SOCIO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF PETROLEUM DEVELOPMENT IN NIGERIA

BY

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A practicum submitted to
the University of Manitoba in partial fulfillment of the
requirements of the degree of

MASTER OF NATURAL RESOURCES MANAGEMENT

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Natural Resources Institute
The University of Manitoba
Winnipeg, Manitoba, Canada

October 1981

ABSTRACT

Several studies have been completed on petroleum resources development in Nigeria, but the scope of these studies were generally confined to the benefits of oil exploitation. Thus, socio-economic and environmental problems associated with oil industrial activities were not mentioned. This study examines these problems but specifically focuses on oil pollution.

Crude oil sales have, since the 1970's, provided the Nigerian government with enormous revenues and foreign exchange earnings. Underlying this wealth however, are socio-economic and environmental problems. The existing laws and regulations governing the petroleum development activities do not adequately address oil pollution and the associated socio-economic problems.

It is recommended that the Nigerian government should have laws and regulations dealing with oil pollution and other environmental problems associated with oil industrial activities; establish a fund supported by a tax on oil at well sites to ensure that victims of pollution are promptly compensated for loss of income and damage to private and public properties; require oil companies to carry out environmental input assessment studies, where necessary, prior to drilling and production operations.

It is concluded that the ideals and values of the society will determine the level of environmental achievement and quality of life in Nigeria.

ACKNOWLEDGEMENTS

The completion of this Practicum would not have been possible without assistance from several individuals.

I would like to thank the members of my Practicum Committee: Professor J. Loxley, Department of Economics, University of Manitoba; Professor H. M. Lapp, Department of Agricultural Engineering, University of Manitoba; and Professor D. Young, Natural Resources Institute, University of Manitoba, for their advice and constructive criticism.

I would also like to thank Professor W. R. Henson, Director, Natural Resources Institute; Professor T. J. Henley, Assistant Director, Natural Resources Institute; R. K. Baydack, Research Specialist and Lecturer, Natural Resources Institute, for their suggestions and advice offered from time to time until this Practicum was completed.

I wish to express my profound appreciation for the financial assistance provided by the Natural Resources Institute; my brothers-in-law Dr. M.S.O. Olisa and Professor R. M. Anikwe; my sisters Kate Olisa and Gladys Anikwe, and my brother Edwin Ojukwu.

Eileen Adams typed the final draft of the Practicum and I wish to thank her for her help and patience.

Finally, it should hardly be necessary to add that any defects found in this Practicum are my own responsibility.

