

A survey of the social and environmental impact of the Escravos- gas-to-liquid project

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Dedication

To the fondest memories of my late Uncle, Mr. Bayo Akinterinwa.

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I never would have made it through this research project without a number of people.

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Abstract

There is need for oil companies to manage the impact of its operations as part of its corporate social responsibility. The success of the Escravos-Gas-to-Liquid (EGTL) project will be measured against its ability to bring about social benefits from its operation with minimal impact to the stakeholders and particularly, the environment.

To advance sustainable development, it is best to fully appreciate the issues and impacts that can arise from the EGTL project.

This dissertation presents the social and environmental issues and potential impact in the exploration of Gas-to-Liquid (GTL). It considers a wide range of issues that might be encountered in oil and gas cycle. It is anticipated that these in turn can facilitate in developing a management framework to help with social planning issues that could be targeted at:

- Project Managers: to help them identify issues that may be important in their leadership role
- Business and project teams, to help them identify issues that may be of importance in project development and management.

The research questions cover the social and environmental impact of gas exploration using the Chevron EGTL project. It takes a look at various social and environmental issues from project phase through operation. The dissertation identifies both the potential positive and negative impact of the project, proposing a management framework that can bring about means of addressing the issues and impacts to the mutual benefit of the company and all other stakeholders.

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CHAPTER ONE

1.0 Introduction

Consideration for the environment is one of the major reasons for the on-going global shift to gas as an energy source. This shift is gradually evolving a growing world demand for natural gas to be supplied either as pipe line or liquefied natural gas (LNG). Natural gas is a clean, burning fuel and poses fewer problems for the environment when compared with other commercial sources of energy.

Of recent is the Gas-to-Liquid (GTL) a new variant driven by a technology for the search of yet another cleaner and environmentally friendly fuel.

Nigeria, with its relatively large gas reserves, is poised to utilize these resources to supply a substantial part of the growing world demand with her GTL, which is expected to come on-stream by 2009.

While this can be attributed to abundant reserves, long term technological and environmental trends indicate a shift towards the preference of cleaner-burning fuels.

GTL conversion which is a new technology in the exploitation of gas is faced with its own challenges as a new product.

Local communities may have a particular interest in this project activity because they are affected either directly or indirectly by the exploration for GTL. Recently, there has been a surge of communal unrest in the host community due to age old neglect by the governments and/or companies, either perceived or not.

These recent exploration activities call for identifying the social and environmental issues and potential impact that can arise from the GTL project. In identifying these issues it is believed that it will aid in developing a

management framework to address/tackle the impending social and environmental issues (Perceived or not) that can affect the operations of exploration companies.

1.1 Problem Statement

For there to be a continued effort toward sustainable growth and development of the society and companies involved in the exploration of GTL, understanding the social and environmental impacts of Escravos-Gas-To-Liquid (EGTL) is imperative.

Whilst the EGTL project is the first of its kind in Nigeria, the social and environmental issues are not fully understood.

As a result of past exploration and exploitation activities, various social and environmental issues rising from the extraction of oil and gas resources have caused different impacts. Due to inadequate management efforts or lack thereof, these activities have had severe effects on the industry and consequently impacted on the stakeholders, particularly the host communities.

In view of the above, identifying these issues and the potential impact will aid in addressing concerns as a result of the exploration activities. This will contribute towards the development of a management framework that can address the impact of these issues so as to bring about mutual benefits to all stakeholders.

1.2 Background

For nearly three decades, petroleum production and consumption has probably brought out both the best and worst of modern civilization in Nigeria. According to (*Hassan et al, 2002*) "It has contributed enormously to the country's economic growth and, on the other hand, has left profound adverse impact on the natural environment and has generated a number of other socioeconomic concerns

including human rights issues.” Nigeria is currently the largest producer of crude petroleum in Africa and sixth largest in the world.

In (Oil and Gas Journal, 2005), “Nigeria’s oil proven reserves is estimated at some 35.2 billion barrels and almost all of these reserves are found along the country’s coastal Niger Delta.”

According to (*Nnadozie, 2001b*) “This makes it highly susceptible to more marine pollution through spillage and blowouts especially in the Exploration and Production (E&P) stages coupled with the continuous flaring of associated gas.”

Without doubt, the Niger Delta is the nerve center of Nigeria’s oil industry. “Crude oil production or output is about 2 million barrels daily and accounts for over 90% of the national total export earnings” (*Baker, 1983; NDES, 1997*). (*Hassan et al, 2002*) also estimates “that the economic value of gas, if fully harnessed could exceed what is currently generated from crude oil.”

“The economic benefit of crude oil exploration and production in Niger Delta, both onshore and offshore have been so overwhelming that, until recently, it overshadowed, the adverse socio-economic impact, ecological devastation and environmental deterioration on oil communities were overshadowed. In spite of the immense wealth accruing from crude oil, extensive damage of farmland, streams and creeks and the persistent threat to health of the inhabitants of this region have been ignored”. (*Hassan et al, 2002*)

The social and economic impact of government policies as well as the consequences of activities of multinationals especially on women has been quite significant, although very little study has been carried out to ascertain the particulars of these impacts.

Nevertheless, there is a perceptible increase in awareness that social issues must be taken into account during policy formulation and implementation.

The issues surrounding the exploration of GTL is the primary focus of this dissertation and it will also build on other issues and challenges that are uncovered in the process of researching this topic.

A report on “*Key Questions in managing social issues in oil and gas project*” by (OGP, 2002) which was adopted by the International Association of Oil and Gas Producers, sets out principles for the social dimension of impact assessment for oil and gas projects, emphasizing integration of social assessments.

The report mentioned above is not comprehensive. It failed to address issues relating to human rights, conflict resolution, revenue management, transparency and the role of government to mention but a few.

1.3 Aims and Objectives

The aim of this dissertation is to identify the various social and environmental issues and impact of GTL exploration on the environment as a means of exploring untapped gas reserves. These impacts are further highlighted to better understand the social and environmental issues surrounding the production of GTL.

More specifically, this dissertation:

- Identifies major social and environmental issues and concerns arising from any foreseeable social impact.
- Identifies major social and environmental impacts to the host communities, and
- Proposes a Management framework as a recommendation.

The aim is to encourage the operating companies to take cognizance of these issues in their operation.

This will help position GTL as a brand in the world market for sustainable capital growth and development.

1.4 Research Approach

Research on the subject matter for this dissertation started as a literature-based research.

The literature review also dwelled on sources from articles from experts in the industry such as the International Association of Oil & Gas Producers, Books like Empowerment in Action by Friends of the Earth, Nigeria. Other sources used are journals for example Oil and Gas journals, consultations, websites like www.centrica.com, as well other intellectual work.

This helped in identifying the past social and environmental issues arising from the experience of oil and gas exploration and production and in arriving at a better understanding of the dynamics of the various issues and its impact. It further highlighted issues that might arise from the development of the GTL project vis-à-vis previous initiatives in addressing past experiences from similar gas projects.

1.5 Research Outline

In chapter two, a literature review on social and environmental issues and impact of gas exploration is presented. It summarized the key literature review for this dissertation. The focus is to identify the previous issues experienced as a result of past exploration activities and create awareness for the research question. However, this was done with a description of the case study project.

The third chapter discusses the research design and approach used in identifying the social and environmental issues and impact surrounding the exploration of GTL.

Chapter four presents the findings of the study and discussed the outcome and validation of the findings with respect to the research questions.

Finally, chapter five draws conclusions and recommendations based on the conclusion of the findings and outcome of the field work.

CHAPTER TWO

2.0 Literature Review

2.1 Background

There is mounting pressure on the oil and gas sector to manage the social impacts of its operations as part of its core business activities. The corporate social responsibility (CSR) awareness and the social performance of the oil and gas sector are being measured against its ability to protect community welfare and increase the social benefits derived from its operations. There are calls for corporate action from a range of stakeholders, including investors, shareholders, regulators, environmental and social organisations, and community groups. In response, major oil and gas companies are continuing to further develop their CSR portfolio, refine operational strategies, formulate better social management and community investment programs.

Engineering services contractors provide engineering, procurement, construction, operations and maintenance services to the oil and gas sector. These contractors have traditionally not been involved in managing the social performance or CSR of oil and gas project operations. (*Petter Matthews, et al, 2004*) argues that “there is a great opportunity for contractors to become engaged in managing social impacts and improving social performance of projects and client-led operations. In most cases, it is the contractors who are on the ground and in direct contact with communities throughout the lifecycle of oil and gas projects.”

Many of Chevron Nigeria’s operations are located in communities characterised by poverty and relatively weak public institutions. In order to assess how EGTL might enhance its social performance and gain business advantages in these challenging environments, it is helpful to understand international development and corporate social responsibility (CSR) issues.

This section identifies some key trends and illustrates them with examples of specific policy initiatives emanating from governments, international financial institutions, bilateral and multilateral donors.

“A recent World Bank task force on ‘Low Income Countries under Stress’ described a core group of countries endowed with oil and gas deposits as ‘policy poor but resource rich. The suggestion was made that the richness of resources may contribute to inadequate public policy” (World Bank, 2003). It also claims that “This can occur, for example, by reducing the pressure on governments to secure a popular mandate, increasing opportunities for corruption, undermining macroeconomic stability and inducing conflict. Christian Aid and Global Witness, two respected international NGOs, recently published reports highlighting similar issues”.

While there are examples of countries like Botswana, where natural resource wealth has contributed to considerable reductions in poverty, there are many more, such as Nigeria, Indonesia and the Philippines, where the fiscal management of natural resource wealth has been inadequate or corrupt and has lead to civil unrest and political suppression. (World Bank, 2003) says “It is not uncommon in oil producing regions for the local population to harbour grievances towards foreign oil companies and their main contractors because of the adverse social and environmental impact of oil and gas projects and/or inefficiencies in resource rent distribution.” This has put pressure on companies to provide social programmes as a means to manage the operational risks stemming from the discontent within local communities.

In response to these problems, a number of governments and NGOs are focusing their efforts on improving revenue transparency and management. These initiatives recognize the positive role that the disclosure of oil and gas revenue payments can play in reducing corruption and promoting good governance. When supported by pro-poor expenditure priorities, these initiatives are helping to forge a positive link between oil and gas development and poverty

reduction. Examples of such initiatives include the Extractive Industries Transparency Initiative (EITI), funded through DFID and Publish What You Pay (PWYP), a coalition of campaign organisations.

