention of vector-borne diseases |
| Increase in the incidence of STDs/HIV | | <p>The following would be implemented for the project work force and the Government of Chad would implement the same strategies for the community surrounding the project area directed toward the prevention of STDs/HIV:</p> <ul style="list-style-type: none"> • Coordination with government national AIDS program, particularly programs directed toward female commercial sex workers and other vulnerable women • Surveillance and treatment of STDs, particularly genital ulcers • Information, education and communication (IEC) • Aggressive distribution of condoms • Surveillance activities to monitor HIV prevalence rates |
| Increase in incidence of water and food-related illnesses | | Implement measures in project housing, transportation, water and sanitation directed toward water and food sanitation and hygiene |
| Increases in accidents and injuries, security incidents | | Implement measures in the areas of project housing, transportation, water and sanitation, and telecommunications targeting the prevention of accidents and injuries |

**TABLE 1-1
PROJECT IMPACTS WITH PROJECT DESIGN AND PROPOSED MITIGATION MEASURES**

| IMPACT DESCRIPTION | PROJECT DESIGN MEASURE OR PROPOSED MITIGATION MEASURE |
|--|--|
| Increase in chemical exposures and environmental diseases | Implement measures in the areas of project housing, transportation, water and sanitation, and telecommunications targeting the prevention of chemical exposures and environmental diseases |
| WASTE MANAGEMENT | |
| Generation, treatment, and disposal of various types and volumes of solid, liquid, petroleum-based, and hazardous wastes | Incorporation of standard waste management practices in the project would include an overall waste management plan and facility-specific waste management plans |



LÉGENDE

- ☐ Champ de Komé
- ☐ Villages / Villages
- ☐ Champ de Miandoum
- ☐ Stations de collecte
- ☐ Champ de Bolobo
- ☐ Rivières



ESSO Exploration and
Production Chad Inc.

ZONE DES CHAMPS DE PÉTROLE DU PROJET

DAMES & MOORE
A MEMBER OF THE CH2M HILL GROUP

FIGURE 1-2

ENVIRONMENTAL

CAMEROON PORTION

ASSESSMENT - EXECUTIVE SUMMARY

Chad

Export

Project

OCTOBER | 1997

| | |
|---|------------------|
| 1.0 EXECUTIVE SUMMARY | Page 1-1 |
| 1.1 INTRODUCTION AND BACKGROUND | Page 1-1 |
| 1.2 PROJECT DESCRIPTION | Page 1-2 |
| 1.3 PROJECT ALTERNATIVES | Page 1-4 |
| 1.4 LEGISLATIVE, REGULATORY, AND POLICY CONSIDERATIONS | Page 1-5 |
| 1.5 ENVIRONMENTAL SETTING | Page 1-8 |
| 1.6 ENVIRONMENTAL IMPACTS AND MITIGATIONS | Page 1-11 |
| 1.7 CONSULTATION WITH AFFECTED GROUPS | Page 1-16 |
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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION AND BACKGROUND

The objective of the Chad Export Project is to produce, transport, and sell oil from three oil fields in the Doba Basin of southern Chad to world markets in a manner compatible with the balanced environmental and economic needs of the people of Chad and Cameroon.

The proposed project includes the oil field development in Chad, and a pipeline transportation system from Chad to a marine terminal facility off the Atlantic coast of Cameroon (Figure 1-1). This environmental assessment (EA) addresses the Cameroon portion of the project, including:

- An 880 km long, 760 mm diameter pipeline in Cameroon, contiguous with the pipeline in Chad
- Two intermediate pump stations located along the pipeline route in Cameroon
- A pressure reducing station (PRS) close to the shore crossing of the pipeline
- A subsea pipeline approximately 11 km long, terminating at a floating storage and offloading (FSO) vessel offshore Kribi
- Various infrastructure facilities and upgrades, including temporary and permanent storage areas, road and rail system, a satellite-based communications system, and a pipeline operations and administrative office in Douala.

The project is being considered by a consortium comprised of Esso Exploration and Production Chad Inc. (Esso), Société Shell Tchadienne de Recherches et d'Exploitation, and Elf Hydrocarbures Tchad (referred to as the Consortium). The Cameroon Oil Transportation Company (COTCO) has been formed with equity participation from the Consortium and the Republics of Chad and Cameroon. COTCO will construct, operate and maintain the pipeline transportation system in Cameroon.

This EA has been prepared to meet the environmental assessment requirements of COTCO and to support funding applications from the Republic of Cameroon to the World Bank and from COTCO to the International Finance Corporation ([IFC] the private sector lending agency of the World Bank), international lending agencies, and export credit agencies. The EA responds to World Bank guidelines and Operational Directives and addresses project impacts on the human, biological, and physical environments. A separate EA has been prepared with respect to the Chad portion of the project.

Expert and independent environmental advice has been an integral part of the preliminary engineering of the project, reflecting a key project development strategy of minimizing the

adverse environmental impacts of the project by the early recognition and, where possible, avoidance of sensitive issues. Environmental and socioeconomic inputs to project development and preparation of the EA have been the responsibility of an international consulting firm with extensive experience in the environmental assessment of complex projects, utilizing an array of specialist organizations and individuals, including Cameroonians, as subconsultants. Consultations with affected groups, including the local population, nongovernmental organizations, and relevant government ministries and agencies, have been undertaken and will continue throughout project development.

Both beneficial and adverse impacts are recognized in the EA. Mitigation strategies have been developed to reduce almost all identified significant adverse impacts to less-than-significant levels. These mitigation strategies are more fully described in an Environmental Management Plan (EMP) which COTCO and the Republic of Cameroon are committed to implement.

1.2 PROJECT DESCRIPTION

The Chad Export Project is being engineered to avoid incidents that would cause adverse environmental impacts by the appropriate design, construction, operation, monitoring and maintenance of project facilities, and the operation of a comprehensive program for safety and environmental protection. This program would ensure regulatory compliance, provide appropriate health, safety and personnel training, and ensure that project-generated wastes are reduced where possible and are appropriately handled, treated, and disposed of, where necessary.

The project will be managed with the goal of preventing incidents that potentially cause adverse environmental or social impacts. Comprehensive risk assessments will be conducted throughout the design, construction, and operation of the project to reduce risk and mitigate the consequences of safety, health, and environmental incidents. Recognizing that accidents may occur, policy will be to respond quickly and effectively to incidents resulting from operations while cooperating with industry organizations and authorized government agencies. Emergency response plans will be developed prior to start up and operation of the project to ensure that adequate resources are committed and available in the event that an incident, such as an oil spill, should occur.

A major project component is a pipeline, 760 mm in diameter and buried throughout its length generally with a minimum of one meter of cover. Cover will be increased for road crossings and other sensitive areas and reduced to a minimum of 0.50 m in rocky areas. The pipe will be protected with a corrosion protection coating and cathodic protection. Isolation valves will be installed at intervals for operational purposes and to minimize environmental impacts in case

of leaks. A combination of leak detection methods will be utilized for the pipeline transportation system leak detection system. The system will be fully automated and manned 24 hours a day.

Two intermediate pump stations (numbered 2 and 3) would be sited near the towns of Dompla and Belabo, respectively. Each station would occupy an area of about 10 ha and would incorporate facilities including:

- Crude oil-fueled pumping units
- Crude oil-fueled power generation units
- Crude oil line heaters
- Various waste facilities including oily water treating and disposal, incineration facilities, and a landfill
- Living accommodations for 20 workers
- An airfield.

A normally unmanned PRS near Kribi would occupy an area of approximately 2.5 ha and would include the following facilities:

- Pressure regulating and pressure reducing systems
- Surge tankage for emergency pressure relief
- A landing area for helicopters.

A subsea loading pipeline would extend from the PRS to offshore loading facilities. The offshore loading facilities would include an FSO vessel converted from an existing crude oil tanker modified to include onboard boilers burning crude oil and a hull structure that could be attached to a single-point mooring system. The FSO would have segregated ballasts to ensure that seawater and oil are not intermixed, thereby eliminating the need for oily water ballast treatment and disposal.

Other project facilities include: a pipeline operations and administrative office in Douala, a satellite-based communications system, permanent storage yards at the Douala port, the railhead at Ngaoundal, and at Ngoumou, seven temporary yards at various locations between the Chad border and Kribi, necessary upgrades to the existing rail system between the port of Douala and the railhead at Ngaoundal, upgrades to approximately 300 km of existing roads between Ngaoundal and the Chad border, and the construction of a short section of new road to a new crossing of the Chad border between Touboro and Baibokoum in Chad.

Pipeline construction would involve the temporary clearing of a strip of land between 30 and 60 m wide along the pipeline route; digging a ditch to accommodate the pipeline; transporting and

stringing pipe along the length of the route; welding the pipe; installing the pipe in the trench; backfilling the trench; and reclaiming the cleared area along the pipeline route.

Project construction in Cameroon will take place over 3.5 years and would involve a peak work force in Cameroon of between 2,000 and 2,600. Based on preliminary estimates it is envisaged that between 1,000 and 1,500 jobs would be available for Cameroonians. During the nominal 30 year life of the project, approximately 300 operations personnel will be required, and about 200 of these positions could be available for Cameroonians. An aggressive plan will be instituted to hire and train Cameroonians to replace expatriate personnel as operations progress.

1.3 PROJECT ALTERNATIVES

A number of alternatives were identified and considered in the development of the envisioned project, including:

- **Alternatives to Pipeline Transport of Produced Crude Oil**—Alternatives such as various combinations of trucking, rail, road, river, and small diameter pipeline transportation of crude oil have been considered. The determination has been that the development of a pipeline transportation system from the Doba Basin in Chad directly to the Cameroon coast for subsequent export by tanker is the only feasible alternative to export the volumes of oil necessary to maintain the project's economic viability.
- **Alternative Pipeline and Facility Sitings**—The selected locations and routes were assessed to be the most economical and to be technically and environmentally acceptable. Criteria considered in evaluating corridor alternatives included avoidance of certain features such as:
 - Areas of high priority for protection or exclusion by the government and the World Bank
 - Parks, reserves, and other areas of importance
 - Villages, related structures, and areas inhabited by indigenous peoples.

Other criteria including landforms, infrastructure, and development were evaluated to identify preferred areas for pipeline routing, such as existing infrastructure, access routes, and disturbed areas.

- **Onshore Versus Offshore Oil Storage**—The FSO alternative was selected on the grounds that it will require fewer changes in land use, consume less fuel in performing its function, and have a lower capital cost. The FSO alternative is environmentally preferred. In

addition, it will be possible to replace the initial FSO with one of a different size to match a change in production level.

- **Alternative Marine Terminal Locations**—Selection of the Kribi area resulted from the pipeline corridor evaluation, which determined that a corridor terminating near Kribi was preferred. Following selection of the preferred corridor, a further study of marine terminal locations in the Kribi area was conducted. This study resulted in selection of a location near Kribi that is cost effective and will not result in excessive disruption of beach recreational uses or fishing activities.
- **Project Transportation Alternatives**—An assessment of transportation alternatives including air, rail, road, navigable waterways and ocean ports determined that project transportation needs in both Cameroon and Chad should be met by shipping internationally sourced materials to one or more ports in Cameroon, followed by combined road/rail transportation within Cameroon and for shipments to Chad, and limited air freight to Chad. Alternative road/rail routes were then evaluated, and upgrading of the existing rail system between Douala and Ngaoundal and of the shortest road route between Ngaoundal and the Komé area in Chad is the preferred alternative. This alternative provides the best access to the pipeline route, takes advantage of an existing paved road, requires the least amount of laterite road upgrading, and is judged to be the least environmentally intrusive of the alternatives evaluated.
- **The No Project Alternative**—Should the project not be developed, the benefits to Cameroon realized from local employment, increased government revenues, improved infrastructure, and enhanced business opportunities would not occur, nor would the potential adverse impacts of the project. As indicated in the environmental economics analysis conducted for the project, the project has been shown to be of net positive benefit to Cameroon. The no project alternative would result in a lost opportunity for Cameroon.
- **The Proposed Project**—The proposed project is the basis for project development and is fully described in this EA.

1.4 LEGISLATIVE, REGULATORY, AND POLICY CONSIDERATIONS

The principal legislative and regulatory considerations to which the project will be subject are the laws and regulations of the Republic of Cameroon and the Convention of Establishment to be entered into by the Republic of Cameroon and the Cameroon Oil Transportation Company (COTCO). The project also will be developed in compliance with various international treaties and World Bank guidelines. Where no appropriate legislation, regulations, or guidelines or

provisions of the Convention of Establishment exist, the project will adopt international industry standards.

The principal Cameroon legislation will be Law No. 96/14 that governs pipeline transportation of hydrocarbons extracted from other countries and its implementing texts and the Convention of Establishment. Law No. 96/14 sets out attribution requirements and rights attached to the authorization for transportation by pipeline; conditions of construction and operation of a system for transportation by pipeline; relations with landowners; taxation of the transportation of hydrocarbons by pipeline; supervision and control by the government; and other miscellaneous provisions. Other relevant Cameroon legislation that applies insofar as it is not contrary to or inconsistent with the provisions of the Convention of Establishment includes:

- General Tax Code in force as of December 31, 1994
- Customs Code in force as of December 31, 1994
- Registration, Stamp and Trusteeship Code in force as of December 31, 1994
- Finance Laws and ordinances pursuant to these Finance Laws of the Republic of Cameroon in force as of December 31, 1994.

In addition, all ordinary law provisions of the Republic of Cameroon which are not contrary to or inconsistent with the Convention of Establishment apply, including the following laws and texts:

- The Code for the Forest, Wildlife, and Fishing, which addresses the protection and regulation of usage of forest, fauna, and fish resources
- A law (number 89/027) addressing waste management issues and regulating the production, storage, transportation, and disposal of various wastes
- A law (number 84/13) establishing regulations governing the use of state water resources in Cameroon, including rivers, seas, lakes, and groundwater
- Various statutes applying to land tenure, including ordinances and decrees governing state lands, ordinances establishing rules governing private land tenure, and a law, and a decree dealing with the expropriation of land
- A decree providing general codes for building construction
- Permitting regulations established (under law 64-LF-23) to protect the health of the general public, and subsequent laws and decrees which deal with matters such as sanitary conditions, food, drinking water, dangerous, unhealthy or obnoxious establishments; the protection of telecommunications or electric cables; water and gas pipes; sewage systems; and pressure vessels such as water and gas storage tanks.

Notwithstanding the foregoing, the following laws and texts and their implementing texts will not apply, unless otherwise provided by the Convention of Establishment or by Law No. 96/14:

- Law No. 64/LF/3 of April 6, 1964 governing mineral substances of the Federal Republic of Cameroon
- Law No. 64/LF/4 of April 6, 1964, setting forth the basis, rate, and means of recovery of fixed fees, royalties and mining taxes
- Law No. 78/14 of December 29, 1978, amending, with regard to hydrocarbons, Law No. 64/LF/3 of April 6, 1964 governing mineral substances of the Federal Republic of Cameroon
- Law No. 78/24 of December 29, 1978, setting forth the basis, rate and means of recovery of fixed fees, royalties and mining taxes
- Law No. 82/20 of November 26, 1982, setting forth obligations of oil companies
- Law No. 89/15 of July 1989, modifying and amending certain provisions of Law No. 82/20 of November 26, 1982, setting forth obligations of oil companies
- Law No. 91/18 of December 12, 1991, relative to special incentives to develop research in order to promote research and production activities of Hydrocarbons in the Douala basin
- Ordinance No. 90/007 of November 8, 1990, governing the Cameroon Investment Code
- Ordinance No. 94/003 of January 24, 1994, amending various provisions of the Investment Code
- Decree No. 77/58 of December 23, 1977, governing storage and distribution of petroleum products.