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CHAPTER I

INTRODUCTION

1.1 Historical Review

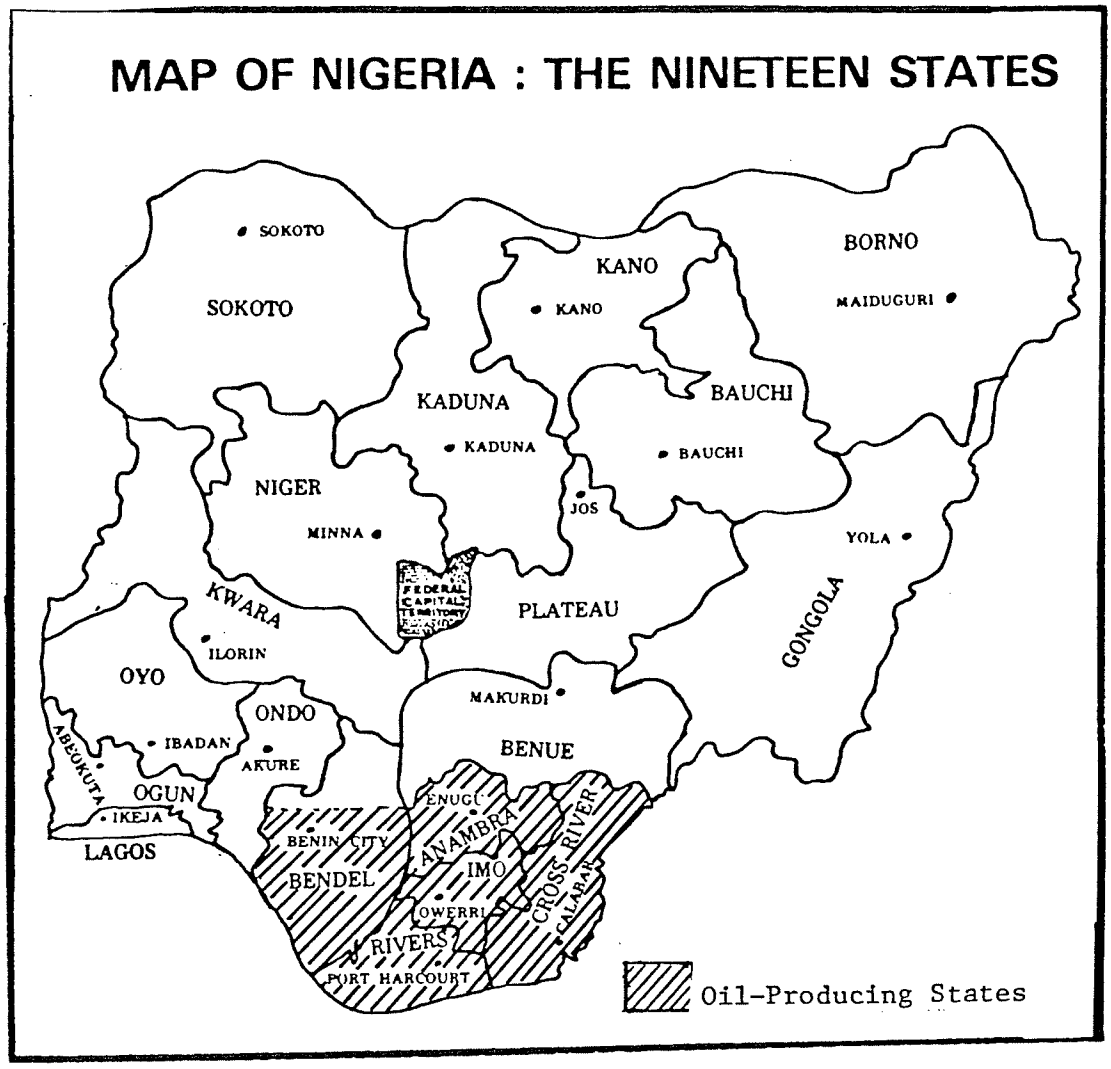
The search for petroleum in Nigeria began in 1908. It was not until 1956, however, that a commercially exploitable quantity was discovered by the Shell d'Arcy Petroleum Development Company of Nigeria, an affiliate of Shell Petroleum Company and British Petroleum Company.[1] This corporation acquired the first oil concession, located in Southern Nigeria, particularly in the Niger Delta region. Although most of Nigeria was extensively explored for crude oil, Southern Nigeria appeared to be the only oil-bearing region (See Fig.1.1). The successes in the early investigations attracted world attention and brought many other foreign operators to the Nigerian scene. By the early 1960s crude oil explorations in Nigeria had extended to offshore areas.

Currently there are 15 oil companies in Nigeria holding licenses and/or leases to operate but 12 of these companies are actively engaged in exploration and eight are involved in the actual production.

The producing companies are either wholly on their own or in partnership with others. The producing companies include Shell-BP, Gulf Oil, Agip-Phillips, Elf, Texaco-Chevron, Panocean, Tenneco-Mobil-Sunray and Ashland. Out of the eight producing companies four hold concessions in the offshore areas. The offshore oil companies include Shell-BP, Gulf Oil, Mobil Oil and Texaco. The state-owned Nigeria National Petroleum Corporation (NNPC), created in 1971, has joined foreign

[1] BP's interests were nationalized in Nigeria in August, 1979.

FIGURE 1.1


MAP OF NIGERIA : THE NINETEEN STATES
SOKOTO
SOKOTO
KANO
KANO
BORNO
MAIDUGURI
KADUNA
KADUNA
BAUCHI
BAUCHI
NIGER
MINNA
JOS
YOLA
FEDERAL CAPITAL TERRITORY
PLATEAU
GONGOLA
KWARA
ILORIN
OYO
MAKURDI
ONDO
IBADAN
AKURE
BENUE
ABEOKUTA
OGUN
IKEJA
ENUGU
ANAMBRA
BENIN CITY
LAGOS
BENDEL
IMO
CROSS RIVER
OWERRI
CALABAR
RIVERS
PORT HARCOURT
Oil-Producing States

operators in the search for oil in Nigeria. As a new company NNPC has limited resources and experience to undertake exploration and production on its own. Thus, NNPC has been working in partnership with all the oil producing companies, with the exception of Tenneco-Mobil-Sunray. Crude oil is currently produced from 1,457 wells located in 169 known fields (U.S. Department of Energy, 1979).

The Nigerian petroleum industry did not make any appreciable impact on the economy until the early 1970s when crude oil production as well as revenues increased. Nigeria joined the Organization of Petroleum Exporting Countries (OPEC) in 1972. The OPEC has provided a leverage for the oil-exporting countries to obtain guaranteed price improvements from the international oil majors. Currently, Nigeria is the world's sixth largest oil producing country. Production capacity of the developed wells oscillates around 2.30 million barrels per day, but current production is reduced to about 2.17 million barrels per day, being a part of production policy of the NNPC (Petroleum Economist, April 1980). In 1978, about 30 percent of the estimated daily average oil production of 1.85 million barrels was derived from the offshore fields (West Africa, 11 December, 1978, p. 2484).