From (AMEC plc, 2004), "The Government of Timor Leste has signed up to the EITI principles, whilst the Indonesian government has expressed support in principle. A group of NGOs has formed a PWYP Indonesia network and several international NGOs linked to PWYP are working in Timor Leste. In recognition of the potential commercial and reputational costs of being associated with financial mismanagement and poverty, leading oil companies have publicly expressed support for the EITI including Shell, BP, Chevron, Exxon Mobil, Woodside and Conoco Philips."

Revenue transparency is the focal point in AMEC's operational countries i.e. in Indonesia, Papua New Guinea, Vietnam and Timor Leste. These four countries have suffered from conflict, high levels of corruption and tension over revenue flows especially between the oil, gas and mining companies and their host communities. The article suggests that "a watching brief needs to be maintained by AMEC and other oil and gas engineering and services contractors to follow the reaction of oil and gas companies in modifying their social performance policies and objectives in light of the transparency debate." (AMEC plc, 2004).

(AMEC plc, 2004) also put forward that "It will be considerate to encourage oil and gas companies to realign their community investment programmes with public and provincial authorities' economic development plans and public expenditure budgets. Companies may also collaborate with development organisations to help build local institutional capacity in financial management and infrastructure service delivery".

"Contractors should monitor these developments and identify opportunities to propose (in bid documents) resources and competencies that add value to their clients' social objectives in areas of engineering design, project management,

financial packaging for public infrastructure projects, or business models for public service delivery.” (AMEC plc, 2004)

2.2 Description of the Case Study Project

2.2.1 Overview

Chevron Nigeria Limited, together with Nigeria National Petroleum Corporation (NNPC), intends to build a 34,000 barrel-per-day Gas to Liquid (GTL) products plant in Escravos, Nigeria. With EGTL as the first project in Nigeria utilising its technology and technical expertise, SasolChevron will work on the design and development of EGTL and will provide management, operating and technical services to the project owners. SasolChevron will also be marketing the products from EGTL. (Chevron, 2005).

EGTL will be an integral part of the owners' overall gas utilisation strategy that includes domestic natural gas sales, regional natural gas sales through the West Africa Gas Pipeline (WAGP), and international sales of GTL Products. The proposed GTL plant will be capable of converting natural gas into premium environmentally friendly fuel and GTL naphtha products. Europe will be the primary market for all fuel products from the Nigerian plant, although some products may be sold in the United State of America (USA).



Figure 2.1: The Escravos Terminal Nigeria, site of the planned NNPC Chevron Gas to Liquids fuel plant. (Source: SasolChevron)

According to (Perry A. Fischer, 2001), "GTL is not new. It was first achieved by Paul Sabatier and Jean Senderens in 1902 by creating methane from hydrogen and carbon monoxide. Franz Fischer and Hans Tropsch further developed the synthesis to mainly oxygenated products and liquid hydrocarbons in 1923. GTL is an application of the basic Fischer-Tropsch (FT) process, where synthesis gas (or syngas, $H+CO$) is reacted in the presence of an iron or cobalt catalyst."

From (Chevron, 2005), "The EGTL plant, the gas feed which is mainly methane has been conditioned in the adjoining gas plant to remove any significant volume of propane and heavier gases to prevent fouling of downstream catalysts. This gas is then mixed with oxygen in the Auto-Thermal Reformer (ATR) through a burner where some of the gas is partially oxidized and undergoes a combination of exothermic and endothermic reaction where the vessel is maintained at temperature near $1,000^{\circ}C$ creating a mixture of carbon monoxide and hydrogen ($H+CO$) called synthesis gas (syngas)."

The syngas is cooled to condense and excess steam removed; the gas is then preheated before entering a slurry phase Fischer-Tropsch (F-T) synthesis vessel where the gas bubbles through a tall slurry hot liquid wax and cobalt catalyst. The syngas is converted to hydrocarbons where the light ones go overhead and are condensed by cooling. The hot liquid wax that is created mixes with the slurry to form a waxy syncrude, the raw materials for transportation fuel. A portion of the wax and catalyst is returned to the synthesis vessel.

This synthetic crude is now upgraded using Chevron Isocracking and hydroisomerisation process by dicing heavier molecules which are usually solid at room temperature, and re-arranged their ends so they become liquid such as synthetic fuel, naphtha and kerosene. The liquid contains visually no sulfur with little nitrogen and carbon arranged in rings; a notorious source of soot and particulates.

2.2.2 Primary Product

The following is the product and quantity from the EGTL plant process (*Chevron, 2005*);

F-T diesel: 22,100 BPD

F-T Naphtha: 10,300 BPD

LPG: 900 BPD

Condensate: 30,000 BPD

2.2.3 Daily Production Rates

The daily production rate gathered from the fields is between 650-720 MMscf/d. The EGTL plant will require a feed of 300 MMscf/d, and the gas plant consumes approximately 158 MMscf/d in term of fuel and Natural Gas Liquid (NGL) shrinkage. Gas injection requirements are expected to be 40 MMscf/d.

The remaining 222 MMscf/d would most likely be transported down the Nigeria Gas Company (NGC) pipeline to the proposed WAGP (*Chevron, 2005*).

2.2.4 Gas Consumption

Fuel and shrinkage at the gas plant is approximately 22% of the inlet volume. The gas plant consumes approximately 3.5% of the inlet gas as fuel. Based on an inlet of 300 MMscf/d of the EGTL plant of an assumed 900 BTU/cf (after gas processing), and production 30,000 production per day of diesel and naphtha, gas consumption is roughly 43%. In other words, only 57% of the inlet Btu is converted into product in the EGTL plant (*Chevron, 2005*).

2.3 Description of the Environment

2.3.1 Socio-economic Environment

According to (*Chevron, 2005*), "The environmental description of the project area was adapted from a detailed Chevron Environmental Baseline Survey (EBS) based on an extensive literature review, remote sensing, data from two-season (dry and wet) field work, and laboratory analyses. The EBS study area included the areas within a 10 km radius around the EGTL Project site. All locations within a 2 km radius around the project site served as the region of very intensive field investigation. Areas within 2-5 km radius around the project site were treated as the buffer zone, while areas between 5-10 km radius were considered the control point areas."

2.3.2 Geographical Location

The proposed EGTL Project will be sited adjacent to the existing Escravos Gas Project (EGP) Phases 1 & 2. The project site lies within Latitudes 5° 37' and 5° 38'N and Longitudes 5° 12' and 5° 13' E (Figure 2.1), and is proposed to occupy about 72 hectares (0.72 km²) of land area.



Figure 2.2: Location of Project

2.3.3 Socio-economic Characteristics

According to (Chevron, 2005), "The socioeconomic data was primarily obtained from two sources: the Escravos Tank farm and Terminal Environmental Evaluation Report (EER) (1999) and a separate group of socioeconomic studies carried out in 2001 for Chevron Nigeria Limited (CNL) operational areas. In addition, supplemental information was obtained from the community needs assessment carried out by CNL for the EGTL and EGP-3 projects. The data from these studies was obtained from questionnaire surveys and interviews conducted in the area."

Notable settlements within the EBS area include Ugborodo, Madangho, Arunton, Ugboegungun, Igbelemeji, and Saghara. The population of the settlements ranges from 11 for Igbelemeji to 6,838 for Ugborodo. (See Table 2-1). These figures indicate that all the settlements are rural, as none has a population close to 20,000, the benchmark for urban settlements in Nigeria.

Table 2-1: Population Structure of Villages in the Study Area

Name of Village	No. of Male	%	No. of Female	%	Total
Ugboegungun	284	42.5	384	57.5	668
Igbelemeji	7	63.6	4	36.4	11
Saghara	2,405	69.3	1,067	30.7	3,472
Arunton	256	44.8	316	55.2	572
Ugborodo	3,433	50.2	3,405	49.8	6,838
Madagbo	706	52.5	639	47.5	1,345
Total	7091	54.9	5815	45.1	12906

Source: National Population Commission, Census '91 Final Results

Ugboegungun, Ugborodo, Saghara, Igbelemeji, and Arunton are the settlements closest to the project area (see Figure 2-1). Igbelemeji, by far the smallest of these, is a small hamlet inhabited by one extended family.

The male component of the population is approximately 55%. Approximately 52% of the population is between 21 and 40 years of age, with approximately 71% of the population married. Over 75% of the population has received some form of formal education. Indeed, the bulk of them (45%) have secondary education, while only approximately 22% of the people have no formal education.

The communities in the area are predominantly Itsekiri and they share a common culture and social organization. The Olu of Warri is the paramount ruler and he is represented in the Itsekiri clans by chiefs that he appoints. Next in the

hierarchy are the clan heads who administer the clans through village heads. The village heads are in turn assisted by a council of elders and chiefs. Individual villages also have village (development) committees, youth councils and women's groups. These institutions are fairly recent creations and they complement the functions of the traditional institutions.

Traditional religious practices are quite widespread with shrines and sacred grounds for this purpose. The community shrines are typically located on riverbanks, adjacent to the villages.

Given the aquatic and river-dependent nature of the area, several deities, traditional ceremonies, and festivals are all associated with water bodies. There are no sharp distinctions between Christians and traditionalists. For instance, Christians are known to participate in the traditional religious activities of the communities.

The land tenure system in the area is communal, with land being administered by the village head, aided by elders. The land use pattern in the communities traditionally consists of built-up areas interspersed with small farms. The dominant produce grown in this area are banana, plantain, and cassava. In addition to farming, fishing is an important economic activity. Fish traps, dragnets, and cast nets are widely used in this regard.

In general, living conditions in the area are poor. Transport infrastructure is not well developed and movement is restricted to waterways (creeks and rivers) by boats and canoes.

Potable water supply is barely adequate and most communities depend on rainwater and surrounding rivers, which are often contaminated with raw sewage. The most important source of energy in the area is biomass fuels, especially firewood, which is used for cooking and processing fish. Electricity is generally not available in most of the settlements. Health care services are virtually non-existent in all the settlements. The only exception used to be Madangho where a

functional health centre was provided by CNL. However, the health centre was burnt down during each of the last two ethnic crises. Traditional medicine is therefore widely used, and is based on medicinal leaves, herbs, roots, and tree barks.

2.4 Potential Social and Environmental Issues and Impacts

The impact of Oil and gas extraction varies on the communities and its environment. These impacts depend upon the stage of the project, the nature and sensitivity of the surrounding environment and the effectiveness of planning, pollution prevention, mitigation and control techniques.