Relevant Conventions, Treaties and Agreements in which Cameroon is a participant include: The International Convention on Civil Liability for Oil Pollution Damage, International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Montréal Protocol on Substances that Deplete the Ozone Layer, Bamako Convention on the Ban of the Import into Africa, the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, the Convention on Biological Diversity, and the United Nations Framework Convention on Climate Change.

Relevant World Bank policies and guidelines that will be complied with include:

- World Bank Environmental and Occupational Health and Safety Guidelines
- World Bank Operational Directives on social issues
- IFC Environmental Analysis and Review of Projects
- World Bank Environment, Health and Safety Guidelines for Onshore Oil and Gas Development.

1.5 ENVIRONMENTAL SETTING

Human Environment

Cameroon has a population of 13 million and Gross National Product per capita of about U.S.\$650 per annum. In Cameroon's economy agriculture comprises 59 percent of the labor force, industry 13 percent, and services 28 percent.

The project area traverses Cameroon and requires that the project interact with a wide variety of ethnic, religious, linguistic, cultural, and socioeconomic groups. This diversity is illustrated by the fact that in each of the five areas in which socioeconomic surveys were conducted for the project (around Touboro in North Province, Meiganga in Adamaoua Province, Nanga Eboko in Centre Province, around Yaoundé, and Kribi in Océan Province), there are up to 17 different principal ethnic groups, and as many as 6 principal languages. The common language spoken in all areas is French.

The project area as a whole is occupied by farmers, herders, fishermen, and hunters and gatherers. Most households engage in at least two of the activities that their region provides. Even in those rare circumstances where subsistence farming is not the principal economic activity in a household, agriculture is still practiced as a necessity. Commerce and petty trade are also essential to most household production strategies, and while they are generally very small-scale, they are of particular significance to women.

As agriculture is the single most important component of production in the project area, land use and land tenure are of great significance. Consequently, the practice of multiple usage of productive resources can result in conflicts. Officially, all unregistered land in Cameroon is part of the National Domain (except those parts that are in the Public Property of the State). Since land registration is infrequent in rural areas most of the natural resource endowment in the country, including lands used for subsistence farming, cash crops, and forest resources, are within the National Domain and the Public Domain. Nevertheless, traditional uses are widely recognized and may result in multiple users of the same tract of land.

Fishing is a primary economic activity in the Kribi region and is less important in streams and rivers elsewhere in the project area. Although fishing rights are not as regulated as land use rights, they are usually owned by specific clans, lineages, or ethnic groups.

The raising of livestock is practiced by three categories of peoples, all of whom are most prevalent in the north of the project area: nomadic pastoralists, livestock merchants, and sedentarized pastoralists.

Hunting and gathering is not considered to be a primary economic activity in any region, with the exception of the Pygmy population in the Kribi region. The trade in bushmeat is a significant economic activity in some cases, and bushmeat is an important food supplement as well.

Pygmy groups in the Kribi region may be classified as indigenous peoples, as defined by the World Bank, as they are recognized groups with a social and cultural identity distinct from the broader society. They reside in or near dense forests and are primarily hunters and gatherers who are self-sufficient and rely on the floral and faunal resources of an area for most of their needs. While the Pygmies maintain a principal, fixed settlement, they make extended journeys into the forest, usually within a 50 km radius of their main village. These villages are separate from but associated with the villages of the broader population (the Bantu), and it is through their contacts with the Bantu that the Pygmies tend to interact with the world at large.

Biological Resources

The biological resources of the project area can be classified into four zones: the wooded savanna south from the Chad border (accounting for approximately 320 km of the pipeline route); the semideciduous forests of the Deng Deng region (approximately 300 km of the pipeline route); the mixed semideciduous forest around Yaoundé (approximately 80 km of the pipeline route); and the Atlantic littoral evergreen forest of the coastal region around Kribi (approximately 180 km of the pipeline route).

The wooded savanna is generally quite heavily utilized by the local population for farming and raising livestock, although a section of the route alignment through the Mbéré Rift Valley (approximately 60 km long) is unique in its relative lack of disturbance and, most importantly, for its wildlife resources (reportedly including species such as hippopotamus, buffalo, a variety of antelopes, and occasionally, elephants). Special measures will be implemented to ensure that project impacts in the Mbéré Rift Valley are less than significant.

The semideciduous forest is rich in commercial timber species but is generally species-poor. Wildlife in the Deng Deng area is still quite diverse and reportedly includes animals such as gorilla, elephant, buffalo, and several monkey species.

The mixed semideciduous forest in the project area has high human population densities and, with the exception of some isolated hills around Yaoundé, natural forest values (including wildlife and rare plants) are considered to be less sensitive than elsewhere in the project area.

The Atlantic littoral evergreen forest has a high level of biodiversity, although the pipeline route has been selected to minimize intersections with relatively undisturbed forest by following degraded areas associated with existing roads.

Biological resources are utilized by the human population in a number of ways. The use of plants is widespread throughout the project area but is particularly important to the Pygmies in the Atlantic littoral evergreen forest. Commercial timber extraction is most important in the semideciduous forest, and timber production is also practiced in the Atlantic littoral evergreen forest.

Pipeline routing and facility siting has been undertaken to avoid various biologically important locations near the project area, including:

- Important wildlife habitats in the Faro Reserve - Benoué National Park - Boubou Ndjida National Park area
- The Pangar-Djerem Fauna Reserve and the proposed Mbam and Djerem National Park
- The Nyong River wetlands
- The Campo Reserve.

Marine Environment

The offshore geology of the project area comprises sands, silts, clays, and muds, with a few rocky outcrops that the project would not impact. The sea floor slopes relatively smoothly to the west, and water depths suitable for the location of an FSO occur from about 10 km offshore. Two high and two low tides occur daily in the project area, and the tidal range is around 2 m. Currents vary with depth and distance from shore in the range 8 to 11 cm/sec. Wave measurements in the project area indicate a wave height of generally less than 2 m but varying up to 3.5 m. The seawater is somewhat turbid with a temperature near the sea floor of between 24 and 26° C. The marine biology of the project area is quite uniform, with only relatively low densities of bottom-dwelling organisms and of fish. Sea grasses are uncommon, as are reef corals, and true coral reefs are absent from the coast of Cameroon. The project is not expected to have any significant impact on fisheries.

Water Resources

Surface waters in the northernmost part of the project area are part of the Lake Chad basin, whereas the remainder of the area drains to the Atlantic Ocean. The pipeline would cross seven major rivers in Cameroon, of which the largest is the Nyong. Most streams are perennial, and watersheds generate significant volumes of surface runoff, suggesting significant potential for scour and degradation during major storms, which is being addressed through design and construction techniques.

Both groundwater and surface waters are extensively utilized for water supply in Cameroon and for a variety of other purposes including fishing and household requirements.

Topography

From the Chad-Cameroon border at an elevation of about 500 m above sea level the pipeline route rises to an elevation of about 1,150 m at the watershed between the Lake Chad and Atlantic drainages. The route then descends across two plateaux and an intervening escarpment to a rolling terrain, with some steep hilly areas around Yaoundé. This varied topography passes gradationally to a relatively flat coastal plain with isolated hills and ridges before the route descends to sea level near Kribi.

Meteorology and Air Quality

The climate of the project area varies from tropical in the north to equatorial at the coast, and annual rainfall in the project area varies from 1,400 mm near Touboro to 2,900 mm at Kribi. While there are pronounced variations in the seasonality of rainfall, there is generally one rainy season in the north, and two in the south. Typical air pollution sources include industrial facilities, vehicles, agricultural activities, and dust. Air pollutant concentrations are generally higher in urbanized areas and lower in undeveloped areas.

1.6 ENVIRONMENTAL IMPACTS AND MITIGATIONS

The potential impacts of the proposed project have been classified into four categories:

- Beneficial
- Less than significant
- Significant but mitigable
- Significant and unavoidable.

Environmental Economic Impacts

World Bank guidelines advise that environmental costs and benefits should be quantified to the extent possible and economic values attached, if feasible. Economic values of impacts in the following nine major categories were estimated:

- Agriculture
- Forestry and forest/savanna products
- Livestock
- Petroleum transportation
- Job search
- Housing
- Transportation

- Health
- Multiplier impacts.

Most cost categories are determined by changing current land use to uses related to petroleum transportation. Most benefit categories are determined by infrastructure investments and direct and indirect revenue flows.

The aggregate present value of the estimated impacts to Cameroon is a range of positive net benefits between 224 and 247 billion FCFA (U.S. \$448 million to \$494 million). Consistent with World Bank guidelines, the environmental and economic impact analysis indicates that after taking into account estimates of environmental costs and benefits, the proposed project is a net positive benefit to Cameroon.

Beneficial Impacts

A variety of significant beneficial impacts will result from development and operation of the proposed project. Plans are being developed to focus project benefits, such as employment and purchasing of goods and services to groups and communities that would be in the vicinity of the project. The proposed project will also provide substantial financial revenues to the Republic of Cameroon from taxes and oil transportation fees. Other benefits include:

- Provision of employment to Cameroonians during project construction
- Long-term employment of Cameroonians during project operations
- Provision of training to the project work force
- Purchases for the project of locally sourced goods and services
- An increase in the overall level of economic activity as a result of project development and operations
- Upgrades to and maintenance of roads and other infrastructure needed for the project.

Minimization of Adverse Impacts

The early and extensive integration of environmental inputs to the preliminary engineering of the project has resulted in the avoidance of many potentially significant adverse impacts and the reduction of many others to less-than-significant levels. It has also resulted in the incorporation of design measures into the project which prevent or minimize adverse environmental effects.

Examples of impact avoidance by the integration of environmental inputs and incorporation of project design measures include:

- Pipeline corridor and route selection to identify and, where feasible, avoid potentially sensitive resources and locations
- Use of existing infrastructure and disturbed areas for pipeline routing and facility siting
- Early identification of environmental and socioeconomic issues
- Review of the Terms of Reference (TOR) for the EA with the Republic of Cameroon and the World Bank
- Consideration of environmental effects in the analysis of project alternatives such as the location of marine terminal facilities
- Minimization of potential waste management impacts by the early development of an integrated project waste management strategy and incorporation of a Waste Management Plan
- Development and implementation of a consultation and participation process with nongovernmental organizations and local peoples that allowed for the identification of issues significant to the affected population
- Incorporation of drainage, erosion, and sedimentation control measures to protect water resources
- Incorporation of an Occupational Health and Safety program
- Incorporation of sanitation, housing, vector-control, food and water supply, and workplace safety guidelines for the project.

Those impacts considered to be significant but mitigable or less than significant with implementation of a project design measure are listed in Table 1-1, as are the design measures and mitigations. Impact assessment shows that three issues predominate in Cameroon: potential impacts on the human environment, biological resources, and public health.

Human Environment Impacts and Mitigations

- Project land needs will be met with the allocation of a land easement for use during construction of the pipeline, and a reduced easement (the system easement) for the operations phase of the project. Land requirements for project ancillary facilities such as the pump and pressure reduction stations, storage yards, and access roads to ancillary facilities will be somewhat less during operations than during construction. The lands required for the project are currently either private titled lands, concessions (for agriculture and natural resources exploitation and forestry), or customarily occupied and unexploited National Domain or State Private Property lands. Land needed for the Cameroon Transportation System will be acquired and incorporated into State Private Property as necessary by the Republic of Cameroon. The Republic of Cameroon is supportive of prior

users of customarily used lands resuming their former activities, subject to the restriction of non-interference with the normal functioning and maintenance of the Cameroon Transportation System.

A detailed Compensation Plan is being prepared to ensure that fair and transparent compensation is made to individuals and households affected by project land needs in Cameroon. Compensation can be made in cash or in-kind.

- The beneficial impact of employment has the potential to be reduced by the perception of inequitable distribution of jobs. Mitigation for this will be the establishment of a hiring plan based on matching the numbers and skills of Cameroonian workers with project needs. The plan will be designed with the first priority of directing employment among villages in the vicinity of the project. The second priority will be to broaden the hiring catchment area to include regional villages, and the third to draw on labor at the national level. The hiring process will be conducted in an open manner to demonstrate fairness.
- Inflationary effects on area residents and the development of a boom-bust syndrome are potential negative aspects of the potential beneficial impact of generating local business opportunities. Any inflationary effects will be mitigated by the development of a process to distribute project purchases across a broad geographic area and amongst more than one supplier.
- The potential disruption of transhumant movements during project construction will be mitigated by consultation with transhumant group leaders and others such as veterinarians and village residents to provide adequate advance notice of project activities so that appropriate temporary adjustments to traditional migratory routes can be made.
- The project has been routed to avoid known settlements, including those of Pygmies, and future routing activities will also have this goal. Any potentially affected populations, including Pygmies, would be consulted. The project compensation plan will address compensation for groups that may be affected.

Biological Resources Impacts and Mitigations

While project development is being undertaken to minimize impacts on biological resources (by means such as pipeline routing to avoid potentially sensitive areas and to preferentially intersect areas already degraded by human activity), a certain level of impact is unavoidable. This level of impact will be mitigated by a variety of design measures that often address more than one specific impact. Instances include:

- The implementation of various soil conservation techniques that will protect both topsoil and aquatic resources
- Restricting the extent of areas used for construction purposes to the minimum necessary to ensure safe and efficient working conditions, thereby minimizing impacts on biodiversity and the loss of vegetation and habitat
- Various measures to control induced access (minimizing construction of new access roads, erecting and maintaining barriers to the land easement) to limit impacts on wildlife, fisheries, and forest resources
- Work force orientation to project policies on driving standards, hunting, fishing, and the purchase and consumption of bushmeat. This orientation training, together with the enforcement of such policies, will result in the mitigation of project impacts on wildlife and other natural resources.

The Mbéré Rift Valley contains relatively undisturbed wooded savanna. Of the 110 km section of the pipeline that passes through the valley, a 60 km long central section is relatively inaccessible and harbors wildlife that has been somewhat less affected by human pressures than elsewhere. This 60 km section of the valley (core area) is important because it is not permanently occupied by humans and exploitation is not intense. Hunting pressure is dispersed. This has resulted in a relatively higher species richness and diversity. The most cost effective and environmentally acceptable pipeline alignment in this area is being evaluated. For a route through the valley, the mitigations for induced access referred to above would be implemented, together with other mitigations including:

- Prohibition of construction camps in the core area of the valley
- Restriction of construction access to the land easement in the core area
- Early reinstatement of natural barriers to movement along the land easement
- Education and control of the project work force.

Public Health Impacts and Mitigations

The project would affect six environmental health areas:

- Respiratory disease
- Vector-related disease
- Sexually transmitted disease and HIV/AIDS
- Water and food-borne disease
- Accidents and injuries

- Exposure to potentially hazardous materials.

Associated environmental health impacts have been grouped in four subsectors:

- Housing
- Transportation
- Water and sanitation
- Telecommunications.

Impacts arising from the linkage between the affected environmental health areas and the four subsectors would be mitigated by a series of project design measures, existing Republic of Cameroon programs, and a community outreach program. These mitigation measures and programs build upon the inherent link between health outcome and infrastructure improvements in housing, transportation, and water supply and sanitation. Public health impacts are of greatest concern during construction of the project due to the influx of workers; impacts are expected to be significantly less during operations.