These impacts involved are potential threats which with proper care and attention may be avoided, minimized or mitigated. The industry has been proactive in the development of management systems, operational practices and engineering technology targeted at minimizing such impacts. Though these have gradually reduced the social issues arising from Exploration and Production (E&P), more still need to be done. According to (UNEP/IPICEA publication, 1995), amongst the various initiatives in the industry targeted at reducing the impacts are examples such as; “the innovative technology applied by Mobil and Shell in Malaysia, commitment to the local community by Imperial Oil in Northern Canada and Canadian Occidental in Yemen; and various environmental protection programmes implemented by Chevron in Papua New Guinea, BP in Colombia, Amoco in Western Siberia and Caltex in Indonesia.”

“Arco has applied an ‘offshore’ approach to operations in remote rainforest locations (Hettler et al, 1996); and various novel technologies have been applied in the disposal of drilling wastes, produced water treatment and atmospheric emissions.” (*E & P forum, Oct. 2003. report #2 56/87*).

Several types of potential social and environmental impacts are highlighted here. “They include Human, Socio-economic and cultural impacts; and atmospheric,

aquatic, terrestrial, and biosphere impacts.” (*UNEP IE/PAC Technical report 37, E & P Report #2 72/254, 1997*)

2.4.1 Human, Socio-economic and cultural impacts

According to a (Joint E&P Forum/UNEP Technical Publication, 1997) on Environmental Management of Oil and gas Exploration, “the Exploration and production operations induce economic, social and cultural changes. The extent of these changes is especially important to local groups, particularly indigenous people who may have their traditional lifestyle affected.”

(Al Faruque, et al, 2006) posit that “the socio-economic and cultural impacts of the extractive (E&P) operations include: changes in land-use patterns, increase in local population levels resulting from immigration due to new access routes and employment possibilities; impacts on socio-economic systems due to new employment possibilities and income differentials; inflation; impacts on social cohesion and cultural structures; destruction of cultural heritage, practices and beliefs; conflicts between development and protection; natural resource use and associated negative effects of road construction and changes in the transportation infrastructure and associated effects.”

The (E&P Forum/UNEP, 1997) acknowledge, “That some positive changes may probably result, from where proper consultation and partnership have developed. For example, improved infrastructure, water supply, sewerage and waste treatment, health care and education are likely to follow. However the uneven distribution of benefits and impacts and the inability, especially of local leaders, always to predict the consequences, may lead to unpredictable outcomes. With careful planning, consultation, management, accommodation and negotiation some, if not all, of the aspects can be influenced.”

2.4.2 Atmospheric Impacts

Atmospheric issues that can impact on the livelihood of the surrounding communities are attracting increasing interest from both industry and government authorities worldwide. This has prompted the oil and gas exploration and production industry to focus on procedures and technologies to minimize emissions.

The (Joint E&P Forum/UNEP Technical Publication, 1997) advises that “It is important to understand the sources and nature of the emissions and their relative contribution to atmospheric impacts, both local and those related to global issues such as stratospheric ozone depletion and climate change, in order to examine the potential impacts arising from exploration and production operations.”

From (Remis System, 2002), “the primary source of atmospheric emissions from oil and gas operations arises from:

- Flares and vent
- Combustion units (engine, turbine, heaters, boiler, etc)
- Fugitive equipment leaks (valves, flanges, etc)
- Airborne particulates from loading operations (truck, rail, etc) and
- Process units (amine, glycol units). etc

The principal emission gases include carbon dioxide, carbon monoxide, methane, volatile organic carbons and nitrogen oxides.

The volumes of atmospheric emissions and their potential impacts depend upon the nature of the process under consideration. The potential for emissions from exploration activities to cause atmospheric impacts is generally considered to be low. However, during production, with more intensive activity, increased levels of emission occur in the immediate vicinity of the operations.

Following substantial efforts by industry, unplanned emissions have significantly reduced and alternative agents for existing and new developments have been engineered.

For instance, emissions from the North Sea exploration and production industry is less than 1 per cent of the total emissions generated by the European Union countries, and that significant reductions have occurred as a result of improved infrastructure (*E & P Forum, Report #. 2 66/216, Dec. 1994*). The report provides practical examples of techniques for improving performance with emerging technologies and good practice.

From the example above, the industry has demonstrated a commitment to improve performance as indicated. There are a number of emerging technologies and improved practices which have potential to help to improve performance further, both for existing fields and new developments. The environmental benefits and relative costs depend heavily on the specific situation for each installation e.g. on some fields there is no economic outlet for gas. In general, new installations offer more scope for improving performance and have been pursued by the industry (*E & P Forum, Report #2. 66/216, Dec. 1994*), in particular relating to reducing flaring and venting, improving energy efficiency, development of low NO_x turbines, controlling fugitive emissions, and examining replacements for fire fighting systems.

2.4.3 Aquatic Impacts

The principal aqueous waste streams resulting from exploration and production operations are:

- Produced water;
- spills and leakage;
- Process wash and drainage water;
- Drilling fluids, cuttings and well treatment chemical;

- Cooling water;
- Sewerage, sanitary and domestic wastes.

Again, the volumes of waste produced depend on the stage of exploration and production process. During seismic operations, waste volumes are minimal and relate mainly to camp or vessel activities. In exploratory drilling the main aqueous effluents are drilling fluids and cuttings, whilst in production operations - after the development wells are completed - the primary effluent is produced water.

E & P Forum (*Waste Management Guidelines* Sept. 1993. Report #.2.58/196) summarises waste streams, source and possible environmentally significant constituents, as well as disposal methods. Water-based drilling fluids have been demonstrated to have only limited effect on the environment. The major components are clay and bentonite which are chemically inert and non-toxic. Some other components are biodegradable, whilst others are slightly toxic after dilution (*The Impact of water-Based drilling Mud Discharges on the Environment. Industry and Environment Overview Series (UNEP Paris, 1985)*). The effects of heavy metals associated with drilling fluids (Ba, Cd, Zn, and Pb) have been shown to be minimal, because the metals are bound in minerals and hence have limited bioavailability. Oil-based drilling fluids and oily cuttings, on the other hand, have an increased effect due to toxicity and redox potential. The oil content of the discharge is probably the main factor governing these effects.

Ocean discharges of water-based mud and cuttings have been shown to affect benthic organisms through smothering to a distance of 25 metres from the discharge and to affect species diversity to 100 metres from the discharge. Oil-based muds and cuttings affect benthic organisms through elevated hydrocarbon levels to up 800 metres from the discharge. The physical effects of water-based muds and cuttings are often temporary in nature. For oil-based mud and cuttings the threshold criteria for gross effects on community structure has been suggested at a sediment base oil concentration of 1000 parts per million (ppm),

although individual species showed effects between 150 ppm and 1000ppm. However, work is under way to develop synthetic muds to eventually replace oil-based muds. (*Joint E&P Forum/UNEP Technical Publication, 1997*).

The high pH and salt content of certain drilling fluids and cutting poses a potential impact to fresh-water sources.

Produced water is the largest volume aqueous waste arising from production operations, and some typical constituents may include in varying amounts inorganic salts, heavy metals, solids, production chemicals, hydrocarbons, benzene, Polycyclic aromatic hydrocarbons PAHs and on occasions naturally occurring radioactive material (NORM). In the North Sea environment the impact of produced water has been demonstrated to range from minor to non existent (NSPW, 1994), particularly given rapid dilution factor of 200 within 1 minute, 500 within 5 minutes and 1000 in an hour at a distance corresponding to 1km from the source. The environmental impact of produced waters disposed to other receiving waters other than Open Ocean is highly dependent on the quality, the components, the receiving environment and its dispersion characteristics. The extent of the impact can only be judged through an environmental impact assessment (*E & P Forum, May 1994. Report #2. 62/204*).

Other aqueous waste streams such as leakage and discharge of drainage waters may result in pollution of ground and surface waters. Impacts may result particularly where ground and surface waters are utilized for household purposes or where fisheries or ecologically important areas are affected.

Indirect or secondary effects on local drainage patterns and surface hydrology may result from poor construction practice in the development of roads, drilling and process sites.

2.4.4 Terrestrial impacts

The (Joint E&P Forum/UNEP Technical Publication, 1997), highlights three basic sources from which potential impacts to soil arises, these are;

- Indirect impact arising from spillage and leakage or solid waste disposal;
- Physical disturbance as a result of construction; and
- Contamination resulting from spillage and leakage or solid waste disposal.

The impacts that may result from poor design and construction include soil erosion due to soil structure, slope or rainfall. Left undisturbed and vegetated, soils will maintain their integrity, but, once vegetation is removed and soil is exposed, soil erosion may result. Alterations to soil conditions may result in widespread secondary impacts such as changes in surface hydrology and drainage patterns, increased siltation and habitat damage, reducing the capacity of the environment to support vegetation and wildlife.

In addition to causing soil erosion and altered hydrology, the removal of vegetation may also lead to secondary ecological problems, particularly in situations where many of the nutrients in an area is held in vegetation (such as tropical rainforests); or where the few trees present are vital for wildlife browsing (e.g. tree savannah); or in areas where natural recovery is very slow (e.g. Arctic and desert eco-systems). Clearing by operators may stimulate further removal of vegetation by local population surrounding a development.

Land farming and land spreading have also been extensively practiced in the past for the treatment of oily petroleum wastes, and water-based muds and cuttings.

However, there are potential impacts where toxic concentrations of constituents may contaminate the soil or water resources, if an exposure pathway is present. In the case of muds and cuttings, the most important consideration is the potential for the waste to have high salt content. Arid regions are more prone to

adverse effects than wetter climates, as are alkaline soils or those with high clay content compared with acid, highly organic or sandy soils. During the drilling of a typical well in the region of 3000m in depth, some 300-600 tonnes of mud may be used, and 1000-1500 tonnes of cuttings produced. Land farming and land spreading, however, remain viable treatment options provided a proper assessment is made, and correct procedures are followed.

Considerations include the site topography and hydrology, the physical and chemical composition of the waste and resultant waste/soil mixture. With proper assessment, engineering, design, operation and monitoring, land farming provides a cost effective and viable technique for waste disposal.