1.7 CONSULTATION WITH AFFECTED GROUPS

The project will be developed in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates and to communicate with the public on environmental matters. A program to effect consultation, coordination, and interaction with affected groups, nongovernmental organizations, and government agencies has been developed that includes:

- Communication and consultation with affected communities
- Identifying relevant government ministries and NGOs
- Canvassing of key issues during preparation of the EA TOR
- Conducting fact-finding meetings
- Reviewing the TOR with the Republic of Cameroon and the World Bank
- Consultation with relevant ministries, NGOs, and groups within affected communities during EA development
- Reviewing the draft EA with government ministries
- Reviewing the draft EA with nongovernmental agencies and the community.

Consultation, coordination, and in-country fact-finding meetings have been conducted in English and French, and local languages since June 1993. This has included representatives of the Republic of Cameroon, NGOs, and affected groups near the pipeline route and project facilities. Information has been gathered directly or indirectly by allowing these entities to provide information of direct interest or concern to them. This approach, conducted during initial project

planning, encouraged participants to contribute freely when project plans were still at an early stage of definition. This was followed (beginning in 1995) by significant communication and consultation with affected communities and NGOs during the EA human environment field program. This program was conducted by a team experienced in conducting field work in the project area and using local languages.

In all, 68 sites (villages, camps, neighborhoods) and 185 households were surveyed. In addition, more than 10 NGOs have been consulted in Cameroon.

Key issues identified in the consultation process leading up to EA development are related to land use, compensation, employment opportunities, and biological and water resources. Specifically, accessing land and determining land ownership have been identified as areas of concern. Additionally, the hiring process and compensation in terms of openness and fairness to local populations is also of significant interest to the population. Biological issues related to oil spill prevention and biodiversity were also cited as areas of concern.

The project has been developed to address these issues. For example, project land requirements will be minimized to the extent feasible, a comprehensive compensation plan will be developed and implemented, a system of hiring will be formulated to ensure equitable employment practices are adopted, and project design and mitigation measures will minimize impacts on biological and water resources.

Continuing consultation is planned beyond finalization of the EA. This is an important component of the proposed project to integrate public opinion and to promote understanding of potential impacts and proposed mitigation measures.

1.8 ENVIRONMENTAL MANAGEMENT PLAN AND MONITORING SYSTEMS

The project is committed to conducting its operations in compliance with all applicable laws and regulations and to design, construct, and operate project facilities to high standards. An Environmental Management Plan (EMP) is under development that will describe measures and actions that are planned to be undertaken during the design, construction, operation, and decommissioning of the Cameroon portion of the project to eliminate or reduce key identified biophysical, socioeconomic, and health issues/impacts to acceptable levels. In order to accomplish this goal and function as an implementation plan for the project's environmental management actions, the EMP will:

- Denote the project's key biophysical, socioeconomic, and health topics and their associated issues/impacts

- Provide summaries of specific biophysical, socioeconomic, and health-related issues/impacts, mitigation and monitoring actions planned for the Cameroon portion of the project
- Define and discuss the roles and responsibilities of the key project participants (i.e., the Republic of Cameroon and COTCO)
- Outline project and Republic of Cameroon oversight organizations as they relate to environmental matters
- Summarize the costs associated with these environmental oversight organizations
- Provide a milestone schedule that features important environmentally-related milestone linkages to project execution
- Introduce environmental management tools that are envisioned for the project and key activities/studies that will assist in the crafting of these tools.

The EMP will contain those measures which the Republic of Cameroon and COTCO are committed to undertake.

1.9 CONCLUSIONS

The Chad Export Project is incorporating environmental inputs in all phases of project development. Early recognition of environmental issues has avoided prospective adverse impacts and allowed most remaining significant impacts to be reduced to less-than-significant levels. Consequently, while substantial beneficial impacts would be generated, minimal significant but unavoidable impacts are associated with the project.

**TABLE 1-1
CAMEROON SIGNIFICANT IMPACTS/MITIGATIONS/DESIGN MEASURES**

| Impact Description | Proposed Mitigation Measure/Design Measure |
|---|---|
| HUMAN ENVIRONMENT | |
| Short-term changes in land use, mainly in the land easement will result in dislocation of some agricultural and other economic activities. | Development and implementation of a detailed Compensation Plan. |
| Long-term changes of land use within the system easement, allowing only cultivation of annual crops that do not interfere with the functioning and maintenance of the pipeline. | Development and implementation of a detailed Compensation Plan. |
| Long-term permanent changes in land used for construction and operations of permanent facilities such as the two pump stations and pressure reduction station. | Development and implementation of a detailed Compensation Plan. |
| Labor recruitment and the potential for inequitable distribution of jobs | Develop a plan for worker recruitment to give priority to the employment of qualified Cameroonian nationals in an equitable manner. |
| Potential boom-bust syndrome as workers are released from construction | Provide open communication to all during the recruitment process as to temporary nature and duration of jobs on the project. |
| Potential development of unplanned settlements in the vicinity of project camps and facilities | Management actions will be aimed at limiting the potential for the development of unplanned settlements; however, the provision of services to mitigate any residual impacts cannot be guaranteed. |
| Inflationary effects on area residents from purchase of local goods and services for the project | Distribute purchasing activities among more than one supplier. |
| Potential boom-bust syndrome for local suppliers as purchasing requirements for the project decline at the end of the construction | Distribute purchasing activities among more than one supplier. |
| Dust generated by project activities resulting in unsafe traffic conditions and nuisance to local populations | Implement dust control protocol. |
| Disturbance to ancestral remains and sacred places and objects | Consult with village and religious leaders and local residents to identify areas to be avoided and to negotiate special handling. |
| Interference with transhumant migration patterns causing encroachment on neighboring landholdings or increased competition for food and water | Inform transhumant group leaders, veterinarians, and herders of interruptions to migratory routes. |
| Potential disturbance of Pygmy settlements and populations during construction | Utilize results of the recent project survey of Pygmy populations during future routing activities to limit impacts to Pygmy villages or camps. Consult with Pygmies potentially affected by the project; address compensation through the Project Compensation Plan, if necessary. |
| BIOLOGICAL RESOURCES | |
| Movement, mixing, and compaction of soils by heavy equipment resulting in loss of topsoil and essential nutrients and other soil components | Incorporation of a soil erosion and sedimentation control program. |
| Removal of vegetative cover and shade canopy, increasing soil surface temperature, decreasing moisture content, killing soil organisms, and increasing potential for erosion along the pipeline and roadway/river crossings | Provide buffer zones around sensitive areas. |

**TABLE 1-1
CAMEROON SIGNIFICANT IMPACTS/MITIGATIONS/DESIGN MEASURES**

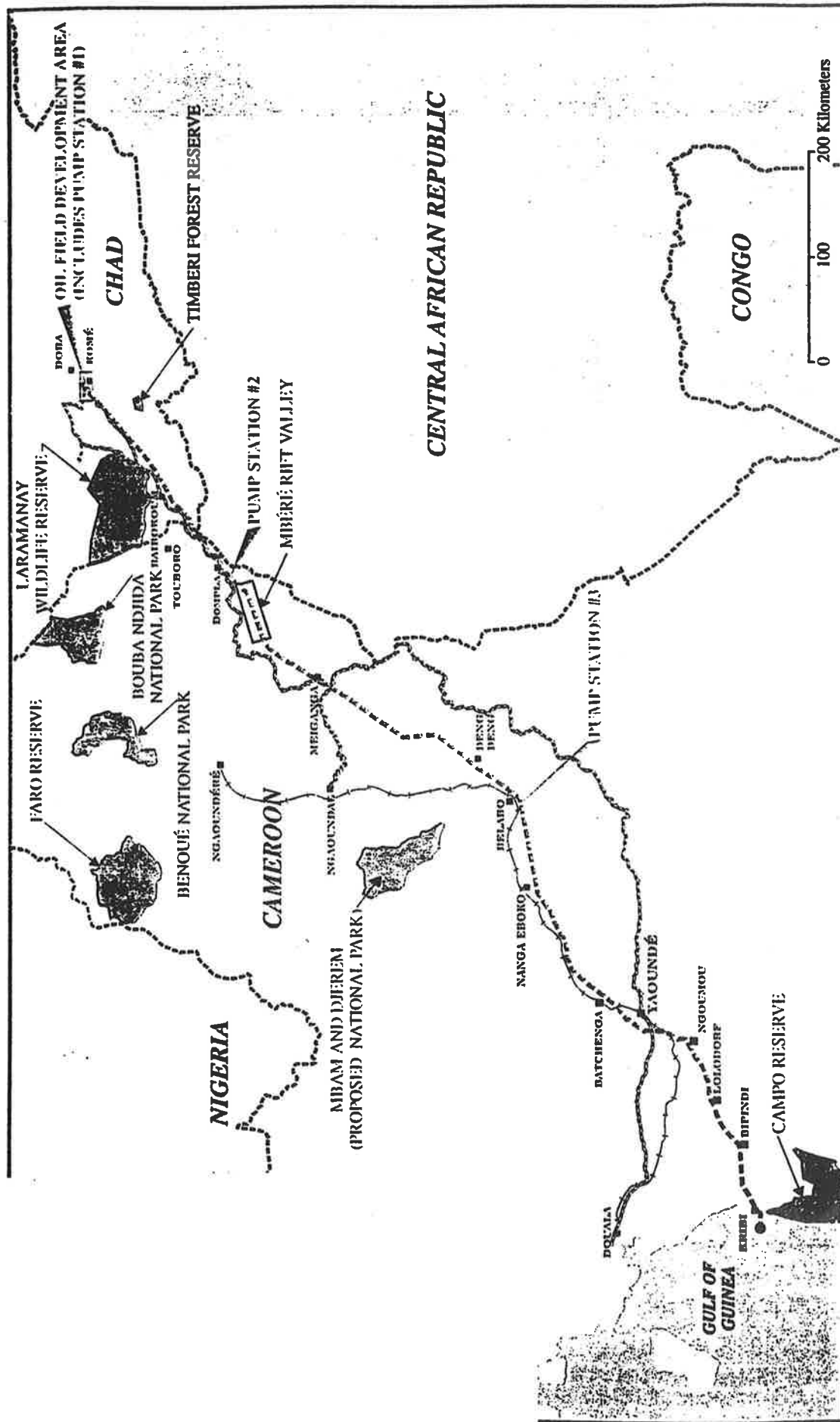
| Impact Description | Proposed Mitigation Measure/Design Measure |
|--|---|
| Deposition of dust on vegetation adjacent to project facilities and roadways, which could contribute to local die-off of the vegetation | Implementation of a dust control protocol at appropriate project facilities. |
| Increase in soil temperatures resulting in drier soils directly above the pipeline where it exits the pump stations | Extra depth of burial would be provided where the pipeline exits the pump stations. |
| Possible spread of the invasive weed <i>Chromolaena (Eupatorium) odorata</i> into the Mbéré Rift Valley | Establish current northern limit of range of the weed and implement a program during construction to minimize the potential for further northerly migration along the project route. |
| Removal of commercially valuable timber where the pipeline passes through patches of unlogged semideciduous forest north of the Lom River, and between Bélabo and the Nanga Eboko area | Coordination with timber concessionaires prior to construction to maximize the recovery of timber felled by the project. |
| Potential increase in mortalities of wildlife from increased traffic on main and secondary access roads | Strictly enforce speed limits on main and secondary access roads. |
| Disturbance or clearance of natural vegetation along rivers and streams, important in providing cover to slow moving or sedentary wildlife species | To the maximum extent possible, maintain natural wildlife corridors and gallery forest along rivers and streams; minimize the width of disturbance and large tree removal in vicinity of rivers and streams. |
| Facilitation of access to currently remote and relatively inaccessible areas including patches of relatively undisturbed semideciduous forest and patches of mature or well-developed secondary forest in the Atlantic littoral evergreen zone. | During construction, access would be restricted. Unauthorized use of the pipeline route during construction would be prevented. Where operations access is not necessary natural barriers along the pipeline route would be reinstated and artificial barriers erected at intersections with roads. |
| Facilitation of human access to the core area of the Mbéré Rift Valley | A variety of mitigation measures will be implemented, and will be optimized based on the results of various supplementary studies that will be undertaken to focus the mitigation effort. |
| Degradation of natural habitat in the core area of the Mbéré Rift Valley from construction activity | Minimizing or reducing disturbance to sensitive valley habitats during construction. A variety of mitigation measures will be implemented, based on the results of supplementary wildlife studies undertaken to focus the mitigation effort. |
| Direct displacement of local wildlife or depletion of wildlife resources due to hunting or an increased demand for bushmeats by the construction work force in the wooded savanna, semideciduous forest, and Atlantic littoral evergreen forest. | Prohibit hunting/poaching by work force; prohibit project purchases of bushmeat from villages; feed work force. |
| Increased turbidity and reduced visibility due to erosion and sedimentation | Incorporate erosion and sedimentation control plan. |
| Potential disturbance to aquatic resources from minor spills of diesel, gasoline, hydraulic, brake, transmission, and other equipment fluids or chemicals | Incorporate project safety and environmental measures and spill response plans during construction and operations. |
| Damage to botanical, wildlife and other aquatic resources and contamination of both groundwater and surface water bodies resulting from oil spills | Incorporate project safety and environmental protection measures and an oil spill response plan, associated training, equipment, and supporting infrastructure into the project. |
| Reduction of biodiversity due to habitat fragmentation and disturbance in the core area of the Mbéré Rift Valley | Restrict construction access to the land easement; establish camps or other construction facilities outside the sensitive zones and bus workers to construction camps; control access to the land easement. |

**TABLE 1-1
CAMEROON SIGNIFICANT IMPACTS/MITIGATIONS/DESIGN MEASURES**

| Impact Description | Proposed Mitigation Measure/Design Measure |
|---|---|
| Reduction of biodiversity due to habitat fragmentation and disturbance should the pipeline intersect any sensitive patches of semideciduous forest or patches of Atlantic littoral evergreen forest | Construction access would be provided via the land easement through the patches of sensitive forest; establish camps and other construction staging areas outside the sensitive zones wherever practicable; revegetate and return sites to prior use where not practicable to avoid; control access to the land easement. |
| Reduction of biodiversity throughout the Mbéré Rift Valley, the semideciduous forest and the Atlantic littoral evergreen forest as a result of induced access effects | Induced access as a result of the project would be controlled by: erecting vehicle barriers to prevent unauthorized vehicular access to the land easement during construction and operations; patrolling access points; and maintaining and upgrading of barriers as necessary. |
| MARINE ENVIRONMENT | |
| Exposure of sandy and rocky intertidal habitats, and marine birds and fish to oil spills | Design and manage project to avoid incidents. An oil spill response plan and associated response training and equipment and supporting infrastructure would be incorporated into project design. |
| Disturbance of tourism and recreational beach use from an oil spill incident with shoreline contamination | Project safety and environmental measures and an oil spill response plan, associated response training, equipment, and supporting infrastructure would be incorporated into the project. |
| HYDROLOGY, HYDROGRAPHY, HYDROGEOLOGY, AND WATER QUALITY | |
| Increased peak flows of small, unnamed tributaries or drainages in the immediate vicinity of cleared areas | Design drainage systems to drain surface runoff to more than one tributary or in a manner that minimizes erosion. |
| Increased potential for water erosion and sedimentation from ground disturbing activities associated with installation of the pipeline. | Incorporate erosion and sedimentation control plan. |
| GEOLOGY, SOILS, AND SEISMICITY | |
| Increased potential for wind and water erosion from ground disturbing activities | Incorporate soil erosion and sedimentation control plan. |
| Increased potential for sedimentation in streams intersected during pipeline construction | Incorporate erosion and sedimentation control plan. |
| Potential for erosion, scour and changing bottom profiles to expose pipeline | Assess scour potential in support of pipeline design. |
| Potential for differential settlement and blasting induced localized slope instability causing structural damage to buildings of facilities. | Incorporate recommendations of geotechnical engineering evaluation. |
| METEOROLOGY AND AIR QUALITY | |
| Generation of particulates from earthmoving activities | Implement dust control protocol at appropriate project facilities. |
| Compliance with World Bank guideline values for worst-case concentrations of NO ₂ | Confirm modeled NO _x ground-level concentrations meet guidelines with final design input parameters or amend final design accordingly |
| PUBLIC HEALTH AND SAFETY | |
| Increased incidence of respiratory disease | Implement sanitation guidelines for contractors responsible for housing; incorporate sanitation and hygiene training into new employee orientation; medical screening |

TABLE 1-1
CAMEROON SIGNIFICANT IMPACTS/MITIGATIONS/DESIGN MEASURES

| Impact Description | Proposed Mitigation Measure/Design Measure |
|--|---|
| Increased incidence of vector-related disease, such as malaria, schistosomiasis, filariasis, and onchocerciasis | Implement vector control and housing guidelines for housing; implement health screening and surveillance during recruitment; employee training on proper work practices |
| Increased incidence of sexually transmitted diseases | Education for project employees on prevention of STDs including HIV; signage on STD prevention in housing |
| Increased incidence of water and food related illnesses | Implement sanitation and food and water supply maintenance guidelines for storage, distribution, housing, and camps; regular health screening for food handlers |
| Increase in accidents, injuries, and security incidents | Incorporate guidelines for safe workplace maintenance and accident prevention, site-specific emergency medical response plans, safety training for all personnel, driver safety training, construction, and operation signage |
| Increase in chemical exposure and environmental diseases | Implement standard waste management practices and waste management plans, waste segregation and inventory procedures, training for safe handling of wastes and hazardous materials |
| WASTE MANAGEMENT | |
| Generation, treatment, and disposal of various types and volumes of solid, liquid, petroleum-based, and hazardous wastes | Incorporate standard waste management practices in the project which include an overall waste management plan and facility-specific waste management plans |



ENVIRONMENTAL

CHAD PORTION

MANAGEMENT

PLAN - EXECUTIVE SUMMARY

Chad

Export

Project

DECEMBER 1997

Executive Summary

This Environmental Management Plan (EMP) describes measures and actions that are planned to be undertaken during the design, construction, operation, and decommissioning of the Chad portion of the Chad Export Project (the Project) to eliminate or reduce key identified biophysical, socioeconomic, and health (collectively referred to as “environmental” or *via* the acronym “BP/SE/H”) issues/impacts to acceptable levels.

A compendium of Project Design Features, Mitigation Plans, and Monitoring Plans that spans all of the Project’s components located within Chad (i.e., the oilfield development [including drilling], the TOTCO Transportation System, and related supporting infrastructure) is provided for twenty eight key environmental topics along with a listing of issues/impacts pertaining to each topic. The environmental topics that are addressed in the EMP are:

- **Biophysical Topics**

- Air Emissions
- Sewage/Wastewater Discharges
- Hydrotesting
- Surface Water and Groundwater Protection
- Surface Water and Groundwater Consumption
- Loss of Groundwater Recharge Areas
- River/Stream Flow Disruption
- River/Stream Bed and Bank Disturbances
- Soil
- Vegetation
- Freshwater Fish
- Wildlife

- **Socioeconomic Topics**

- Migration to the Project Area
- Local and National Business Opportunities and Revenues
- Employment
- Education and Training
- Housing
- Land Use
- Sacred and Cultural Sites
- Semi-Sedentary and Transhumant Cattle Movements
- Fishing Resources

- **Health Topics**

- Respiratory Diseases
- Sexually Transmitted Diseases
- Vector-Borne Diseases
- Water-Borne Diseases

- Food-Borne Diseases
- Occupational Exposures
- Accidents/Injuries

Each topic's Project Design Features and Mitigation/Monitoring Plans are founded on strategies presented in the Chad Environmental Assessment report and requirements contained in a number of Project-specific technical documents. In addition, the actions that the government of Chad will carry out regarding each environmental topic are highlighted.

The organizations that will be established by the Operator of the Project's oilfield development (i.e., Esso Exploration and Production Chad Inc. [EEPCI]), the owner of the TOTCO Transportation System (i.e., Tchad Oil Transportation Company, S.A. [TOTCO]), and the government of Chad to oversee the environmental aspects of the Project during its construction and operations phases are outlined.

At peak staffing levels, the construction phase EEPCI/TOTCO environmental oversight organization will engage 4-7 professionals at a cost of ~ \$US 0.5 - 1.0 million per annum. The EEPCI/TOTCO operations phase organization will feature 2-3 environmental professionals at a cost of ~ \$US 0.25 million per annum - these individuals will perform a number of specialized environmental duties as well as overseeing the environmental-related activities performed by a variety of operations personnel. The efforts of the EEPCI/TOTCO construction and operations phase environmental oversight organizations will be augmented by consultants and specialists on an as-needed basis.

The government of Chad's organizations providing environmental oversight to the Project are also outlined. Chad has already established the National Technical Committee for Environmental Monitoring (Comité Technique National pour le Suivi et le Contrôle des aspects environnementaux, or "CTNSC") to follow oil projects within the country. Further, the CTNSC will form an organization called the Executive Secretariat, which will perform the environmental monitoring of the TOTCO Transportation System and the oilfield development activities. It is expected that the Executive Secretariat will hire 13 people (6 professionals, 7 support staff) and purchase equipment and means of transportation for a total cost of 582 million CFA during the first year of the Project's construction. Thereafter, the budget will be approximately 300 million CFA per year until the end of the construction phase. During the operations phase, the Chadian government's organization related to the Project will feature a decreased number of professionals and a reduced annual budget.

A number of Environmental Management Tools planned for the Project are presented and discussed, including the following:

- Public Consultation Plan for Public Project Documents
- Compensation and Resettlement Plan
- Land Easement Environmental Alignment Sheets

- Community Health Outreach Program
- Waste Management Plans
- Oil Spill Response Plan
- Decommissioning Plan

Successful execution of the EMP requires that the individual actions presented in the text of the document are undertaken by the responsible Project parties (i.e., EEPIC, TOTCO and the government of Chad).

The environmental-related Project specification documents that form the basis of the Project Design Features, Mitigation Plans, and Monitoring Plans recorded in the EMP are included as an Appendix. Additional information supporting selected EMP elements has also been included in a number of other Appendices.

Chapter 1

Overview of the Environmental Management Plan

1.0 Introduction

Chapter 1 provides an introduction to the Environmental Management Plan (EMP) for the Chad portion of the Chad Export Project (hereafter also referred to as “the Project”). The purpose of this Chapter is to:

- define the objective of the EMP,
- provide background information regarding the Project (a more comprehensive overview is provided in Chapter 2),
- introduce and briefly discuss the Project’s Environmental Assessment and Management Processes,
- outline the EMP’s structure, and
- highlight the documents cited to prepare the EMP.

1.1 Environmental Management Plan Objective

It is the objective of this EMP to describe measures and actions that are planned to be undertaken during the design, construction, operation, and decommissioning of the Chad portion of the Project to eliminate or reduce key identified biophysical, socioeconomic, and health (hereafter collectively referred to as “environmental” or *via* the acronym “BP/SE/H”) issues/impacts to acceptable levels. Successful execution of the EMP requires that the individual actions presented in Chapters 3, 4, and 5 of the document are undertaken by the responsible Project parties (i.e., EEPCI {see below}, TOTCO {see below}, and the government of Chad).

In order to accomplish this goal and function as an implementation plan for the Project’s environmental management actions, this EMP:

- denotes the Project’s key environmental topics and their associated issues/impacts;
- provides summaries of specific biophysical-, socioeconomic-, and health-related issues/impacts mitigation and monitoring actions currently planned for the Chad portion of the Project;
- defines and discusses the roles and responsibilities of the key Project participants (i.e., the Operator of the Project’s oilfield development [EEPCI], TOTCO, and the government of Chad);
- outlines EEPCI, TOTCO, and government Project oversight organizations as they relate to environmental matters;
- summarizes the costs associated with these environmental oversight organizations;
- provides a Project schedule; and
- introduces Environmental Management Tools that are envisioned for the Project along with key activities/studies that will assist in the crafting of these tools.

Overall, the Environmental Management Plan extends the analyses presented in the Chad Environmental Assessment (EA) to include additional information/data.

1.2 Background

1.2.1 The Chad Export Project

A **Consortium** of international oil companies consisting of Esso Exploration and Production Chad Inc. (EEPCI) [40% interest], Société Shell Tchadienne de Recherches et D'Exploitation (Shell) [40% interest], and Elf Hydrocarbures Tchad (Elf) [20% interest] has proposed the Chad Export Project. This Project involves the development and transport of crude oil reserves from three oilfields located in southern Chad through neighbouring Cameroon to the Gulf of Guinea on the Atlantic Ocean for commercial export. The two key components of the Project are:

- an oilfield development in the Doba Basin of southern Chad featuring ~ 300 oil production wells, a small number of produced water injection wells, a system of flowlines and gathering pipelines, oilfield-area produced fluids treating facilities, a power plant, and a Central Treating Facility; and
- a Transportation System (see below) that features a 1050 kilometre (650 mile) pipeline to transport crude oil from the oilfields in southern Chad through Cameroon to the Atlantic Ocean, associated pump stations and facilities, and an off-shore marine terminal consisting of a moored Floating Storage and Off-Loading vessel.

Key elements of the Project are highlighted in the Figure below:

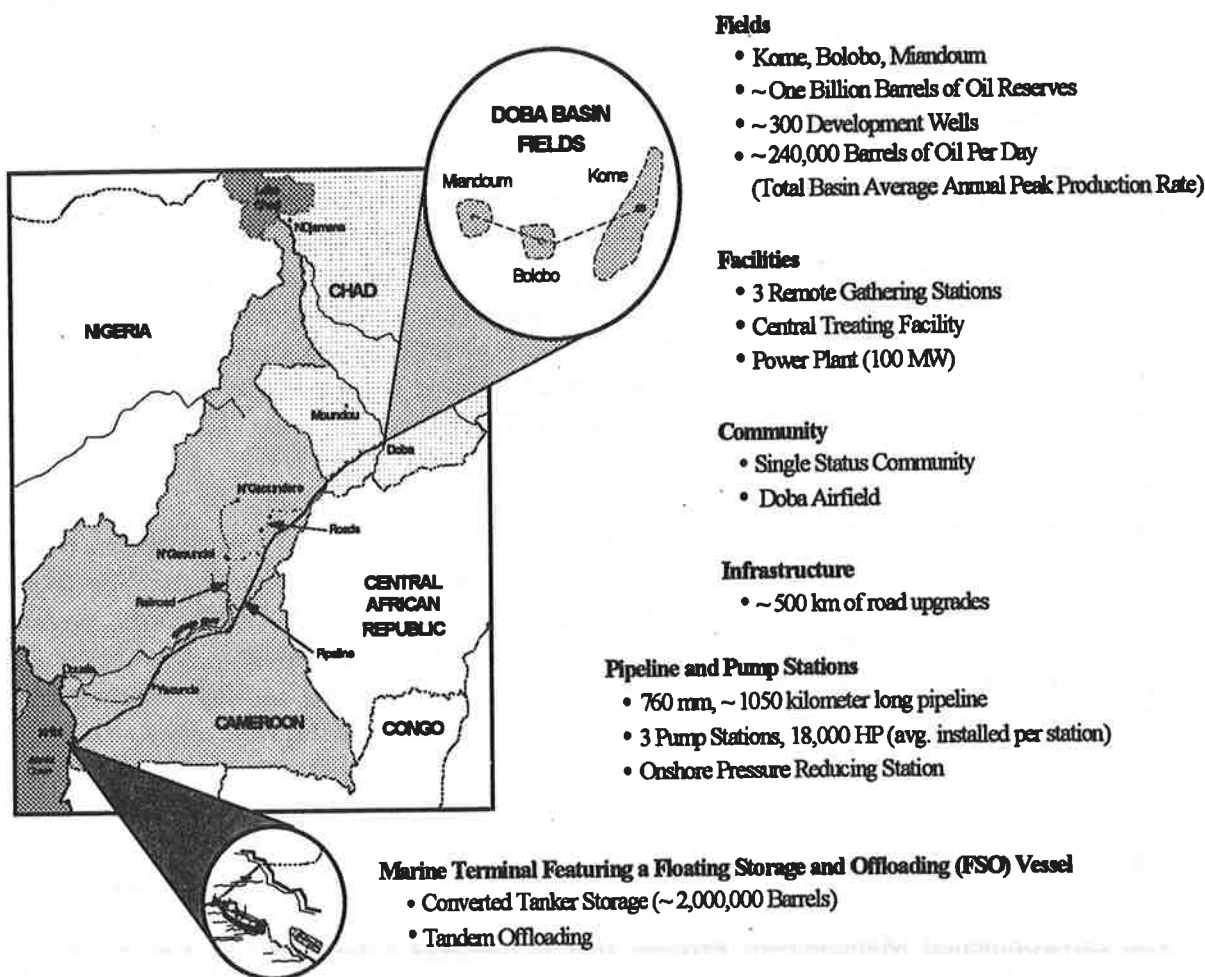


Figure 1.1 Key Elements of the Chad Export Project

EEPCI is the Consortium's designated Operator for the Project's oilfield development component. The segment of the Transportation System (see below) that is located in Chad (hereafter referred to as the "TOTCO Transportation System") will be designed, constructed, operated, maintained, and decommissioned by a Chadian company (Tchad Oil Transportation Company, S.A. = TOTCO) whose shareholders will be an affiliate of each of the Consortium members and the Republic of Chad. Similarly, the design, construction, operation, maintenance, and decommissioning of the portion of the Transportation System (see below) situated in Cameroon (hereafter referred to as the "Cameroon Transportation System"), which includes the marine terminal, will be overseen by a Cameroonian company (Cameroon Oil Transportation Company, S.A. = COTCO) whose shareholders will be an affiliate of each of the Consortium members, the Republic of Chad, and the Republic of Cameroon. Collectively, the TOTCO Transportation System and the Cameroon Transportation System form the Chad Export Project "Transportation System".

For a more detailed description of the Chad Export Project, refer to Chapter 2 in this document and Section 3 in the Chad Environmental Assessment report. In addition, further details concerning TOTCO, COTCO, and EEPCI can be found in Chapter 2.

1.2.2 Project Philosophy

The Project participants are committed to engineering, constructing, and operating the Chad Export Project in accordance with applicable legislation in force. The Project participants are also committed to undertaking this venture in a manner that is in harmony with recognized, appropriate international engineering, construction, and operations practices and standards for crude oil developments. Moreover, this commitment extends to bringing the Project to fruition in a manner that is compatible with the balanced environmental and economic needs of the people of Chad.