Soil contamination may arise from spills and leakage of chemicals and oil, causing possible impact to both flora and fauna. Simple preventive techniques such as segregated and contained drainage systems for process areas incorporating sump and oil traps, leak minimization and drip pans, should be incorporated into facility design and maintenance procedures. Such techniques will effectively remove any potential impacts arising from small spills and leakage on site. Larger incidents or spills offsite should be subject to assessment as potential emergency events and, also under Oil spill contingency planning. (Joint E&P Forum/UNEP Technical Publication, 1997)

2.5 Trends in social and environmental issues and performance – Approach

The potential for oil and gas operations to cause impact must be assessed on a case-to-case basis, since different operations, in different environments, in different circumstances may produce large variations in the magnitude of a potential impact. According to the (Joint E&P Forum/UNEP Technical Publication, 1997), "With the proper application of management techniques and best environmental practice, many, if not all, potential impacts will be eliminated or mitigated. The assessment of potential impacts and management measures

is commonly carried out through a social impact assessment, either conducted independently or within the framework of an HES management system, and as may be requires by formal SIA procedures where they apply. In some countries, SIA is a requirement before approval can be given, and frequently the result of the SIA determines the condition of approvals and permits”.

The publication also share the view that the “potential impact of exploration and production activities must also be considered in the context of national and global protection policies and legislation. Such policies objective will provide clear guidance on the relative importance of a given issue or potential impact. For example, an assessment may identify an apparently small level of impact, which, when seen in the context of national objectives, may acquire an increased significance and importance and require especially careful management”.

2.6 Conclusion

Due to the nature of Oil and Gas extraction activity, little can be done to completely eliminate the occurrence of various issues caused as a result of the operations. But as these issues occur and manifest, careful and necessary steps can and should be taken to mitigate the impact so as to minimize the effect on people, their socio-economic activities, the eco-system and the environment.

In essence, it is evident that identifying the social and environmental issues and the potential impact of the GTL project is key to developing an effective management framework.

CHAPTER THREE

3.0 Research Design and Methodology

This Chapter addresses research methods and the approach used in gathering the information for the social and environmental issues and impacts from the exploration of GTL. The research method adopted in this dissertation is outlined in section 3.1; followed by the various data sources as described in section 3.3.

3.1 Research Methodology

Interviewing colleagues working in the area of GTL was one of the major mediums for this research work. The interviewees were specialists in the following fields; community and public affairs management and health, safety and environmental management. These specialists form the core of the consultation forum.

Questionnaires were used to sample the opinions of the community and people impacted by the project in order to understand their standing on the issues.

Formal focus group discussions were organized with some of the host communities; spoke with community leaders and youth who are directly impacted by the new development of the EGTL project.

The overall approach used in conducting the field work is further explained below;

The research into this subject matter is based on experiences as well as the lessons learnt from previous E&P research work. Common discoveries between these other academic works are; labour conditions, socio-cultural interference, high cost of living, damage to farm yields due to pollution, environment degradation, the insensitivity of operating companies and the host government to the plight of the local communities and many more. The nature of the issues

mentioned here has drawn the bases of interacting with various stakeholders involved.

This integrated approach was adopted in anticipation that sufficient and adequate insight will be gained and this will in turn help in the clarification of new issues that might arise from the EGTL project. Information collated was compared with operations of similar projects in other parts of the world.

The methodologies adopted in this project were influenced by the nature of the research topic and the diversity of its stakeholders.

The questions raised by this research has evolved partly as a result of the need to create awareness of social and environmental issues surrounding the exploration and production of GTL, in order to facilitate necessary steps in tackling the social and environmental issues so as to strive toward the successful execution of the project.

3.2 Phases of the Research

The research of the subject matter can be classified into 2 phases;

- Phase 1: The basis for the survey was prepared following a traditional pattern of literature study, development of a conceptual framework, and refinement of research questions.
- Phase 2: An empirical study was conducted, through consultation and structured interviews, with various stakeholders.

3.3 Data Sources

This research dwelled on various sources, for its study data, from the questionnaires used for the analysis, comparison and evaluation of the depth of some of the social and environmental issues discovered and data collated from

focus group discussions with host communities and face to face interviews of identified stakeholders.

3.3.1 Questionnaire

The questionnaire was designed particularly for the host communities with a population sample of 150 people. The decision to work with this number is because of the sensitivity and present situation of Niger Delta area. The design target was to reach key community informants, community heads, youth representatives, market leaders, farmers and other community members.

The aim of the questionnaire is to tease out the thoughts of those affected by oil and gas exploration and in this instance EGTL.

The questionnaire was designed with inputs from experts experienced in Health, safety and environmental issues. The questionnaire was varied with Environment impact assessment questionnaire sources. It was designed to make the selection of choices easier for the respondents. Each question expected the respondent to select one or more of the available options.

Due to the subjective nature of the research questions, the result was analysed based on the percentage respondent on various issues. The intent is to know the actual size of respondents to specific issues.

In the outline of the analysis, out of the 150 questionnaires distributed, only 109 were returned. This represents 72.67% of the targeted sample size.

The parameters of interest include highlighting the social and environmental issues, perception of ways of addressing such issues, expectation from the project and how the oil producing companies can tackle this. These contributed extensively to putting together suggestive means of addressing the social and environmental impact of the project.

3.3.2 Interviews

The research also made use of a series of semi structured interviews and focus group discussions with staff working on the public affairs and HES support for the EGTL project. Discussions were also held with representatives of various sub-contractors, Chevron, community groups, and local government agencies. Major opinions sought through interviews contributed immensely to provide some broad based answers to key questions in managing the social impact. A first hand experience helped in providing the needed impetus to formulate plans that can help make the project a success.

3.3.3 Observations

In researching this subject matter it was observed that most of the major stakeholders were eager for the project to succeed. This was evident in the way and manner they showed interest in viewing their concerns. The large turn out at the community focus discussions, illuminated the stakeholders' desire, particularly the host community members which was another indication of their eagerness.

Equally of interest were the extensive use of communication methods; power point presentations, interaction with the community representatives of the company and a model (display) presentation of the production facility.

3.4 Research approach – Summary

This chapter discussed extensively the research design and the methodologies used in obtaining information for this dissertation. The various steps used in collecting information were explained.

The aim is to capture the issues and various potential impacts that will and can affect the remote communities around the exploration location. A key proposition of the research is that these can be used to advance a management framework

that will deliver business advantages to the companies and their clients and also bring about better social benefits to the host communities and other stakeholders.

The next chapter will however present the outcome. It will try to capture the highlights of major issues and its impact.

CHAPTER FOUR

4.0 Results Presentation

The previous chapter discussed the research design and the methodology used in this project. The analysis of the information obtained from the investigation was performed and the sources as indicated in the information were also documented. This chapter presents the findings of the study and the outcome of the field work. This is followed by a discussion of the results and validation of the findings.

4.1 Public Scoping of Key issues

The purpose of the public scoping exercises was to capture points and issues that require investigation in management of social and environmental issues. This can be used in the development of an Environmental Impact Assessment incorporating social analysis. The public scoping was carried out in focus group discussions established to encourage debate about the EGTL project. Table 4-1 presents the attendance figures at the public open day meetings.

Locality	Date	No. of Attendants
Ugborodo	12 January	97
Madangho	15 January	138
Arunton	18 January	56
Ugboegungun	8 February	86
Igbelemeji	9 February	3
Saghara	26 February	49

TABLE 4-1: Attendance figure at focus group discussion with host communities

Ninety-Seven (97) people attended the open day in Ugborodo, Niger Delta on January 12, 2007 at the town hall centre. The deliberation at this meeting and other meetings were documented. The document formed part of the basis for the conduction of this dissertation

Briefing Documents were circulated to 85 youth and community representatives, local council representatives, company representatives' inviting comment. Leaders of various youth groups, the community leader and the company were encouraged to comment and critique the briefing document. Responses to this briefing document also became part of this dissertation. The consultation processes are outlined in Appendix 2.

Because most people do not view the existing plants in Chevron operations and the EGTL plant separately, questions about the existing plants were often meant to apply to the EGTL project as well.

In this chapter, the social and environmental issues that were raised during the scoping are aggregated and summarised. A number of these issues are in the nature of questions which were responded to at the meetings and do not require further explanation.

Colleagues who are specialists in the following fields; community and public affairs management and health, safety and environmental management, were engaged in the focus group discussion. They helped in providing answers to the questions raised.

The answer may not necessarily represent the official stand of the company but their views come from a wealth of experience in the company and relationships with host communities.

The key social issues, together with any other issues considered to be important can be used as the basis for development of a management framework.

4.2 Key Issues and Questions Raised at the Focus group discussion

4.2.1 Questions and Issues on the Potential Benefits from the EGTL Project

The proposed EGTL project has raises the expectation of the stakeholders, particularly the host communities to the benefit that will come to them and the communities. Many of the attendees at the focus discussion, particularly youths, asked about employment opportunities both during and after the construction and into the operational phase of the project. Queries came both from job hunters and from State and Local government personnel. Questions were raised on developmental efforts that may come from the company. Questions were also asked about the wider benefits of the project to Nigeria as a whole. Also they wanted to know how the proceeds from the sale of the liquefied gas would be distributed to the State and local communities affected by the project. Specific issues raised were as follows:

What employment opportunities will be generated during the construction and operational phases of the project? Will Chevron assist in the training of construction and operational staff?

From Chevron's plan, an estimated 1,100 workers will be engaged during the construction phase of the project. As a policy, Chevron's hiring practice give priority to qualified locals except where expertise is not available. The long-term goal is to run the total operation with a Nigerian workforce. This is evidenced by the number of operations trainees sent to Sasol, in South Africa. A direct positive impact will be felt on the socio-economic environment, there by improving the quality of life and welfare of the local residents. In light of this, more local people would go into commercial activities, providing services for patronage of workers' community. A secondary positive impact is the technology transfer brought about by project.

How will the spin-offs of the project be addressed with respect to other land use?

Preliminary consideration in the planning of land-use around the project site is generally considered by the company during the execution of projects such as this.

Will Chevron construct and/or upgrade creeks/roads used to access the construction site?

As with previous project development, Chevron will construct roads and creeks to operate and maintain the facilities. Where necessary, within the vicinity of the facility, similar provision will also be made.

What happens to the temporary camps and the associated facilities after construction is completed?

It is understood that all construction facilities are temporary and may be removed afterwards. The benefit of leaving construction facilities in place will be at the discretion of the company.

Will Chevron assist the host communities in development with regards to contributions to upgrade of schools, health facilities, etc?

Chevron has a long term commitment in participating in socio-economic projects in Nigeria, particularly its operational areas. The extent of such is normally covered in its Social Impact Study (SIS).

4.2.2 Questions on Pollution

How will the waste generated by the project be processed in order to avoid damage to the Environment?

This is determined in an Environmental Impact Assessment (EIA).

How would the project compensate for pollution?

Any incident of pollution will be addressed through the necessary agencies. Compensation will be provided in accordance to the laid down schedule.