In keeping with this overall Project philosophy, it is the intention of the Project participants to avoid, where and when practical, those situations or incidents that could cause unacceptable, adverse biophysical, socioeconomic, or health impacts. For those environmental situations or impacts that cannot be avoided, however, the Project participants are committed to identifying and undertaking appropriate mitigation measures. Comprehensive risk assessments will be conducted during the engineering, construction, and operations phases of the Project to reduce risk and identify situations requiring mitigation.

1.3 Environmental Assessment and Management Processes for the Project

The Environmental Management Process that is depicted below (Figure 1.2) has been adopted for the Project:

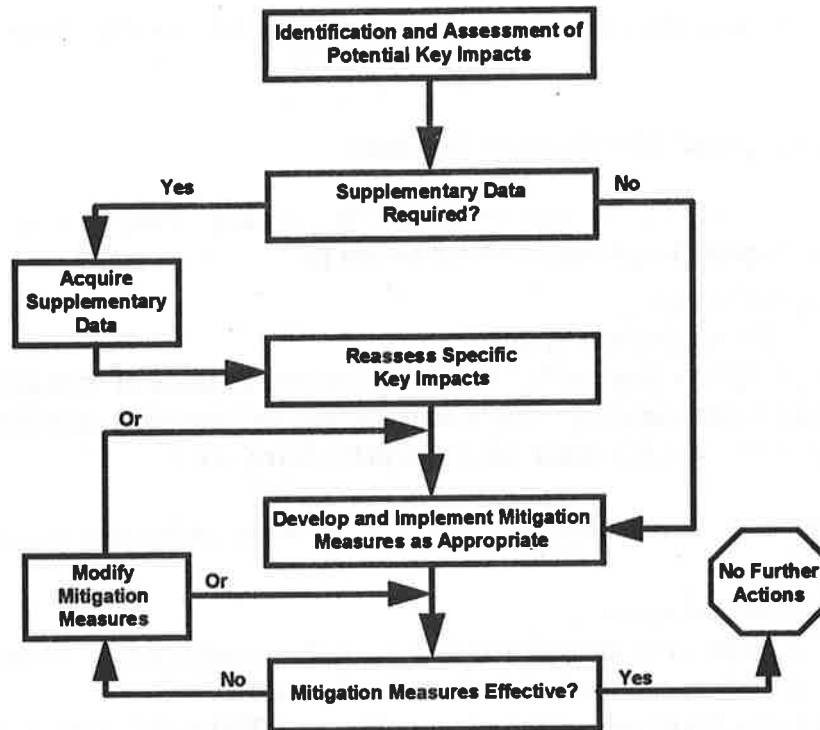


Figure 1.2 Environmental Management Process for the Project

As can be seen, it is the goal of this process to develop mitigation measures for key environmental issues/impacts that, when evaluated, are found to be effective. In some instances, attaining this goal may require iterative enhancements.

In support of this environmental management approach, a three-step Environmental Assessment Process was devised to identify key environmental issues/impacts and develop appropriate mitigation measures. This EA process is shown in Figure 1.3:

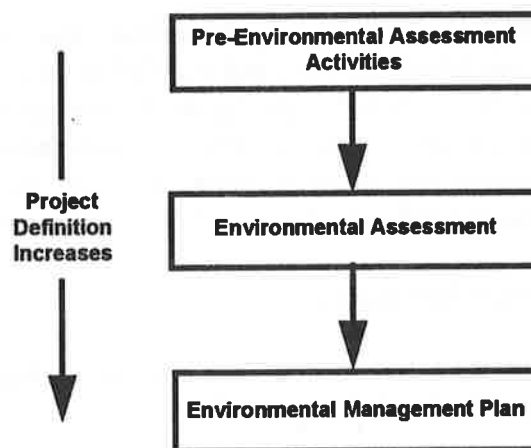


Figure 1.3 Environmental Assessment Process for the Project

The first two steps in this process will be briefly discussed so as to provide a context for the EMP.

1.3.1 Pre-Environmental Assessment Activities

The strategy adopted for the Project during its planning phase was to avoid or limit environmental impacts by paying careful attention to:

- facility siting and sizing;
- routing of the Transportation System;
- Project design options (e.g. surface *versus* sub-surface disposal of produced water); and
- overall design parameters (e.g. landfill construction and operating specifications, local employment plans, potable water treatment procedures, etc.).

A number of activities in support of this strategy were undertaken beginning in 1993. These included:

- data assimilation and review:
 - initiation of an effort to identify and analyze pertinent published and unpublished biophysical, socioeconomic, and health-related data on Chad
- development of a Geographical Information System (GIS) to facilitate capturing and depicting environmental data gathered throughout the life of the Project
- adoption of Terrain Analysis Mapping:
 - (initial) utilization of existing satellite imagery, aerial photographs, and topographical maps
- reconnaissance missions to Chad to:
 - identify and consult with communities that may potentially be affected by the Project
 - identify additional data sources
 - initiate an effort aimed at ground-truthing data and information, including incorporation of findings into the GIS and Terrain Analysis Maps
- development of the Terms of Reference for the Chad Environmental Assessment.

These pre-EA activities proved to be very beneficial, since a number of undesirable environmental impacts were identified early and avoided by recasting certain aspects of the Project (e.g., selection of the proposed route for the Transportation System). Additionally, early recognition of some key environmental issues/impacts allowed for the ready incorporation of appropriate mitigation measures into the basic Project design. These topics are discussed in more detail in Sections 3, 7, and 8 of the Chad EA.

1.3.2 Chad Environmental Assessment

Following the pre-EA activities, a formalized EA was undertaken for the Chad portion of the Project in order to independently and objectively:

- identify the key human, biophysical, socioeconomic, and health issues early in the Project's planning stage;
- acquire and assimilate appropriate data regarding these topics;
- incorporate key learnings into the Project design to the extent practical;

- ensure that the Project is constructed and operated in an environmentally acceptable manner;
- identify mitigation measures to appropriately address key environmental impacts/issues;
- generate a document that would facilitate consultations with various stakeholders on biophysical, socioeconomic, and health-related aspects of the Project;
- satisfy the environmental assessment needs of the government of Chad, the Consortium, TOTCO, and the World Bank and other lenders.

The Chad EA was undertaken at the preliminary engineering phase of the Project. As a result, all aspects of the Project (including specific locations for oilfield-area facilities and the Transportation System land easement) were not in a state of final definition when this study was conducted. Therefore, the EA does not address all location-specific biophysical, socioeconomic, and health topics to the level of detail required to produce a suite of finalized environmental management actions. However, conducting the Chad EA at an early stage in the life of the Project had a number of advantages including:

- significant technical, economic, and environmental issues were identified early and suitable mitigation measures (including issue/impact avoidance) were devised, reviewed, and incorporated into the Project design;
- key stakeholders provided input on the nature and scope of the Project while it still retained a greater degree of flexibility.

Dames & Moore, an internationally respected multi-disciplinary consulting firm, was retained by the Project participants to conduct the Chad EA. The EA was prepared in a manner that was consistent with World Bank requirements and guidelines. In addition, the EA was conducted in accordance with a Terms of Reference (TOR) document that was reviewed and sanctioned by the government of Chad and the World Bank. This TOR document was developed utilizing information collected from a variety of sources, including consultations with several Non-Governmental Organizations.

The Chad EA was conducted from 1995 through 1997.

1.4 Environmental Management Plan Structure

The Environmental Management Plan for the Chad portion of the Project is structured in the following manner:

- Chapter 1. Overview of the Environmental Management Plan
- Chapter 2. Overview of the Chad Export Project
- Chapter 3. Project Management Framework and the EEPCI/TOTCO Environmental Oversight Organizations

| | |
|------------|--|
| Chapter 4. | Role of the Chad Government and Its Environmental Oversight Organizations |
| Chapter 5. | Environmental Management Actions |
| Chapter 6. | Environmental Management Tools |
| Chapter 7. | List of Contributors to the Environmental Management Plan |
| Appendices | <ul style="list-style-type: none"> - List of Acronyms Appearing in the Environmental Management Plan - Chad Health Risk Matrix - Overview of the Transportation System's Land Easement Centreline Survey - Sample Land Easement Environmental Alignment Sheet for the Transportation System - Selected Job Specification Coordination Procedures - Selected General Project Specifications - Selected Cameroon/Chad Specifications - Selected Esso Chad Specifications |

Chapter 1 is intended to describe the purpose, objective, and format of the EMP and the method by which this document was prepared.

Chapter 2 provides an overview of the Chad Export Project. Background information is provided on the following topics:

- components of the Project and their associated key facilities;
- legal framework for the Project;
- Project decommissioning;
- Project schedule; and
- the physical, biophysical, socioeconomic, and health-related settings in the Republic of Chad in relation to the Project.

Chapter 3 is devoted to a discussion of the:

- Project's management framework,
- EEPCI/TOTCO construction and operations phase environmental oversight organizations,
- relationship with contractors during the Project's construction phase.

Financial and personnel requirements for the EEPCI/TOTCO environmental oversight organizations have been included in the text.

Chapter 4 is focused on Project involvement-related matters regarding the Republic of Chad. This chapter outlines three topics:

- the government's areas of responsibility regarding environmental issues and impacts,

- construction and operations phase Project environmental oversight organizations of the government, and
- the manner in which the government intends to fulfill its environmental oversight obligations.

Financial and personnel requirements for the government's Project environmental oversight organizations are included in the text of Chapter 4 along with a brief discussion of the institutional strengthening requirements within the government of Chad necessitated by the Project.

Chapter 5 is the technical core of the EMP, for in it appears a summary of the:

- key biophysical, socioeconomic, and health-related topics related to the development of the Chadian oilfields and the TOTCO Transportation System and their associated issues/impacts;
- items incorporated into the design of the oilfield development and the TOTCO Transportation System to avoid or mitigate environmental issues/impacts;
- environmental mitigation and monitoring plans;
- environmental actions and responsibilities of the government of Chad.

Chapter 6 outlines a number of Environmental Management Tools that are planned for the Project along with key studies/activities supporting the synthesis of these tools.

Chapter 7 provides a listing of the individuals who have contributed to the drafting of the Environmental Management Plan.

Finally, a number of Project-specific documents and data compilations that support the contents of the EMP are provided as appendices.

1.5 Environmental Management Plan Preparation

Exxon Production Research Company was contracted to oversee the development of the Environmental Management Plan for the Chad portion of the Project. A multi-disciplinary team featuring Esso/Exxon environmental specialists, environmental, socioeconomic, and health specialists from Dames & Moore, and a number of independent environmental scientists/consultants was assembled to prepare the document. In addition, key Chadian government officials were involved in drafting Chapter 4.

The Environmental Assessment report for the Chad portion of the Project was used as a starting point for drafting this EMP. In addition to various World Bank directives that were in force in September, 1997, the following Project-specific documents were consulted extensively during the preparation of this document:

- **Selected Job Specification Coordination Procedures (JSCP):**
 - JSCP 19 Changes in Work / Deviations from Job Specifications
 - JSCP 22 Project Safety Practices
 - JSCP 23 Occupational Health, Medical Facilities, and Sanitation
 - JSCP 27 Training
 - JSCP 29 Socioeconomic Interactions
 - JSCP 30 Environmental Management
 - JSCP 31 Interface Management
- **Selected General Project Specifications (GPS):**
 - GPS-001 Camps and Facilities
 - GPS-002 Catering Services
 - GPS-003 Potable Water Treatment, Storage, and Distribution (Temporary)
 - GPS-004 Packaged Sewage Treatment System (Temporary)
 - GPS-005 Water Wells (Temporary)
 - GPS-006 Waste Incinerator (Temporary)
 - GPS-007 Non-Hazardous Solid Waste Landfill
 - GPS-008 Project Safety Requirements
 - GPS-010 Health Plan
 - GPS-011 Waste Management
 - GPS-012 Socioeconomic Action Plan
 - GPS-018 Septic Tank and Effluent Disposal into Drainage Field (Temporary)
 - GPS-020 Survey Camps and Facilities
 - GPS-021 Survey Catering Services
- **Selected Cameroon/Chad Specifications (CCS): {applicable to the Transportation System}**
 - CCS 7-1-10 Waste Incinerator
 - CCS 11-10-1 Water Wells
 - CCS 11-10-2 Potable Water Treatment, Storage, and Distribution
 - CCS 11-11-1 Packaged Sewage Treatment System
 - CCS 13-4-1 Solid Waste Landfill
 - CCS 21-20-107 Soil Erosion Mitigation
 - CCS 21-20-108 Environmental Impact Mitigation

- Selected Esso Chad Specifications (ECS): {applicable to development of the oilfield areas}
 - ECS 7-4-1 Waste Incinerators
 - ECS 11-1-1 Water Wells
 - ECS 11-1-2 Potable Water Treatment, Storage, and Distribution
 - ECS 11-9-1 Septic Tank and Effluent Disposal into Drainage Field
 - ECS 13-4-1 Solid Waste Landfill
 - ECS 26-1-4 Soil Erosion Mitigation
 - ECS 26-1-5 Environmental Impact Mitigation

Each of these JSCP, GPS, CCS, and ECS documents is appended to the EMP.

1.6 Accuracy/Applicability of Information and Statements Contained in the Environmental Management Plan

The information and statements contained in this Environmental Management Plan are considered to be accurate and applicable to the Chad portion of the Chad Export Project in its current form. However, as the Project progresses through detailed engineering, construction, and into operations, changes in its scope are bound to occur. Accordingly, it may be necessary to modify or delete some of the environmental management plans and actions contained in this EMP to properly reflect Project changes. Similarly, it may be necessary to add new environmental management plans and actions to appropriately address new or unforeseen Project situations. In either case, all modifications or augmentations of the Project's environmental management strategies, plans, and actions will be accomplished by adhering to a rigorous, systematic process to steward such changes. The Project's Management of Change Process is outlined in Chapter 3.

ENVIRONMENTAL

CAMEROON PORTION

MANAGEMENT

PLAN - EXECUTIVE SUMMARY

Chad

Export

Project

FEBRUARY | 1998

Executive Summary

This Environmental Management Plan (EMP) describes measures and actions that will be implemented by the Republic of Cameroon and COTCO (i.e., the Cameroon Oil Transportation Company, S.A.) during the construction, operation, maintenance, and decommissioning of the Cameroon portion of the Chad Export Project to eliminate or reduce key potential biophysical, socioeconomic, and health (collectively referred to as “environmental” or *via* the acronym “BP/SE/H”) impacts identified in the Cameroon Environmental Assessment (EA) to acceptable levels. Hereafter, the term “Chad Export Project” is used to describe the combination of the Cameroon and Chad portions of the Chad Export Project. Conversely, the term “Project” in this document refers to the Cameroon portion of the Chad Export Project only. Successful execution of this EMP requires that the specific actions presented in the text are committed to be undertaken by the responsible Project parties (i.e., the Republic of Cameroon and COTCO).