4.2.3 Questions and Issues on Public Health, Environment and Safety (HES).

A general concern was raised about the inherent risk of operating a gas processing plant. The majority of local people knew about the fire that resulted from the blow out at the tank farm in 2004. Many participants had also heard of other accidents associated with Oil and Gas plants/pipelines elsewhere. Hence, the major concerns typically centered on the measures that would be taken by Chevron to ensure that risks are minimized. Specific questions and issues raised were as follows:

What are the situations that normally result from the inherent risk associated with the operation of a gas processing facility and associated infrastructure (pipelines, vessels, etc)? What are the typical consequences of an accident? How will it be handled?

It was explained that a risk assessment of likely scenarios and situation are investigated and covered in an environmental impact assessment.

How will Chevron protect the plant/pipelines against external interference?

Community enlightenment campaign will be put into practice to highlight associated risks caused by external interference. Routine visits and monitoring will be carried out to allow operational personnel to detect and deter external influences. Air surveillance of the pipeline will be carried out periodically.

What will be the risks associated with the gathering of gas and operation of the plant?

A risk assessment will be covered in the EIA.

How will safety procedures be monitored and supervised during the project?

The practice in the industry saddles all operations personnel up through management with the responsibility of HES issues. An audit is normally carried out to ensure compliance.

How will the risk from the potential threat of fire, soot exposure from charcoal used by the Local communities affect the plant where it is in the vicinity of the gas plant?

Charcoal usage and manufacturing will be restricted in areas classified as hazardous.

Will the plant be surrounded by a security perimeter?

Yes. With the increase in hostility in the Niger delta area it is paramount that adequate security will be provided.

4.2.4 Questions on Social Pathologies and cultural heritage

How will the customs and traditions of host communities be respected?

A SIS is used to consider and address the potential impacts and mitigation of this issue. The company exhibits a high regard for its stakeholders in its operation, particularly the host community.

Will the plant site and pipelines impact any sacred sites? Will these be respected and avoided?

This will be investigated as a part of the SIS, and respected if found. If not, where necessary, the company will be willing to negotiate at resolving any of such issue(s) that may arise.

Will the plant/pipelines impact on any archaeological sites?

This is investigated in the SIS.

4.2.5 Questions on the increase in transmissible Diseases

What impact will the introduction of construction teams and camps at Escravos have on the transmission of HIV and other communicable diseases in the local villages?

Construction and associated workers will be guided in HES topics, including the impact of HIV and other communicable diseases. The Social Impact Study covers investigation of health issues related to the project and recommendations are made to minimise any risks caused by construction and operation activities.

4.2.6 Questions on Fishing/Agriculture and Land use

What are the implications for local households who have fishing, agriculture and natural resource use as their main source of income?

Experts in the field of Public and Corporate affairs negotiate with the Government and representative of host communities to determine acceptance procedures and compensation rates for the payment of damages and relocation of any locals, if this is required. The SIS is used to establish the probable extent and significance of these issues.

**Is there any permanent restrictions concerning land use around the plant?
How will this affect existing and potential future land-use?**

The Federal Government Land Act will be used as a resource to dictate certain restrictions with respect to land use and occupation e.g. no structures will be allowed within a pre-determined proximity and right of way, but most fishing and agricultural activities can take place along side the plant site. The probable extent and significance of this impact is detailed in an EIA.

Will there be permanent damage to agricultural produce caused by the construction and operation of the project?

Damage done following construction will be mended. The probability of long-term irreparable (permanent) damage will be investigated and addressed in a SIS.

4.2.7 Questions on Compensation for Damages

How will compensation for losses be estimated? Will compensation include losses such as fishing nets, crops, trees, loss of area for collecting of natural resources? How will payment to the affected people be made?

All resources which are lost and can be valued will be compensated for. The nature and approximation for compensation will be determined based on negotiation.

What guarantees do affected individuals and communities have that fair compensation for construction damages will be paid?

All compensation is negotiated and agreed with the government and representative of the host communities.

4.2.8 Questions on Natural Environment

What impacts may be expected on flora and fauna in the site area during construction and operational phases of the project?

These are covered in the EIA process.

4.2.9 General Questions Raised

Will the WAGP have to buy gas from EGTL?

No. Gas is supplied to WAGP through the existing EGP facility.

What proportion of the GTL will be used in Nigeria compared with export?

Initially all liquid will be going to export. Liquid fuel consumption is still in its infancy in Nigeria. Local supply will depend on future viable projects and local consumption.

How long will the construction phase of the project be?

The current plan is to deliver product in the year 2012. Construction should be completed by late 2010.

Where will the equipment for the project be produced? Why can it not be manufactured in Nigeria?

The majority of the equipment is highly sophisticated and requires specialised production. Since manufacturers are not available locally, it will be sourced from appropriate manufacturers around the world. Local content will be applied to award fabrication contract to local contractors.

Why is the majority of the liquid fuel being exported? Why is more of the Liquid fuel not allocated to use in Nigeria?

There is an existing market in Europe and USA. As gas markets develop in Nigeria, GTL can then be supplied.

4.3 Response to Survey

The questionnaire (see Appendix 1) was circulated in the community around the project area to identify the major social and environmental issues in order to determine the impact of the project.

There were 109 respondents to the questionnaire. They were from the remote community around the Escravos area, where the project is being constructed.

4.3.1 Presentation of Results

Of the 109 respondents, 23 are women, while 86 are men. Majority of the respondents are within the ages of 21-50 years.

About 63% are into fishing, 71% into both farming and fishing. 79% are married. 55% have some form of education. Family sizes ranges from 1-10.

The majority of the respondents are youths belonging to one youth society or the other. On the average they have lived in and around the project area for about four years and most of them have lived there from birth.

The main concerns of the sampled size were; unemployment, loss of biodiversity, pollution, soil and water quality, low farm yield, water scarcity, acid rain, erosion, degradation, rain storm/flooding and deforestation.

Majority of the respondents also agreed that malaria, cholera and water borne diseases were rampant in their communities. Figure 4-1 shows the percentage of respondents identifying different issues affecting the environment as big issues for the local community or for other stakeholders.

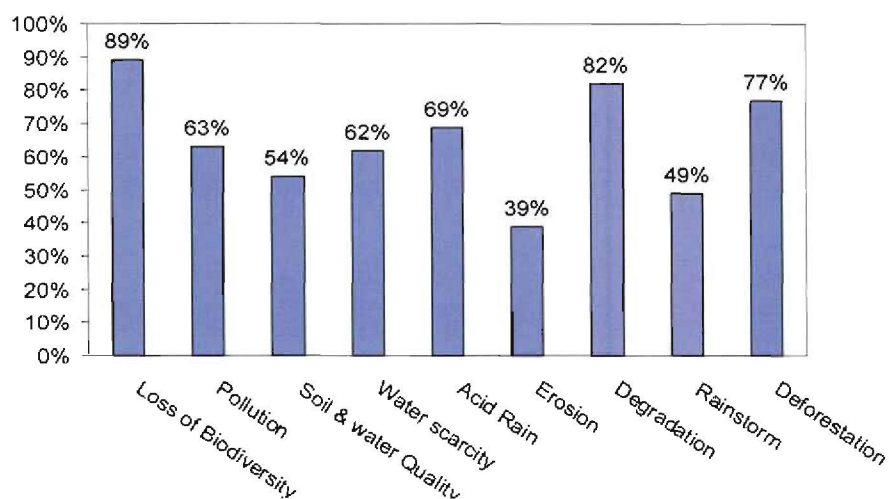


Figure 4-1: The percentage of respondents identifying different issues affecting the environment as big issues.

Figure 4-2 shows the ranking for major social issues. The biggest concerns appears to be poverty, literacy/education, labour conditions, water borne diseases, population increase, high cost of living, health problems, Socio-cultural interference.

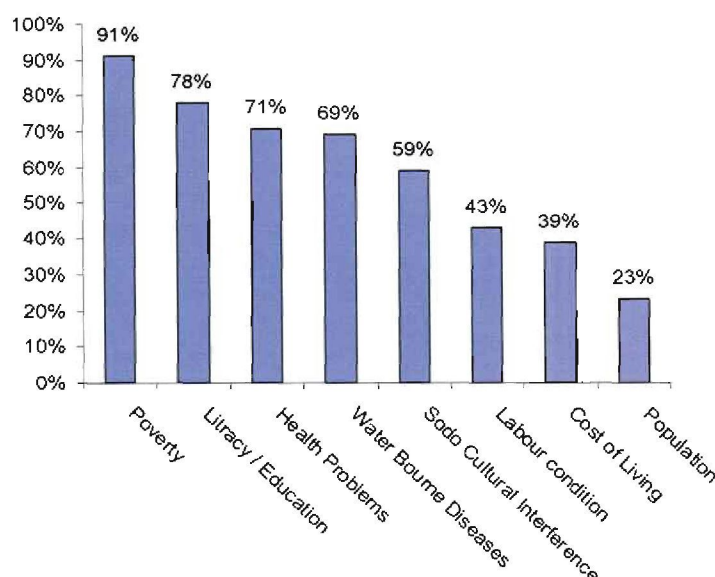


Figure 4-2: The percentage of respondents identifying different social issues as big issues.

Table 4-2 indicates other problems mentioned by respondents in the host communities during the questionnaire survey. The figures represent the percentage response in various age groups. The most frequently mentioned problem is the failure of oil companies to meet demands of host communities, especially in compensation and restitution. This claim cuts across all age groups, and is by far the most serious problem in terms of percentage respondents mentioning it. Apart from the problem of conflict with oil companies, the other problems do not pertain directly to oil companies.

The (-) sign in the table indicates age group did not respond to the problem as issues.