A compendium of Project Design Features, Mitigation Plans, and Monitoring Plans that spans all of the Project’s components is provided for thirty two key environmental topics along with a listing of potential impacts pertaining to each topic. The environmental topics that are addressed in the EMP are:

- **Biophysical Topics**

- Air Emissions
- Sewage/Wastewater Discharges
- Hydrotesting
- Surface Water and Groundwater Protection
- Surface Water and Groundwater Consumption
- Loss of Groundwater Recharge Areas
- River/Stream Flow Disruption
- River/Stream Bed and Bank Disturbances
- Soil
- Vegetation
- Freshwater Fish
- Wildlife
- Marine Discharges
- Surfzone/Seabed Disturbances
- Marine Flora and Fauna

- **Socioeconomic Topics**

- Migration to the Project Area
- Local and National Business Opportunities and Revenues
- Employment
- Education and Training
- Housing
- Land Use

- Sacred and Cultural Sites
- Semi-Sedentary and Transhumant Cattle Movements
- Fishing Resources
- Indigenous Peoples

- **Health Topics**

- Respiratory Diseases
- Sexually Transmitted Diseases
- Vector-Borne Diseases
- Water-Borne Diseases
- Food-Borne Diseases
- Occupational Exposures
- Accidents/Injuries

Each topic's Project Design Features and Mitigation/Monitoring Plans are founded on strategies presented in the Environmental Assessment report and requirements contained in a number of Project-specific technical documents. In addition, the actions that the Republic of Cameroon and COTCO will carry out regarding each environmental topic are highlighted.

The organizations that will be established by the Republic of Cameroon and COTCO to oversee the environmental aspects of the Project during its construction and operations phases are outlined.

At peak staffing levels, COTCO's construction phase environmental oversight organization will engage 11-15 professionals at a cost of ~ \$US 1.5 - 2.0 million per annum (~ 900 - 1200 million FCFA per annum). COTCO's operations phase organization will feature 2-3 environmental professionals at a cost of ~ \$US 0.5 million per annum (~ 300 million FCFA per annum) - these individuals will perform a number of specialized environmental duties as well as overseeing the environmental-related activities performed by a variety of operations/maintenance personnel. The efforts of the COTCO construction and operations phase environmental oversight organizations will be augmented by consultants and specialists on an as-needed basis.

The Republic of Cameroon's organization providing administrative supervision and inspection to the Project is also outlined. *Via* the Decree implementing the Law governing the Transportation by Pipeline of Hydrocarbons Originating from Other Countries, the Republic of Cameroon has established the Pipeline Steering and Monitoring Committee and the Pipeline Inspection Service. The Pipeline Steering and Monitoring Committee will act as the coordinator and liaison between various Cameroon administrations and COTCO. The Pipeline Inspection Service provides the administrative supervision and technical control of the administration related to the construction, operation, and maintenance works of the Cameroon Transportation System. Special legal text will govern this organization and the working order of these intervention agencies.

A number of Environmental Management Tools planned for the Project are presented and discussed, including the following:

- **Public Consultation Plan for Public Project Documents**
- **Compensation Plan**
- **Land Easement Environmental Alignment Sheets**
- **Community Health Outreach Program**
- **Land/System Easement Access Management Plan**
- **Waste Management Plans**
- **Oil Spill Response Plan**
- **Decommissioning Plan**

The environmental-related Project specification documents that form the basis of the Project Design Features, Mitigation Plans, and Monitoring Plans recorded in the EMP are included in Appendix VI. Additional information supporting selected EMP elements has also been included in a number of other Appendices.

Chapter 1

Overview of the Environmental Management Plan

1.0 Explanatory Notes

Hereafter in this Environmental Management Plan (EMP), the following terms apply:

Chad Export Project: Represents the combination of the Cameroon and Chad portions of the Chad Export Project.

Project: Refers to the Cameroon portion of the Chad Export Project only.

BP/SE/H or Environmental: Represents “biophysical, socioeconomic, and health”.

Operations Phase: Refers to that phase of the Project that entails operating and maintenance activities.

FCFA: Represents the legal currency of the Republic of Cameroon. For the purposes of this document, it is assumed that the exchange rate is \$1 US = 600 FCFA.

1.1 Introduction

Chapter 1 provides an introduction to the Environmental Management Plan for the Project.

The purpose of this Chapter is to:

- define the objective of the EMP,
- provide background information regarding the Chad Export Project (a more comprehensive overview is provided in Chapter 2),
- introduce and briefly discuss the Project’s Environmental Assessment and Management Processes,
- outline the EMP’s structure, and
- highlight the documents cited to prepare the EMP.

1.2 Environmental Management Plan Objective

This Environmental Management Plan describes measures and actions that will be implemented by the Republic of Cameroon and COTCO (i.e., the Cameroon Oil Transportation Company, S.A.) during the construction, operation/maintenance, and decommissioning of the Project to eliminate or reduce key potential biophysical, socioeconomic, and health impacts identified in the Cameroon Environmental Assessment (EA) to acceptable levels. Successful execution of this EMP requires that the specific

actions presented in the text are committed to be undertaken by the responsible Project parties (i.e., the Republic of Cameroon and COTCO).

In order to accomplish this goal and function as an implementation plan for the Project's environmental management actions, this EMP:

- denotes the Project's key environmental topics and their associated potential impacts;
- provides summaries of specific biophysical-, socioeconomic-, and health-related impacts mitigation and monitoring actions currently planned for the Project;
- defines and defines the roles and responsibilities of the key Project participants (i.e., the Republic of Cameroon and COTCO);
- outlines the Republic of Cameroon and COTCO Project oversight organizations as they relate to environmental matters;
- summarizes the costs associated with these environmental oversight organizations;
- provides a schedule for the Chad Export Project; and
- introduces Environmental Management Tools that are envisioned for the Project along with key activities/studies that will assist in the crafting of these tools.

Overall, the Environmental Management Plan extends the analyses presented in the Cameroon Environmental Assessment (EA) to include additional information/data.

1.3 Background

1.3.1 The Chad Export Project

A Consortium of international oil companies consisting of Esso Exploration and Production Chad Inc. (EEPCI), Société Shell Tchadienne de Recherches et D'Exploitation (Shell), and Elf Hydrocarbures Tchad (Elf) has proposed the Chad Export Project. This venture involves the development and transport of crude oil reserves from three oilfields located in southern Chad to the Cameroonian Atlantic coast for commercial export. The two key components of the Chad Export Project are:

- an oilfield development in the Doba Basin of southern Chad featuring ~ 300 oil production wells, a small number of produced water injection wells, a system of flowlines and gathering pipelines, and produced fluids treating facilities; and
- a Transportation System (see below) that features a 1050 kilometre (650 mile) pipeline to transport crude oil from the oilfields in southern Chad to the Cameroonian Atlantic coast, associated pump stations and facilities, and an off-shore marine terminal consisting of a Floating Storage and Off-Loading vessel.

Key elements of the Chad Export Project are highlighted in the Figure below:

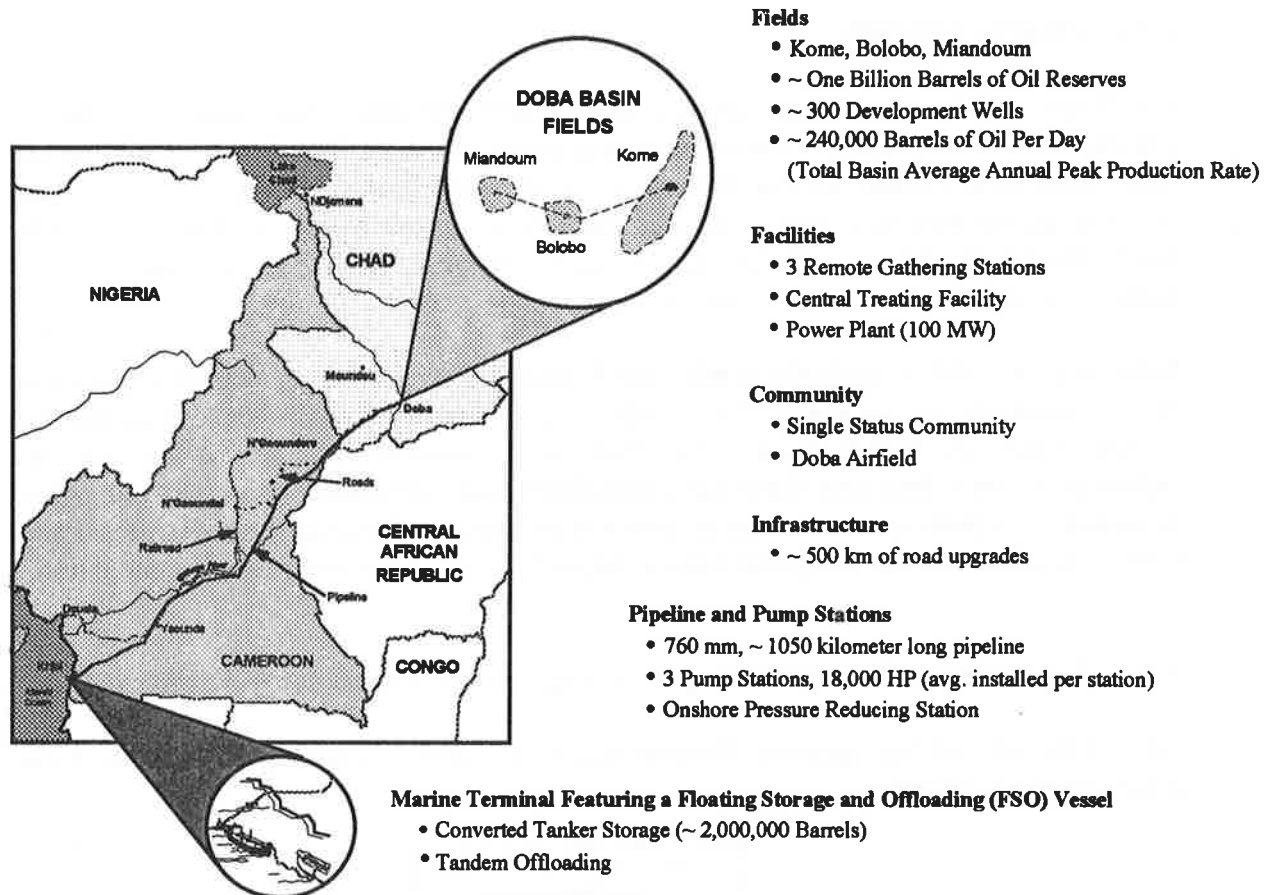


Figure 1.1 Key Elements of the Chad Export Project

Together, the portion of the Transportation System located within Cameroon and the portion of the Transportation System located within Chad form the Chad Export Project's "Transportation System". The design, construction, operation/maintenance, and decommissioning of the portion of the Transportation System (see below) situated in Cameroon (hereafter referred to as the "Cameroon Transportation System"), which includes the marine terminal, will be the responsibility of a Cameroonian company (Cameroon Oil Transportation Company, S.A. = COTCO) whose shareholders are an affiliate of each of the Consortium members, the Republic of Cameroon, and the Republic of Chad.

For a more detailed description of the Chad Export Project, refer to Chapter 2 in this document and Section 3 in the Cameroon Environmental Assessment report. In addition, further details concerning COTCO can be found in Chapter 2.

1.3.2 Project Philosophy

The Project will be engineered, constructed, operated/maintained, and decommissioned in accordance with applicable Cameroonian legislation in force. The Project will also be undertaken in a manner that is in harmony with recognized, appropriate international engineering, construction, and operations/maintenance practices and standards for crude oil developments. Moreover, the Project will be brought to fruition in a manner that balances its environmental and economic aspects.

In keeping with this overall philosophy, the Project will avoid, where and when practical, those situations or incidents that could cause unacceptable, adverse biophysical, socioeconomic, or health impacts. For those environmental situations or impacts that cannot be avoided, however, the Project will identify and undertake appropriate mitigation measures. Comprehensive risk assessments will be conducted during the construction and operations phases of the Project to reduce risk and identify situations requiring mitigation.

1.4 Environmental Assessment and Management Processes for the Project

The Environmental Management Process that is depicted below (Figure 1.2) has been adopted for the Project:

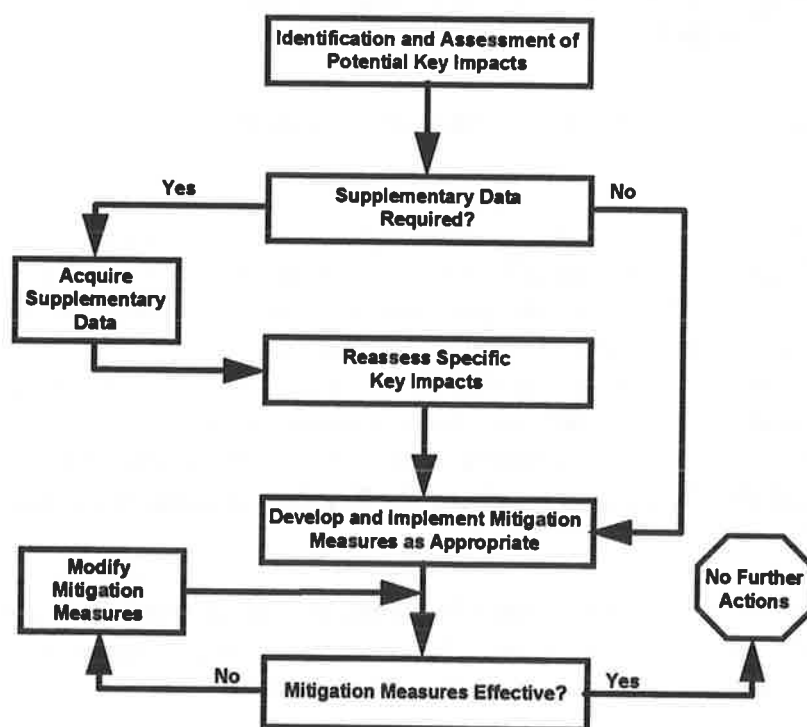


Figure 1.2 Environmental Management Process for the Project

As can be seen, it is the goal of this process to develop appropriate mitigation measures for key potential environmental impacts that, when evaluated, are found to be effective. In some instances, attaining this goal may require iterative enhancements.

In support of this environmental management approach, a three-step Environmental Assessment Process was devised to identify key potential environmental impacts and develop appropriate mitigation measures. This EA process is shown in Figure 1.3:

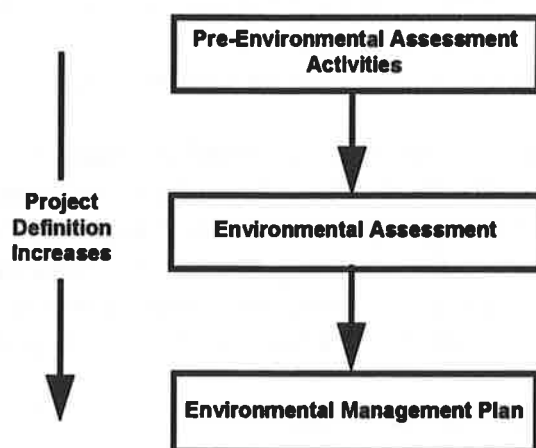


Figure 1.3 Environmental Assessment Process for the Project

The first two steps in this process will be briefly discussed so as to provide a context for the EMP.

1.4.1 Pre-Environmental Assessment Activities

The strategy adopted for the Project during its planning phase was to avoid or limit environmental impacts by paying careful attention to:

- facility siting and sizing;
- routing of the Cameroon Transportation System;
- Project design options (e.g., onshore *versus* offshore marine terminal); and
- overall design parameters (e.g., landfill construction and operating specifications, local employment plans, potable water treatment procedures).

A number of activities in support of this strategy were undertaken beginning in 1993. These included:

- data assimilation and review:
 - initiation of an effort to identify and analyze pertinent published and unpublished biophysical, socioeconomic, and health-related data on Cameroon
- development of a Geographical Information System (GIS) to facilitate capturing and depicting environmental data gathered throughout the life of the Project
- adoption of a Terrain Analysis Mapping approach:

- (initial) utilization of existing satellite imagery, aerial photographs, and topographical maps
- reconnaissance missions to Cameroon to:
 - identify and consult with communities that may potentially be affected by the Project
 - identify additional data sources
 - initiate an effort aimed at ground-truthing data and information, including incorporation of findings into the GIS and Terrain Analysis Maps
- identification and analysis of three potential Cameroon Transportation System route corridors and two potential marine terminal sites
- development of the Terms of Reference for the Cameroon Environmental Assessment.

These pre-EA activities proved to be very beneficial, since a number of undesirable environmental impacts were identified early and avoided by recasting certain aspects of the Project (e.g., selection of the proposed route for the Cameroon Transportation System). Additionally, early recognition of some key potential environmental impacts allowed for the ready incorporation of appropriate mitigation measures into the basic Project design. These topics are discussed in more detail in Sections 3, 7, and 8 of the Cameroon EA.

1.4.2 Cameroon Environmental Assessment

Following the pre-EA activities, a formalized EA was undertaken in order to independently and objectively:

- identify the key human, biophysical, socioeconomic, and health issues early in the Project's planning stage;
- acquire and assimilate appropriate data regarding these topics;
- incorporate key learnings into the Project design to the extent practical;
- ensure that the Project is constructed and operated/maintained in an environmentally acceptable manner;
- identify mitigation measures to appropriately address key potential environmental impacts;
- generate a document that would facilitate consultations with various stakeholders on biophysical, socioeconomic, and health-related aspects of the Project;
- satisfy the environmental assessment needs of the Republic of Cameroon, COTCO, and the World Bank and other lenders.

The EA was undertaken at the preliminary engineering phase of the Project. As a result, all aspects of the Project (including the exact location for the Cameroon Transportation System land easement) were not in a state of final definition when this study was conducted. Therefore, the EA does not address all location-specific biophysical, socioeconomic, and health topics to the level of detail required to produce a suite of finalized environmental management actions. However, conducting the Cameroon EA at an early stage in the life of the Project had a number of advantages including:

- significant potential technical, economic, and environmental impacts were identified early and suitable mitigation measures (including impact(s) avoidance) were devised, reviewed, and incorporated into the Project design;

- key stakeholders provided input on the nature and scope of the Project while it still retained a greater degree of flexibility.

Dames & Moore, an internationally respected multi-disciplinary consulting firm, was retained to conduct the Cameroon EA. The EA was prepared in a manner that was consistent with World Bank requirements and guidelines. In addition, the EA was conducted in accordance with a Terms of Reference (TOR) document that was reviewed and sanctioned by the Republic of Cameroon and the World Bank. This TOR document was developed utilizing information collected from a variety of sources, including consultations with several Non-Governmental Organizations.

The Cameroon EA was conducted from 1995 through 1997.

1.5 Environmental Management Plan Structure

The Environmental Management Plan for the Project is structured in the following manner:

- Chapter 1. Overview of the Environmental Management Plan
- Chapter 2. Overview of the Chad Export Project
- Chapter 3. Project Management Framework and COTCO's Environmental Oversight Organizations
- Chapter 4. Role of the Republic of Cameroon and Its Administrative Supervision and Technical Inspection Organization
- Chapter 5. Environmental Management Actions
- Chapter 6. Environmental Management Tools
- Appendices
 - I List of Contributors to the Environmental Management Plan
 - II List of Acronyms Appearing in the Environmental Management Plan
 - III Cameroon Health Risk Matrix
 - IV Overview of the Cameroon Transportation System's Land Easement Centreline Survey
 - V Sample Land Easement Environmental Alignment Sheet
 - VI
 - Selected Job Specification Coordination Procedures
 - Selected General Project Specifications
 - Selected Cameroon/Chad Specifications

Chapter 1 is intended to describe the purpose, objective, and format of the EMP and the method by which this document was prepared.

Chapter 2 provides an overview of the Chad Export Project. Background information is provided on the following topics:

- components of the Chad Export Project and their associated key facilities;
- legal framework for the Project;
- Project decommissioning;
- schedule for the Chad Export Project; and
- the physical, biophysical, socioeconomic, and health-related setting in the Republic of Cameroon in relation to the Project.

Chapter 3 is devoted to a discussion of:

- the Project's management framework,
- COTCO's construction and operations phase environmental oversight organizations,
- the relationship with contractors during the Project's construction phase.

Financial and personnel requirements for COTCO's environmental oversight organizations have been included in the text.

Chapter 4 is focused on Project-related matters regarding the Republic of Cameroon. This chapter outlines three topics:

- the Republic of Cameroon's areas of responsibility regarding potential environmental impacts,
- the Republic of Cameroon's administrative supervision and technical inspection organization during the construction and operations phases of the Project, especially regarding environmental matters, and
- the manner in which the Republic of Cameroon intends to fulfill its administrative supervision and technical inspection obligations regarding environmental matters.

A brief discussion of the institutional strengthening requirements within the Republic of Cameroon's administrative supervision and technical inspection organization necessitated by the Project is also included in Chapter 4.

Chapter 5 is the technical core of the EMP, for in it appears:

- key biophysical, socioeconomic, and health-related topics related to the Project and their associated potential impacts;
- items incorporated into the design of the Project to avoid or mitigate potential environmental impacts;
- environmental mitigation and monitoring plans;
- environmental actions and responsibilities of the Republic of Cameroon and COTCO.

Chapter 6 outlines a number of Environmental Management Tools that are planned for the Project along with key studies/activities supporting the synthesis of these tools.

Finally, a number of Project-specific documents and data compilations that support the contents of the EMP are provided as appendices.

1.6 Environmental Management Plan Preparation

Exxon Production Research Company developed the Environmental Management Plan for the Project. A multi-disciplinary team featuring Esso/Exxon environmental specialists, environmental, socioeconomic, and health specialists from Dames & Moore, and a number of independent environmental scientists/consultants was assembled to prepare the document. In addition, representatives of the Republic of Cameroon were involved in drafting Chapter 4.

The Environmental Assessment report for the Project was used as a starting point for drafting this EMP. In addition to various World Bank directives that were in force in September, 1997, the following Project-specific documents were consulted extensively during the preparation of this document:

- **Selected Job Specification Coordination Procedures (JSCP):**
 - JSCP 19 Changes in Work / Deviations from Job Specifications
 - JSCP 22 Project Safety Practices
 - JSCP 23 Occupational Health, Medical Facilities, and Sanitation
 - JSCP 27 Training
 - JSCP 29 Socioeconomic Interactions
 - JSCP 30 Environmental Management
 - JSCP 31 Interface Management
- **Selected General Project Specifications (GPS):**
 - GPS-001 Camps and Facilities
 - GPS-002 Catering Services
 - GPS-003 Potable Water Treatment, Storage, and Distribution (Temporary)
 - GPS-004 Packaged Sewage Treatment System (Temporary)
 - GPS-005 Water Wells (Temporary)
 - GPS-006 Waste Incinerator (Temporary)
 - GPS-007 Non-Hazardous Solid Waste Landfill
 - GPS-008 Project Safety Requirements
 - GPS-010 Health Plan
 - GPS-011 Waste Management
 - GPS-012 Socioeconomic Action Plan
 - GPS-018 Septic Tank and Effluent Disposal into Drainage Field (Temporary)
 - GPS-020 Survey Camps and Facilities
 - GPS-021 Survey Catering Services

• **Selected Cameroon/Chad Specifications (CCS):**

- CCS 7-1-10 Waste Incinerator
- CCS 11-10-1 Water Wells
- CCS 11-10-2 Potable Water Treatment, Storage, and Distribution
- CCS 11-11-1 Packaged Sewage Treatment System
- CCS 13-4-1 Solid Waste Landfill
- CCS 21-20-107 Soil Erosion Mitigation
- CCS 21-20-108 Environmental Impact Mitigation

Each of these JSCP, GPS, and CCS documents is appended to the EMP (see Appendix VI).

1.7 Accuracy/Applicability of Information and Statements Contained in the Environmental Management Plan

The information and statements contained in this Environmental Management Plan are considered to be accurate and applicable to the Project in its current form. However, as the Project progresses through detailed engineering, construction, and into its operations phase, changes in its scope are bound to occur. Accordingly, it may be necessary to modify or delete some of the environmental management plans and actions contained in this EMP to properly reflect Project changes. Similarly, it may be necessary to add new environmental management plans and actions to appropriately address new or unforeseen Project situations. In either case, all modifications or augmentations of the Project's environmental management strategies, plans, and actions will be accomplished by adhering to a rigorous, systematic process to steward such changes. The Project's Management of Change Process is outlined in Chapter 3.

COMPENSATION AND

CHAD

RESETTLEMENT PLAN

- EXECUTIVE SUMMARY

Chad

Export

Project

FEBRUARY 1998

1.0 INTRODUCTION

1.1 INTRODUCTION

The Chad Export Project Compensation and Resettlement Plan was developed to meet World Bank Directives on compensation and involuntary resettlement. The Plan's basic goals and principles (Table 1-1) are shared by Esso Exploration and Production Chad Inc. (EEPCI), Tchad Oil Transportation Company (TOTCO), its co-venturers, the World Bank, and the Government of Chad, and are intended to minimize disruption to local peoples. This philosophy considers resettlement as the last resort to Project-driven changes in land use. The Plan calls for fair, adequate, and monitored compensation for adversely affected individuals, households, and communities. The disruption of local peoples is to be minimized, and the social fabric of Project area communities respected.

About 2000 hectares (ha) of land will be needed, most only temporarily, during construction, of which about 10 percent has already been acquired. Of this number, approximately 367 ha will be permanently closed to public use during EEPCI/TOTCO's operations phase. To accomplish this, when economically and technically feasible, land needed temporarily during construction will be reclaimed and made available to communities either as public improvements or reclaimed land.

The following Sections present procedures for determining eligibility for compensation, resettlement, and resettlement alternatives. Implementation procedures and the basis on which compensation is calculated are explained. The Plan is based on Project design and scheduling as of the first quarter of 1998. Section 8.0 sets forth procedures for managing changes that may occur as the Project or local conditions evolve.

1.2 ELEMENTS OF THE PLAN

Key elements include:

- Minimizing Project land use, reclaiming land after construction, and making as much land available as possible to customary users.
- Designing the Project to avoid village relocation.
- Meeting the intent of World Bank guidelines on resettlement and all local laws.
- Recognizing Chad's unique cultural and legal issues.
- Minimizing potential resettlement (an estimated 150 households).
- Modeling resettlement on the existing cultural institution of resettlement common among ethnic groups in the area.
- Determining compensation values based on extensive data collection and socio-economic analysis in the area.
- Providing for EEPCI/TOTCO payment for compensation and resettlement at current market values.
- Incorporating preferences voiced during extensive consultation with local peoples, Non-Governmental Agencies (NGOs), and other stakeholders.
- Providing compensation for both private land owners and customary users.

1.3 PROPOSED PROJECT

The Chad Export Project will produce, transport, and sell oil to world markets in a manner that balances Chad's environmental, economic, and social needs. Three oil fields in Logone Oriental Prefecture will be developed and a pipeline Transportation System built across Cameroon to a floating offshore storage facility in southwestern Cameroon (Figure 1-1).

In Chad, most activity will occur in the Oil Field Development Area (OFDA) in the Cantons of Bero, Kome, and Miandoum (Figure 1-2), where plans call for constructing production facilities and for drilling about 300 wells. Facilities have been sited to avoid settlements and include an operations center, storage areas, roads, an airfield, and housing. Placement of facilities is known except for well drill pads and associated lines. Wells will be sited over a period of several years as data are collected and analyzed from initial test and production wells.

1.4 SUPPORTING STUDIES AND ENVIRONMENTAL DOCUMENTS

An *Environmental Assessment*¹ of the Chad Export Project was prepared to meet World Bank guidelines. The *Environmental Assessment* (EA) identified physical, biological, and human socioeconomic environmental issues in order to minimize adverse impacts through avoidance or redesign early in the Project planning process and adoption of mitigation measures for the environment.

An *Environmental Management Plan*² (EMP) has also been prepared. The EMP provides summaries of specific biophysical, socioeconomic, and health-related Project expectations and issues, along with associated Project mitigations and monitoring actions. Other elements of the EMP include discussion of roles and responsibilities of key participants (e.g., EEPCI/TOTCO and the Government of Chad), oversight organizations, and environmental management tools.

Socioeconomic studies related to potential Project impacts and resettlement were completed in support of the EA and preparation of this Plan. Field studies were conducted by Dr. Ellen Brown, who has 30 years of research experience in Chad. Dr. Brown and her team of Chadian sociological assistants completed over 13 work months of on-the-ground research and extensive public consultation. Appendix B, "Human Environment," of the *Environmental Assessment* contains the full 140-page text of Dr. Brown's research report.

Consultation was carried out in 61 communities (villages and towns), where residents proposed ideas and debated propositions about resettlement and compensation (Section 2.0). Many Plan recommendations were advanced by the people potentially impacted, the local populations in the OFDA cantons. Compensation valuations evolved out of the population's previous experiences with compensation and their

¹ Dames & Moore, October 1997, *Environmental Assessment, Chad Export Project: Chad Portion*, Esso Exploration and Production Chad, Inc.

² *Chad Export Project, Environmental Management Plan*, Exxon Production Research Company, 1997.

judgment of what is fair both for individuals and for the community.

Dr. Brown also studied current and on-going increases in pressure on land in the local slash and burn/mulch farming system. This increased pressure has resulted in decreasing soil fertility. To minimize the potential impact of project land needs, early Project redesign resulted in a significant reduction in Project land needs.

Community consultation and a Public Consultation Program has and will continue to provide information on the scope and nature of Project activities, and issues of concern, such as the availability of jobs. Villages in the Project vicinity will be informed of possible land needs and resettlement options during this pre-construction public consultation period.

Additional socioeconomic information will be collected during the 1998 Centerline survey. Ongoing consultation and "effect monitoring" throughout Project construction will evaluate the degree to which EEPCI/TOTCO socioeconomic goals are achieved (Section 8.0).

1.5 SOCIAL AND CULTURAL CONTEXT

Social-cultural values molded the compensation principles.

| VALUE | RESPONSE |
|---|---|
| A village has a powerful attachment to its location. | Facilities were sited to avoid villages; minimize land needs; and make reclaimed land available to communities. |
| People attach both emotional and economic value to the labor they invest in their fields and homes. | Individuals will be compensated for their labor investment, as well as for materials. |
| Community-wide agreement is the basis for all action. | Community-wide support was solicited for the Plan and will be sought throughout the compensation and resettlement process. |
| Equality is highly valued. There is a strong cultural bias against creating "haves" and "have-nots." | Community compensation avoids creating "haves" and "have-nots," and allows strong and positive social ties and integration into a host community. |
| A cultural value of people living in the area is that any act of giving or taking involves, not equal treatment, but preference and discrimination. Taking land from one person or village, compensating some individuals or groups and not others, is likely to be viewed as discrimination or preference. | <p>The compensation process for directly affected peoples will be open and transparent.</p> <ul style="list-style-type: none"> • Compensation rates will be simple and straightforward, to make it easy for the local population to recognize that compensation has been fairly paid. • Public consultation in affected areas will clearly explain what will and will not be compensated for and when someone is eligible for compensation. • The goal is to have one person see that the same standard applies to him as to others. |

Even though the Plan contains compensation and resettlement processes and valuations proposed and agreed to by most of the population, it is inevitable that some individuals in this culture will perceive partiality and favoritism. Public consultation and transparency is important, but will not completely avoid dissent and dissatisfaction.