Age Group	Type of Problem (in %)						
	Leadership Problem Community Struggle	Non-adherence to demands From oil company	No Government Presence	Political Upheavals And Ethnic Conflicts	Marginalisation By large Communities	Conflict with Company	Others
16-25	9.1	100	27.3	60.0	9.1	9.1	40.0
26-35	6.7	100	20.0	53.3	6.7	-	68.4
36-45	22.2	100	11.1	77.8	-	-	40.0
46-55	18.8	100	18.8	43.8	6.3	6.3	37.5
56-65	14.3	100	28.6	33.8	14.3	14.3	33.5
>65	-	100	-	50.0	25.0	-	60.0

Table 4-2: Variation in Perception of Major Socio-Political Problems among Age Groups in the Project Area

The other problems mentioned during the survey are economic in nature, and are presented in Table 4-3

Age Group	Type of Problem (in %)					
	Lack of pipe-borne water	Inadequate Transport Facilities	Inadequate Market Facilities	Sky-rocketing prices, inadequate food supply	Un employment	Low farm yield
16-25	-	-	8.3	8.3	25.0	50.0
26-35	-	6.3	6.3	25.0	43.8	31.3
36-45	-	-	20.0	30.0	50.0	50.0
46-55	13.3	6.7	6.3	12.5	37.5	25.0
56-65	14.3	-	-	14.3	42.9	28.6
>65	-	-	-	25.0	60.0	60.0

Table 4-3: Variation in Perception of Major Economic Problems among Age Groups in the Project Area

The two major economic problems in the area are low farm yield and unemployment. A common view held by the people is that soil degradation resulting from oil and gas activities around their areas is responsible for the low farm yield. Another problem of note is inflation, manifested in high prices and inadequate food supply. Other people mentioned inadequate infrastructure, such as market places, water supply, and transportation facilities.

Potential Impact

From the results of analysis and concerns expressed during the interviews, focus group discussions as well the questions raised during the consultations with colleagues on the field; it can be deduced that the project will bring about both positive and negative impact to Nigeria and particularly to the host communities.

The following identified positive impacts have the potential to result in a beneficial impact:

- Job creation, particularly increase in local employment
- Technology transfer and training
- Improvement in the socio-economic activities such as procurement of local materials
- Development of local capacity
- Development of technical and commercial skills
- Improvement in the delivery of services in areas such as health, education, transportation and power.
- Positive multiplier effects around the host communities.
- Production of high quality fuel product.

Also identified are the potential negative impacts of the project. They are as follows;

- Deforestation
- Loss of biodiversity

- Pollution, such as unplanned air emissions, hazardous material releases and waste disposal, etc.
- Inflation/High prices
- Health problems
- Youth militancy and unemployment
- Population expansion
- Erosion
- Acid rain
- Low farm yield

4.3.2 Discussion of Results

Social Issues and Impact

From the analysis with respect to the data gathered from the survey, it was evident that impacts resulting from social issues are multi-dimensional. This includes unemployment, high cost of living, literacy/education and socio-cultural interference.

From my findings, the concern of unemployment is based on the fact that most of those engaged for the project can only find temporary succor. A large number of youths in the community dropped out of school to enable them to search for better living standards and/or fend for their family. This makes them to have very little formal education and no technical skill. As a result they only get a temporary succor from their economic and social challenge.

As a result of this and due to the nature of the project a vast majority of them are employed as casuals or on contract basis. Thereafter most of them remain unemployed after the construction phase of the project. Even though a sizeable number of people will be employed for the operational phase, those unlucky afterwards are apprehensive of unemployment. This is a concern that can create

some social tension as idleness of the unemployed youth might lead to increase youth militancy/restiveness.

On job creation, it is expected that employment opportunities will lead to the secondary impact of improving the skills base of the workforce through training and the technology transfer of the GTL process.

Furthermore, there is a concern of population increase as construction work and other related work in the communities lead to the influx of immigrants from outside the communities. Though there is an increase in outsiders coming into the communities, the major concern is more about the impact on their way of life as a people. Both this and the operation of the project, by extension Chevron, will cause socio-cultural interference.

It is expected that the influx of immigrants will trickle in economic prospect for local businesses. Also local small scale suppliers will be able to supply construction materials and spare parts to the company and its contractors.

The secondary effect of the influx of immigrants is the increase in cost of living. This is evident in increasing prices of goods and services. A case in point is the competition to secure the few available residential accommodation thereby increasing rent rates.

Other issues seem more political and self inflicted as a result of inter-communal strives and cultural conflicts amongst the communities.

A major concern they perceived as problematic is the failure of Chevron to meet their demands sometimes ignoring them. In the case where demands are met, some communities believe those closest to the operations benefit more. This has caused divisions and created conditions for agitation and conflicts resulting in communal strife around the area of operations.

Environmental Issues and Impact

From the scene of the study location, it is evident that the environmental issues have largely been a direct result of the exploration activities around this study area. From the response gathered and first hand observation, these issues are aggravated by pollution which has adversely affected the biodiversity, causing severe degradation, health problems and acid rain.

Fishing and farming, a source of livelihood for a sizeable number of the communities, from the river and land have been affected by pollution. This is the main cause of low farm yield. A look at the creeks, where fishing is mostly carried out showed traces of oil spillage. Fish traps, dragnets, and cast nets were visibly damaged.

It was discovered that the remote cause of pollution is oil spillage, gas disposal and flaring, air emission and hazardous chemical releases. This clearly shows an ineffective or careless approach to waste management.

The use of about 73 hectares of land for the EGTL project has increased deforestation. Though the people are compensated for their land they still feel concerned about their farmland. They expressed difficulty in a sense of detachment from their settlement as this resulted in resettlement.

4.4 Validation of Results

In an attempt to examine the accuracy of the issues and impacts recognized in this study, existing data (facts) in other parts of the Niger Delta and other parts of the world was used.

It is common knowledge that the situation in the Niger Delta has grown worse since the discovery of oil over four decades ago.

According to (Shola, O. 2006), "The incessant oil spillages have deprived the people of their main sources of livelihood, that is fishing and farming." He also stated that "Not only have the cumulative effects of oil spills and gas flaring destroyed environmental resources but they also constitute health hazards. As noted farmlands, rivers and their resources have been severely damaged, thereby denying the people their livelihood." This partly explains the high rate of unemployment that characterizes the Niger Delta since the people are predominantly farmers and fishermen.

This is supported by (Agbu, O. 2005) that "Available statistics indicate that between 1976 and 1999, about 3000 oil spill incidents were reported by oil companies in Nigeria, translating into over 2million barrels of oil spilled into the country's terrestrial, costal and offshore marine environment." A (World Bank, 1995) account also reveals that "there were almost 300 spills per year between 1991 and 1993 in the Delta and River state alone, which are the main oil producing states."

According to (Kaladumo, C. 1996), "Some of the health problems are caused as a result of gaseous pollutants released into the atmosphere such as carbon monoxide, nitrogen oxides, sulphur oxides, acid aerosol etc which are noted to cause headaches, heart problems, irritation, dizziness and gene or neuron problems, depending on the pollutants."

From the foregoing it can be seen that the environmental and health impacts of oil and gas on the Niger Delta people have been negative.

The Camisea gas project in Peru has also suffered oil spillage which has led to dire environmental and social consequences similar to those identified in this study. According to (banktrack.org, 2007), "some of the consequences have resulted in diseases and death of indigenous people; Human rights violations; Fish stock declines; Deforestation/Landscape disturbance; Pollution."

Similarly, In the Oriente, Ecuador according to (Steyn, M.S. 2003), “there are also cases of deforestation resulting from clearing of land; destruction of crops in communities close to the exploration area, soil erosion due to soil disturbance that alter drainage in affected area and negatively affects fauna across migration routes.”

She also point out that, the Oriente, like the study area has also attracted a sizeable number of outsiders which have increased land scarcity, displacing them of land and forest resources.

(Steyn, M.S. 2003), acknowledges that “Oil spills, in particular, are one of the major environmental problems of Ecuadorian and Nigerian oil industries which have resulted from oil well blowouts, pipeline leakages, human error, sabotage oil spills, equipment failure and environmental factors.” She highlighted the environmental impact to include damage to crops, pollution of water and soil, and killing of marine resources around the communities.

(ATRIM UK, 2006), conceded in its environmental statement that, “the atmospheric emission as a result of its hydrocarbon extraction (i.e. oil and gas) has caused a range on environment effects. These effects include global climate change, acid rain, photochemical ozone creation potential and other human health effects.”

Similar complimentary impact of this study is seen in the operations of British Petroleum (BP) in Angola and the Caspian. According to (BP, 2002), “its exploration activities has enabled local suppliers to benefit from its business, thereby developing local capacity, providing training in new skills, transfer technology and business know-how and increase ability to access global markets.” Also, its recruitment and development programme in Angola has provided jobs and training of the locals, producing streams of skilled technicians.

4.5 Summary

This chapter has presented the perceived outcome of the social and environmental issues and the potential positive and negative impact of the EGTL project gathered from the field work. These identified potential impacts present the outcome of the questions raised by this dissertation subject matter highlighting the effect of the resource extraction from the host communities and the impacts of resource degradation, pollution, poverty and misery in host communities.

CHAPTER FIVE

5.0 Conclusions and Recommendations

This chapter will raise the main conclusion derived from this research. Recommendations will be made based on the conclusion thereof. Further recommendation will be made for future research.

5.1 Conclusions

The main theme of this dissertation has been the discussion around the perceived environmental and social issues and potential impacts related to the implementation of the EGTL project in respect to gas exploration.

Some highlight from the issues raised in this dissertation is the effect of oil and gas extraction on fishing and agriculture, the basis of sustenance of a significant number of the people in the study host communities. From the response received, it is obvious that it is having an influence on the socio-economics and environment.

This dissertation has also highlighted and shed more light on the effect of the intensive resource extraction from the communities in the study areas and the impacts of resource degradation, pollution, poverty and misery in host communities.

To ensure that the issues and potential negative impacts identified in this dissertation are managed so that the EGTL project is both sustainable and contributes to industrial and community stability, the imperative for effective management within a framework cannot be overstressed.

In view of this, a well articulated social and environmental management framework must find answers to the communities' social well being by actively engaging the people who stand to benefit.

In order to achieve this, I wish to propose a management framework as part of the recommendation.

5.2 Recommendations

5.2.1 Proposed Management Framework

The Environmental Impact assessment (EIA) as part of an Environmental Management System (EMS) used in the planning and execution of project activities should incorporate a comprehensive socio-economic study. This should be carried out long before the construction phase and referenced through the operation phase of the EGTL Project.

The guideline for the socioeconomic study should include;

- Incorporating an emphatic measure of social analysis into the environmental performance of the project
- Clearly defined community development plan.
- A remedial management approach to any foreseeable and/or identified issues relating to the project execution.
- A detailed community/socio-economic understanding in the general framework of the environmental assessments.

In the execution of a socioeconomic study as part of an EIA, the model is to adopt an interactive participatory approach, involving the communities and working with consultants and company representatives.

In the interactive participatory approach the community should be actively involved in data gathering, interpretation and usage. Whilst this will display openness, better quality information will be obtained with minimum time in the process.

By so doing the communities are directly involved in the process from onset rather than collating results based on literature and conjecture. This will help in the management of social and environmental issues in relation to the EMS framework. This should also result in better buy-in from local communities.