1.6 COMPENSATION FOR CUSTOMARY RIGHTS

Land acquisition and compensation will meet Chadian law (Section 4.0) and World Bank compensation principles and will recognize customary rights. This procedure is illustrated in Figure 1-3.

Since most land needed by EEPCI/TOTCO is held by customary rights, this Plan addresses a number of issues related to these rights, including the following.

| ISSUE | RESPONSE |
|---|--|
| Establishing a generous net land yield | Establishing a value for the net yield of the land so farmers can purchase replacement staples even when market prices may be at their peak. |
| Including value of labor in valuation of farmland | Setting the value of farmland at the monetary equivalent of labor invested in preparing and cultivating a field, allowing the user to reestablish an equivalent field elsewhere. |
| Moving cultural sites and burial places | Moving sites, when possible, and providing compensation as per mutual agreement between EEPCI/TOTCO and the local population concerned (Figure 1-4). |
| Recognizing that customary rights may exist on titled lands | Many people depend on land to which they do not have legal title for their livelihood. In rural areas customary users sometimes continue to use land, unaware that it has been acquired legally by someone else. In such cases, both the legal title holder and the customary rights user will be compensated. |
| Importance of bush | Recognizing that bush is in fact extremely valuable to the community, compensation will be paid as part of community compensation. |

Compensation valuations are discussed in Section 5.0 and include a combination of cash, in-kind compensation, and technical assistance. Both individual and community compensation will be provided.

- Individuals will receive compensation for customarily held investments and assets that covers the replacement cost of such investments which have been surrendered or abandoned because of direct Project activity or resettlement (Sections 5.0 and 6.0).
- In-kind community compensation will be paid to villages that undergo significant impacts as a result of Project resettlement (Section 7.0).

1.7 RESETTLEMENT AND RESETTLEMENT ALTERNATIVES

This Plan has been designed to meet World Bank Directives on Involuntary Resettlement (Table 1-2). The Plan provides for resettlement modeled on traditional existing social institutions (Section 6.0).

Early Project planning minimized the potential for resettlement. The number of individuals or households who are at risk of no longer being economically viable because of Project land needs was evaluated on the basis of Project land needs, the average surface area used by a farmer, and the fact that almost half of households have two independent farmers with their own fields. It is estimated that, at maximum,

150 households will be eligible for resettlement.

Families who resettle will be given technical support, advice, and assistance during their move and transition period in addition to compensation for any investments surrendered or abandoned. Resettlement plans include mitigation measures such as improved agriculture. A latrine will be included as part of any new house construction. Therefore, the environmental impact of resettlement activities is expected to be no greater or less than the traditional resettlement on which it is modeled.

In addition, EEPCI/TOTCO will offer two alternatives to resettlement following a facilitated decision-making process. This decision process will help households decide which decision, resettlement or an alternative, fits their particular circumstances. If individuals opt not to resettle, they may choose one of the following options:

- **Improved Agricultural Techniques:** Individuals may choose to learn improved agricultural techniques facilitated by EEPCI/TOTCO and to receive one year of agricultural credits (Section 6.6).
- **Off-Farm Income:** Individuals who have some off-farm skills or realistic business opportunities may choose to receive a year's tuition for approved local skills-training programs, and low-interest loans for tools or materials needed (Section 6.7).

Subsistence farming is likely to remain the major livelihood of most people in the area. But the EA, supported by other studies, has shown that the current agricultural system -- without the Project -- is not sustainable in the longer term. Because EEPCI/TOTCO land needs will increase village land pressure, the Project will facilitate improved agricultural techniques that attempt to slow the decline in local soil fertility, promote the growth of high yield/high value crops, and lower the rate at which bush land is cleared and cultivated.

Table 1-1: Compensation and Resettlement Goals

| |
|-------------------|
| PHILOSOPHY |
|-------------------|

- The local population sees the compensation as fair and equitable based on:
 - local African cultural values,
 - people receiving what is perceived as fair.
- Compensation is as transparent as possible.
- The compensation process treats people and resources in exactly the same way whenever possible.

| |
|-----------------------------|
| GOALS AND OBJECTIVES |
|-----------------------------|

COMPENSATION

- Affected people's standard of living will not be less than their current conditions when compensation is complete.
- Both holders of legal title to land and traditional land users are compensated.
- Project is conducted in a manner that assures the land is available for use when needed for project construction and operations.
- Compensation is perceived as fair by local population.

RESETTLEMENT

- Need for resettlement is limited through Project design.
- Desirable alternatives to resettlement are provided to affected people.
- Affected people have adequate time and resources to reestablish themselves.
- Resettlement follows traditional procedures of local culture.
- Compensation and resettlement do not create dissension within local population.
- Compensation and resettlement activities are fair.

CONTINUING SUPPORT

- People in both impacted and surrounding areas continue to be supportive of the Chad Development Project.

Table 1-2: World Bank Directives Related to Resettlement

Operational Directive 4.30 entitled *Involuntary Resettlement* (June 1990)

The Directive describes:

| Resettlement Objectives | Contents of a Resettlement Plan |
|--|--|
| <ul style="list-style-type: none">• Resettlement is avoided or minimized.• Resettled persons reestablish or improve their former standard of living.• Community participation and resettlement are modeled on existing social institutions of resettlers and hosts when possible.• Absence of legal title to land is not a bar to compensation.• Local populations should be compensated with adequate new land. | <ul style="list-style-type: none">• Community participation• Socioeconomic survey• Environmental protection and management• Land tenure, acquisition, and transfer• Legal framework• Valuation of and compensation for lost assets• Shelter, infrastructure, and social services• Access to training, employment, and credit• Alternative sites and selection and integration with host populations• Organizational responsibilities• Implementation schedule, monitoring, and evaluation. |

***Resettlement Review* by the Evaluations Department (1993), and
Regional Remedial Action Planning for Involuntary Resettlement (1995)**

Indicate that effective resettlement involves:

- Compensation for lost assets in full consultation with affected families
- Assistance with resettlement and support during the transition period
- Assistance in re-establishing or improving the former standard of living
- Sufficient community participation to protect social fabric

Operations Manual Statement 2.33

Establishes two important goals:

- Resettled population should at least regain its prior socioeconomic status within a reasonable transition period.
- No environmental degradation ensues from the resettlement process.

Operations Policy Note 10.08

Gives supplemental guidelines for the financial/economic aspects of resettlement:

- Resettlers should benefit from any economic development brought about by the Project that led to resettlement.
- Options should be offered to enable people to enhance, not just replace, their productive/income-earning opportunities.

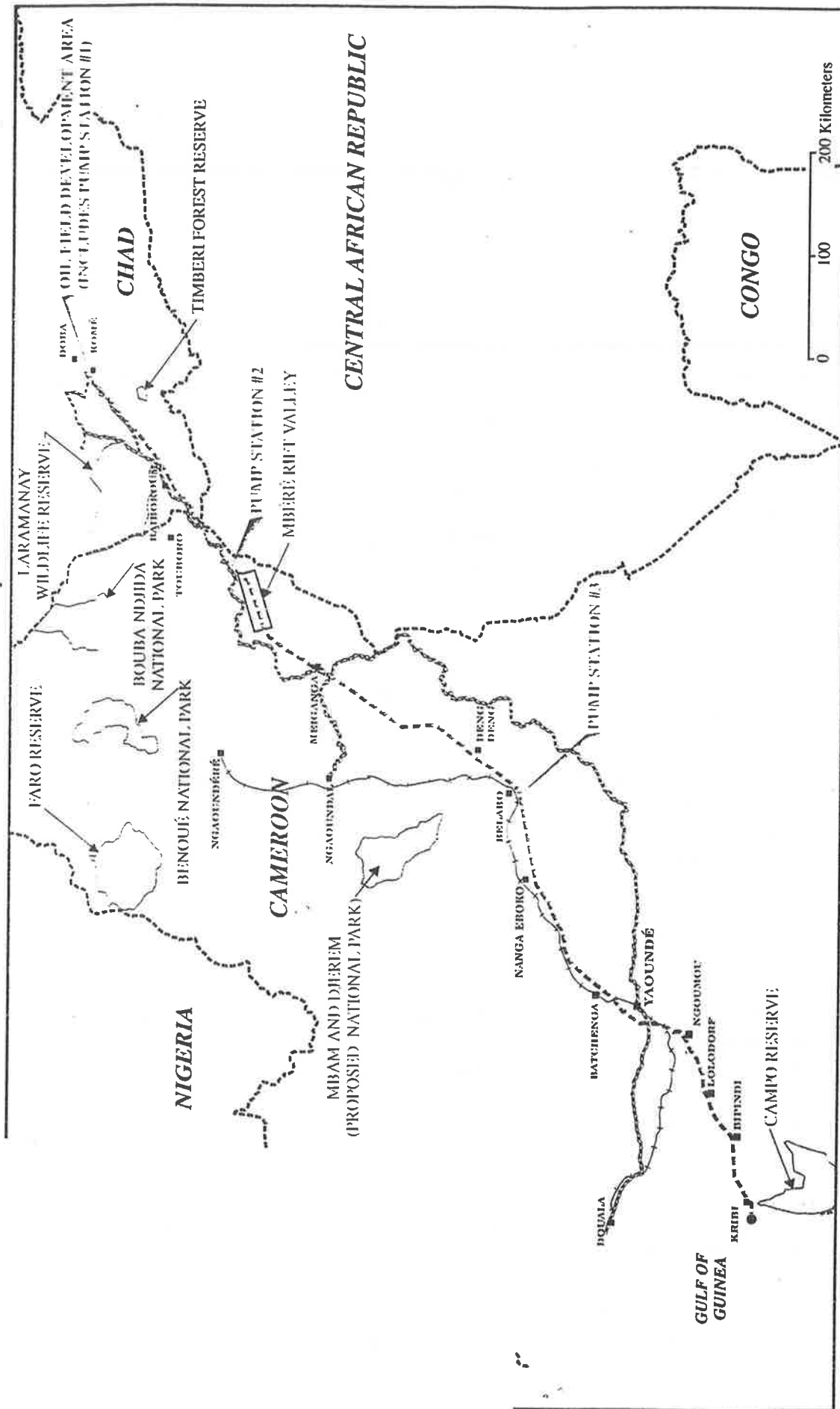
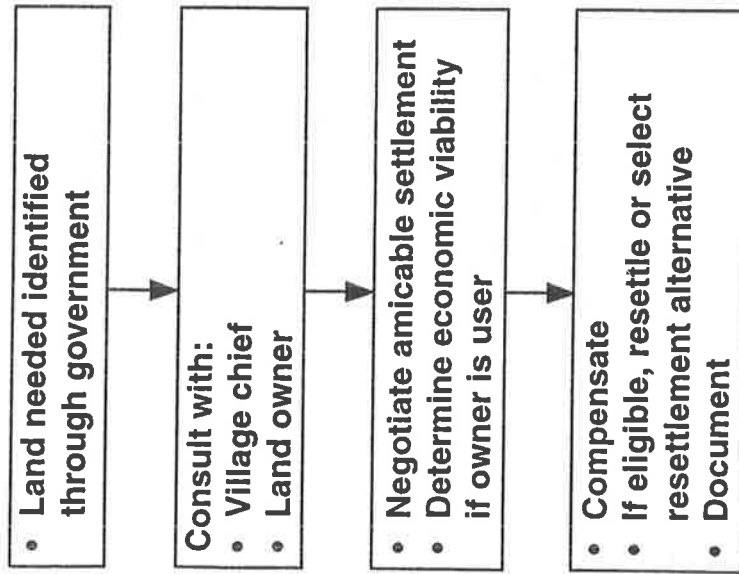


Figure 1-3: Land Acquisition Process

Legal Ownership (Titre Foncier)



Customary Rights

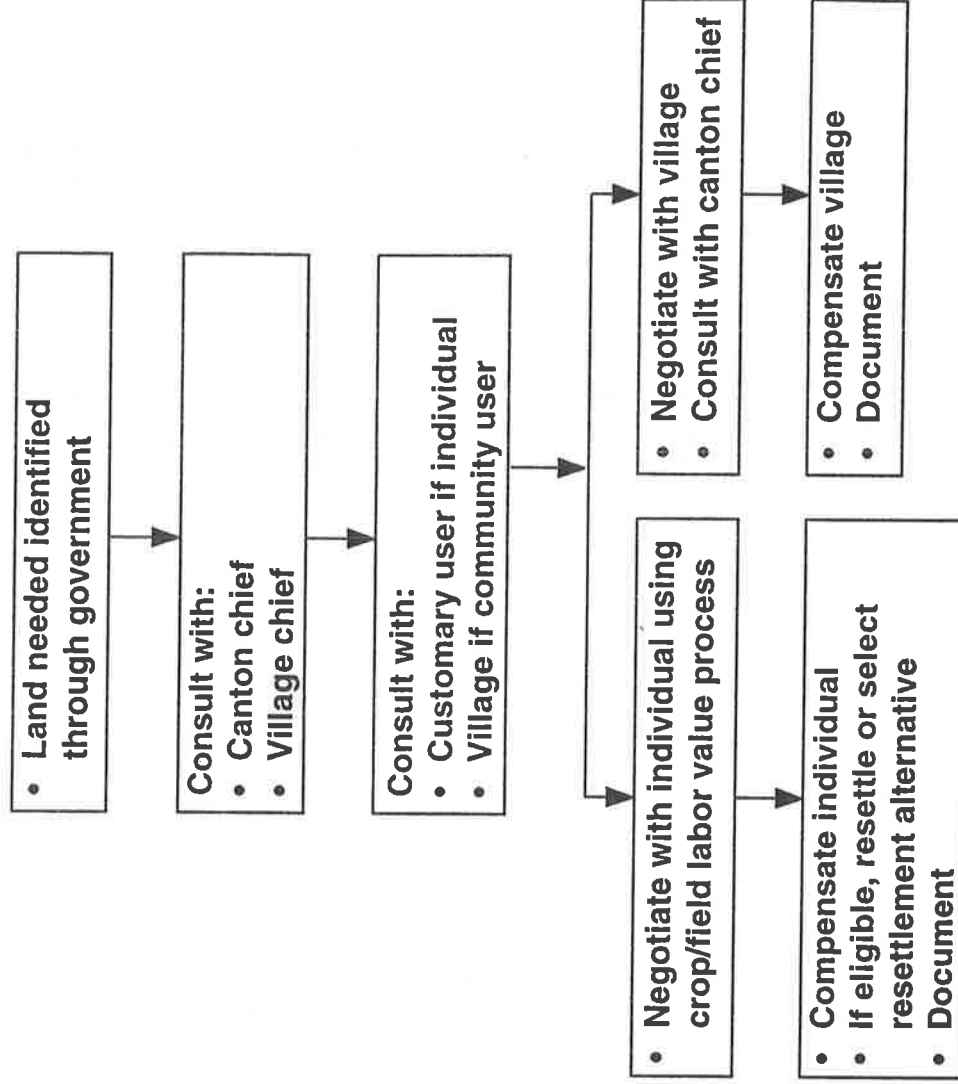


Figure 1-4: Compensation for Sacred Sites