5.2.2 Other Recommendations

1 To combat the adverse effects of oil and gas pollution on the communities, the oil companies and responsible government agencies should show more commitment to the use of abatement procedures and environmentally sound and cleaner technologies for oil and gas exploration and exploitation.

In support, the government should mandate oil companies to provide basic needs of the communities where feasible before the commencement of exploration so as to prevent any negative impact on the immediate communities.

2 On the prevalent literacy level in the host communities, the company should establish a resource/skills development centre in the communities where youth can develop vocational and technical skill. It should also serve to cater for self-help community development processes to give opportunities to partake in controlling development in their communities.

Whilst this will empower them to pursue decent sources of livelihood and encourage self-reliance, it will equally promote the development of Small Medium-scale Enterprise (SME).

3 As the EGTL project enters the operational phase, the company should set up a review mechanism that can be deployed in the event of new impacts not identified in this study.

4 In tackling the potential impact of the EGTL project, the company should collaborate with organisations such as the NGOs in their best practices, where

they can offer independent monitoring capacity in ensuring the impacts are mitigated.

Having come to this recommendation, I strongly believe that it will help to address most of the issues experienced today in the difficult and challenging terrain of the Niger Delta area and in similar places around the world.

5.3 Further Research

Seeing that man is an evolving entity, the questions about the social and environmental implications of EGTL can not be solved once and for all, there will be in my opinion a need for continuous researching in this area for the issues to be resolved as and when they come up.

Future research into the proposed framework should probably investigate and discuss the efficacy of incorporating a socioeconomics study in an EIA. Also, the use of social engagement as a development and management tool could be investigated.

The conclusion in this work share similar views with other research done on similar works. However, future researchers should investigate factors not covered in this work.

Appendix I

SOCIAL AND ENVIRONMENTAL IMPACTS QUESTIONNAIRE

This questionnaire is set to find out what you consider as the social and environment issues that can be caused by the EGTL project (gas exploration) in Escravos.

Please kindly mark the box as applicable.

SETTLEMENT CODE

Name of Village/Quarter

RESPONDENT SOCIAL DATA

Sex:

☐ Male

☐ Female

Age

☐ 10 – 20 years

☐ 21 – 30 years

☐ 31 – 40 years

☐ 41 – 50 years

☐ 51 – 60 years

☐ 61 – 70 years

☐ Above 70 years

Marital status

☐ Single

☐ Married

☐ Divorced

☐ Separated

☐ Widow / Widower

Level of Education

☐ Primary School

☐ Secondary School

☐ Vocational / technical School

☐ Tertiary School

☐ No formal Education

What is your occupation?

☐ Farming/Hunting

☐ Fishing

☐ Technician

☐ Business/Contractor/Trading

☐ Teaching

☐ Civil servant

☐ Retired

☐ Student/Apprentice

☐ Unemployed

☐ Others (specify).....

Family size?

☐ 1 – 3

☐ 4 – 6

☐ 7 – 10

☐ 11 – 15

☐ 16 – 20

☐ Above 20

Statue of respondent?

- | | |
|---|--|
| ☐ Traditional ruler/head of settlement | ☐ Traditional Chief |
| ☐ Union leader | ☐ Youth leader |
| ☐ Doctor/Nurse/Herbalist | ☐ Immigrant/Settler |
| ☐ Visitor | ☐ Other specify |

How long have you lived in the settlement?

- | | |
|--|--|
| ☐ Since birth | ☐ Less than 5 years |
| ☐ 6 – 10 years | ☐ 11 – 15 years |
| ☐ 16 – 20 years | ☐ Above 20 years |

List the common sickness in the settlement?

.....

List the Environmental problems in the settlement?

- | | |
|--|---|
| ☐ Soil infertility | ☐ Pest attack/invasion |
| ☐ Soil salinity | ☐ Erosion |
| ☐ Rain storm/flooding | ☐ Deforestation |
| ☐ Others (specify)..... | ☐ No idea |

Of what use are the water bodies in your area?

- | | |
|--|---|
| ☐ Fisheries | ☐ Irrigation |
| ☐ Domestication (specify) | ☐ Transportation |
| ☐ Recreation | ☐ None |

What properties do you own?

- | | |
|--|------------------------------------|
| ☐ House | ☐ Farm land |
| ☐ Poultry (specify) | ☐ None |
| ☐ Others (specify) | |

What is the nature of land ownership?

- | | |
|--------------------------------------|--|
| ☐ Inheritance | ☐ Tenant/lease |
| ☐ Farming | ☐ Outright purchase |
| ☐ Communal | ☐ Others (specify)..... |

As or for what was the project site used?

- | | |
|-------------------------------------|---|
| ☐ Farming | ☐ Settlement |
| ☐ Greenfield | ☐ Others (specify) |

What cropping system is common here?

- | | |
|---|---|
| ☐ Mono-cropping | ☐ Mixed-cropping |
| ☐ Inter-cropping | ☐ Other (specify)..... |
| ☐ No idea | |

What has been the nature of agricultural yield?

- ☐ Increasing ☐ Decreasing
☐ The same

Will the EGTL project cause, require, bring about or stimulate any of the following?

- ☐ Resettlement of the local population
☐ Compulsory acquisition of land
☐ Displacement of, or damage to, existing industry or agriculture
☐ Job losses among the local population
☐ Child labour
☐ Bonded or forced labour
☐ Large-scale influx of workers
☐ Damage to sites of cultural, historic or scientific interest
☐ Impact on minority or vulnerable communities
☐ Use of armed personnel
☐ Other social drawbacks, losses, or disadvantages, please specify:

.....
☐ Social benefits, please specify:.....
.....

What benefit do you expect from the EGTL project?

- ☐ Employment opportunity ☐ Economic boom
☐ Infrastructure development ☐ Scholarship
☐ Cheap mode of transport ☐ Social benefit
☐ Environmental management ☐ Environment audit
☐ Other (specify).....

What are your fears on the EGTL project?

- ☐ Loss of land acquisition/deforestation ☐ Damage to farmland
☐ Pollution ☐ Health problems
☐ Socio-cultural interference ☐ High cost of living
☐ Increased population ☐ Unwarranted rumour
☐ Distortion of report ☐ Other (specify)

What kind of study of this sort have you had in this area?

.....
.....
.....

Who provided it?

.....
.....
.....

What is your opinion of this study?

- ☐ Supported the study
- ☐ No idea

- ☐ Not supported

What social related problems do you have in your area?

- | | |
|---|---|
| ☐ Youth/Juvenile delinquency | ☐ Land dispute |
| ☐ Chieftaincy tussle | ☐ Inter-family problem |
| ☐ Acute unemployment | ☐ Child abuse |
| ☐ Infant pregnancy | ☐ Others (specify) |

Of past, what social impact problem did you experience, when and where?

.....

.....

.....

.....

Appendix II

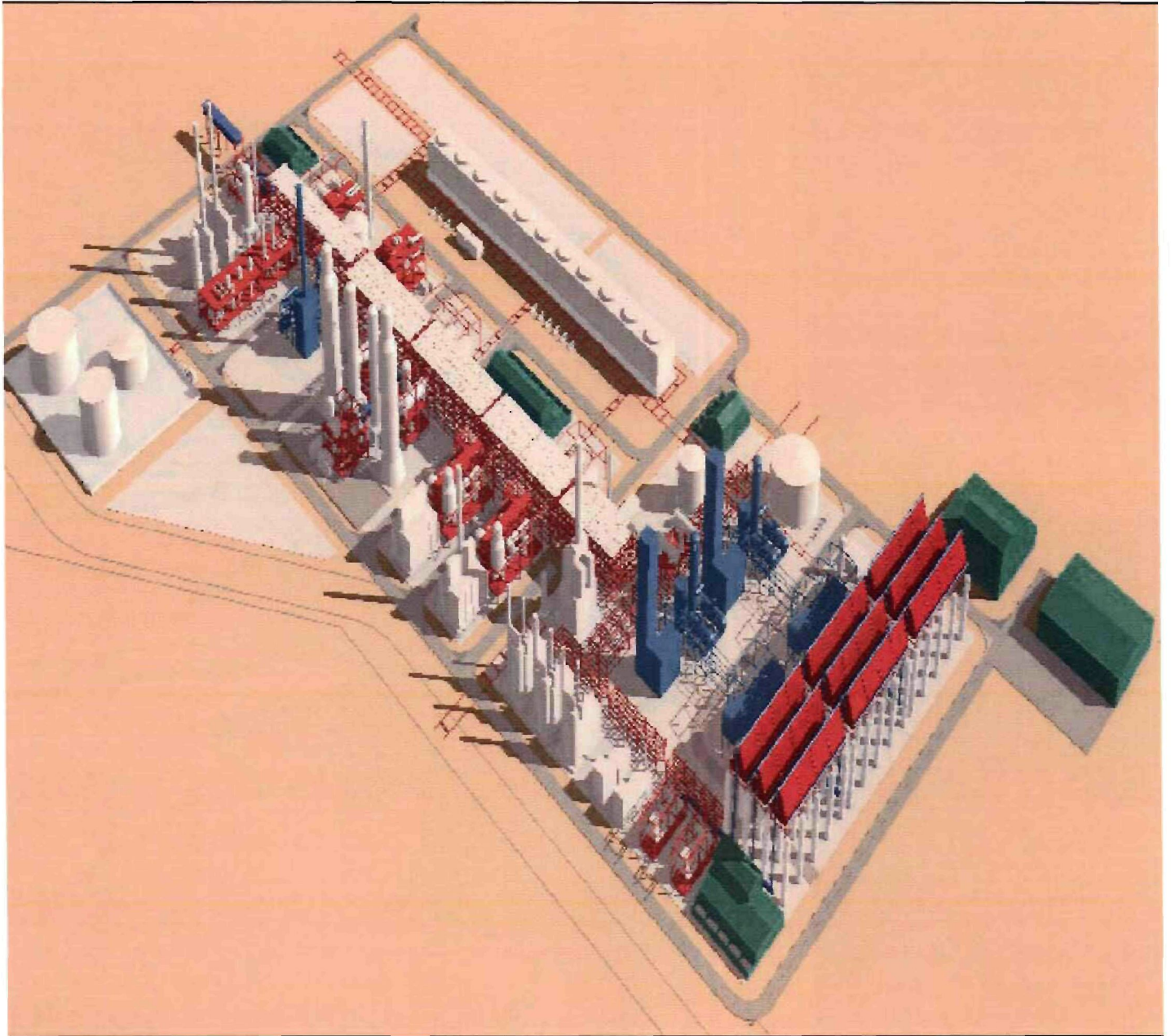
ESCRAVOS GAS-TO-LIQUID PROJECT (EGTL) CHRONOLOGICAL SUMMARY OF THE PUBLIC CONSULTATION PROCESS JANUARY – FEBRUARY 2007
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DATE	LOCATION	ACTIVITY	WHO ATTENDED	ISSUES
Jan. 12	Ughorodo	Consultation, meetings, interviews	Youth leaders Community rep. Local council rep. Student Graduates farmers	Water scarcity Unemployment Pollution/spillage Scared of workers influx Educational facilities Militancy Non-adherence
Jan. 15	Madangho	Consultation, meetings, interviews	Fishermen/women Youths Youth Leaders Farmers Community elders	Unemployment Spillage Destruction of farmlands Compensation Insensitive to infrastructural needs Scholarship Militancy Non adherence
Jan. 18	Arunton	Consultation, meetings, interviews	Youth leaders Teacher Student Community elders Farmers	Job opportunities Water ways Compensation Educational facilities Health Non-adherence
Feb. 8	Ugboegungun	Consultation, meetings, interviews	Youth Farmer Fishermen Community Rep.	Pollution Low farm yield Compensation Infrastructural needs

				Non-adherence to demands Noise
Feb. 9	Igbelemeji	Consultation, meetings, interviews	Community Rep Youths Fishermen/women transporter	Unemployment Erosion Transportation facility Water supply Non-adherence to demands Construction impact
Feb. 26	Saghara	Consultation, meetings, interviews	Nurse Community Rep Artisans Youths Farmer Elder	Public Health & safety Medical facility Waste Electricity Roads Degradation Non-adherence to demands

Appendix III

Facility Plot Plan



References

NNADOZIE, K. 2001b. "Environmental Law and the Oil Industry" Paper Presented at the Workshop on "Essentials of Oil and Gas Law" Organised by the Centre for Petroleum, Environment & Development Studies (CEPEDS). Nigeria.

BAKER, J.M. 1983. The oil industry in Nigeria: A review of ecological and socioeconomic effects and suggestions for future actions. Nigeria

COMFORT HASSAN, et al. 2002. Impact of International Trade and Multinational Corporations on the Environment and Sustainable Livelihoods of Rural Women in Akwa-Ibom State, Niger Delta Region, Nigeria. 2p

E&P FORUM/UNEP, 1997. Environmental Management in Oil and Gas Exploration and Production: An overview of issues and management approaches. Oxford, U.K.

OGP, 2002. Key Questions in Managing Social Issues in Oil and Gas Projects. England: 5p.

AMEC PLC, PETTER MATTHEWS, et al, 2004. Learning from AMEC's Oil and Gas Asset Support Operations in the Asia-Pacific Region, with case-study on the Shell Malampaya Gas-to-Power Project: An Interim Report. London EAP. 7-18p

WORLD BANK, 2003. LICUS Initiative, Implementation Overview, Washington DC: World Bank, Operations Policy and Country Services

E & P FORUM, Dec. 1994. Atmospheric Emissions for the Offshore Oil & gas Industry. Report #2, 66/216

TIMOTHY VAN HINTE, 2005. Managing Impacts of Major Projects: An Analysis of the Enbridge Gateway Pipeline Proposal. Waterloo. 68p

E & P FORUM, Sept. 1993. E & P Waste Management Guidelines. Report #2, 58/196

CENTRICA, 2006. Internet.

<http://www.centrica.com/files/reports/2006cr/index.asp?pageid=291> Date of access: 14 Dec. 2006.

CHEVRON, 2005. Environmental Impact Assessment of EGTL, Draft Final. Lagos CNL.

UNEP/IPICEA PUBLICATION, 1995. The Oil Industry Experience-Technology Cooperation and capacity Building. Contribution to Agenda 21.

Oil and Gas Journal, 2005 Internet.

<http://www.mbendi.co.za/indy/oilg/af/ng/p0005.htm> Date of access: Nov. 2007

E & P FORUM, May 1994. North Sea Produced Water: Fate and effects in the marine environment. Report #2, 62/204

AL FARUQUE A, et al. 2006. Regulation Vs Self Regulation in Extractive Industries: A Level Playing Field. MqJICEL. 2p

ASIAN DEVELOPMENT BANK, 1994. Handbook for Incorporation of Social Dimensions in Projects. ADB.

Metago, 2002. Environmental Management Plan-Construction of Temane well heads, Flowlines, Assess Roads and a Central Processing Facility, Inhambane Province, Mozambique.

OKOTONI O, 2004. Awareness and Environmental Management in Oil Companies in Nigeria. Kamla-Raj. Internet. <http://www.krepublishers.com/02-Journals/JHE/JHE-15-0-000-000-2004-Web/JHE-15-1-001-084-2004-Abst-PDF/JHE-15-1-013-017-2004-Okotoni/JHE-15-1-013-017-2004-Okotoni.pdf> Date of access: August 2006.

UNEP, 1985. The Impact of water-based drilling mud discharge on the environment. Industry and Environment overview series. Paris

HETTLER, J; LEHMANN, B; LE MARIE, L. 1996. Environmental Problems of Petroleum production in the Amazon lowlands of Ecuador. Berliner geowiss. Abh. 71p

CHEVRON, 1999. Escravos Tank Farm and Terminal Environmental Evaluation Report

OGP, 1997. Principles for Impact Assessment: The Environmental and Social Dimension. Report No. 2.74/265. England and Wales.

IMOBIGHE, T.A. 1997. 'Conflict Management In Nigeria', in I.B. Bello-Imam (ed.) Governance In Nigeria: Economy, Politics And Society In The Adjustment Years. Ibadan: Stirling-Horden. 1985–1995, 273p-287p

MAYOUX, L. 2003. Participatory Method. <http://www.enterprise-impact.org.uk> Date of Access: August 2006

REMIS SYSTEM. 2002. Air Emission. <http://www.rficonsulting.com/remissystem-fags.html> Date of Assess: August 2006

CAMISEA, 2004. Amazon and Gas Exploration-Peru.
<http://www.banktrack.org/?visitor=1&show=167&id=110> Date of assess: Dec. 2007

ROSENFELD, A.B., et al. 1997. Reinventing the Well. Approaches to Minimizing the Environmental and Social Impact of Oil Development in the Tropics. Conservation International. 22p. 38p.

ISHISONE, M. 2004. Gas flaring in the Niger Delta: the Potential Benefits of its Reduction on the local Economy and Environment. 14p-16p

O'ROURKE, D & CONNOLLY.S. 2003. Just Oil? The Distribution of Environmental and Social Impact of Oil Production and Consumption.

MARIA S.S. 2003. Oil Politics in Ecuador and Nigeria: A Perspective from Environmental History on the Struggles between Ethnic Minority Groups, Multinational Oil Companies and Nation Governments. Bloemfontein. 274p-280p

ANTRIM, 2006. Environmental Statement for Antrim Resources(NI) Ltd.
https://www.og.dti.gov.uk/environment/ospar_docs/arnil_EMS.pdf Date of assess: Dec. 2007

BRITISH PETROLEUM, 2002. Environmental and Social Review 2002.
http://www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/E/Environmental_and_social_report_2002.pdf 16p. 27p. Date of assess: NOV. 2007

OMOTOLA, S. 2006. The Next Gulf? Oil Politics, Environmental Apocalypse and Rising Tension in the Niger Delta. Accord, Durban. 10p-11p.

KALADUMO, C.O.K. 1996. The Implications of Gas Flaring on the Niger Delta Environment. 8th International Seminar on the Petroleum Industry and the Nigerian Environment, Port Harcourt. 29p.

MORRIS, C. Social Responsibility for the Oil and Gas Sector. IPIECA.

AGBU, O. Oil and Environmental Conflicts, in Saliu, Hassan A. (ed.), Nigeria under Democratic Rule, 1999-2003, Vol. 2, Ibadan: Ibadan University Press, 2005. 82p-83p.

WORLD BANK, 1995. Defining an Environmental Development Strategy in the Niger Delta. Quoted in Frynas, George J. Corporate and State Responses to Anti-Oil Protests in the Niger Delta, African Affairs, Vol. 100, No. 398, 2001. 35p

ABDEL GELIL, I 2007. South-South Cooperation in Environmental Management: The Arab Oil and Gas Sector. UNEP Date of access: 2007
<http://tcdc1.undp.org/EventProceedingFileDownload.aspx?filename=20072214002227.doc>

List of Acronyms/Abbreviations

AIDS	Acquired Immune Deficiency
ATR	Auto Thermal Reforming
Ba	Barium
B/D	Barrel/day
BP	British Petroleum
BpD	Barrels per Day
BTU/cf	British Thermal Unit/cubic feet
BTU	British Thermal Unit
°C	degree Celsius
Cd	Cadmium
CNL	Chevron Nigeria Limited
CO	Carbon Monoxide
CPF	Central Processing Facility
CSR	Corporate Social Responsibility
DFID	Department for International Development
E&P	Exploration and Production
EBS	Environmental Baseline Survey
EER	Environmental Evaluation Report
EGP	Escravos Gas Project
EGTL	Escravos Gas-to-Liquid
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EITL	Extractive Industries Transparency Initiative
EMP	Environmental Management Plan
EMS	Environmental Management System
EU	European Union
FEED	Front End Engineering and Design
FPSO	Flotation Production Storage
FT	Fischer Tropsch

GTL	Gas-to-Liquid
Ha	Hahnium
HES	Health, Environment, and Safety
H+CO	Synthetic gas
HIV	Human Immunodeficiency Virus
HSE	Health, safety, Environment
IBA	Impact and Benefits Agreement
Km	Kilometre
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
m	Metre
m ³	Cubic Metre
mm	Milimetre
MMSCf/d	Million Standard Cubic Feet per day
NE	North East
NG	Natural Gas
NGC	Nigeria Gas Company
NGO	Non-Governmental Organisation
NNPC	Nigeria National Petroleum Company
NORM	Naturally Occurring Radioactive Material
NOx	Various oxides of Nitrogen
Pb	Lead
Ppm	Parts per Million
PWYP	Publish What You Earn
SIA	Social Impact Assessment
SIS	Social Impact Study
SOx	Various Oxides of Sulfur
SW	South West
TBD	To be Determined
UN	United Nation
USA	United State of America

VOC	Voltage Organic Carbon
WAGP	West Africa Gas Pipeline
WHO	World Health Organisation
Zn	Zinc