Nigeria crude oil is light and has on the average a low sulphur content of 0.2 percent. This accounts in part for the high demand for the crude oil in the world markets. Crude oil with low sulphur content produces a relatively low level of sulphur dioxide. Thus, Nigerian crude oil is especially attractive to the Japanese and others who have established a high environmental quality standard.

The petroleum industry is the leading sector of the Nigerian economy. The role of this sector is reflected in the enormous increase

in oil revenues accruing to the Federal Government; and improvement in the Nigerian foreign exchange earnings. Furthermore, crude oil has dominated Nigerian exports since the 1970s. Current crude oil exports represent 96 percent of total earnings. The increasing revenues from crude oil sales enabled the Federal Government to finance the Third National Development Plan (1975-80) which involved a total expenditure of roughly $50 billion United States currency (Third National Development Plan, 1975-80, p. 47).

Crude oil is transported by pipeline system connecting Warri, Port Harcourt and Kaduna refineries to major cities in Nigeria.

Oil aside, Nigeria has large deposits of natural gas some of which are associated with oil. Nigeria currently produces about 56 million cubic metres of natural gas per day, 90 percent of which is being flared. Most of the gas produced in the course of oil drilling is burned because local gas demand is at present low. Consequently, local demand is not sufficient enough to induce the oil companies to invest in gas collection (Akpe, 1980, p. 11).

However, arrangements are being made to export LNG to overseas consumers from the LNG plant under construction at Bonny.

1.2 Statement of the Problem

The Nigerian Government's aim is to encourage crude oil production so that resultant proceeds can be used to ensure that a higher standard of living is attained in the country. Recent estimates reveal that Nigeria's crude oil reserves amount to about 17 billion barrels (International Petroleum Annual, 1978, p. 21). It is likely that production of crude oil from both offshore and onshore areas will

increase in the future.

There is always a potential for oil spills from offshore production, as demonstrated by three major oil spills in Nigeria in recent years. Moreover, with the introduction of large tankers in the crude oil transportation system, the risk of large-scale marine pollution due to accidents has increased.

Increasing participation in the oil industry by a developing country like Nigeria, with very little experience in the petroleum industry, also increases the probability of oil pollution incidents attributable to human error.

Nigeria is a coastal state with marine interests other than petroleum development. For instance, Nigeria has a growing fishing industry in the local as well as distant areas of the country. The Nigerian National Fish Company and the Nigeria Shrimp Company are engaged in distant-water fishing. In addition, the local people of the Niger Delta are involved in small-scale fishing for their subsistence (this being their major occupation). Unfortunately, there is no comprehensive pollution control programme at either state or national level in Nigeria to ensure that various marine and coastal interests are accommodated (West Africa, February 1980, p. 277).

Since the petroleum industry in Nigeria has become a major sector of the Nigerian economy there is a need to develop a programme ensuring that pollution due to an oil spill is controlled and other interests are protected.

The recent oil spill resulting from Funiwa-5 well blowout serves as an important reminder to the Nigerian Government of the need to pass environmental laws and regulations that will enable Nigeria to effectively

control pollution resulting from this source.

Previous incidents of oil spills were reported in 1970 at Obaji, though the most recent and devastating took place in January 1980 at Texaco-Chevron-NNPC's Funiwa-5 well located eight kilometres from the Atlantic coast in 60 metres of water. An estimated 280,000 barrels of oil were spewed into the sea, affecting about 100 kilometres of the coast (West Africa, March 10, 1980, p. 427). Driven by winds and waves the oil spread 30 kilometres inland along creeks of the Niger estuary, affecting 200 towns and villages and a population of more than 250,000. Referring to this tragic incident West Africa reported:

> This is a tragedy not so much of death though several people have died after drinking polluted water and a number of children are desperately ill...as of the total disruption of lives.

In the absence of any form of legal and institutional order to protect the environment and the public from oil pollution Nigeria may seem to be a 'pollution-haven' for the oil companies who operate there.

1.3 Objectives

In order to provide the Nigerian Government with a guideline for developing a pollution control programme the objectives of this study include:

(1) Examination of various international, regional and national legal regimes and administrative policies designed for coping with oil pollution.

(2) Examination of economic policies available to governments for dealing with environmental pollution problems.

(3) Evaluation of the regulatory control policies governing the

Nigerian petroleum industry.

(4) Examination of actual and potential effects of an oil spill in Nigeria in order to assess its socio-economic and environmental implications.

(5) Recommendations of policies to the Nigerian Government for dealing with oil pollution problems.

1.4 Delimitations

This study is not in the main concerned with the following areas:

(1) Detailed engineering approach to pollution control.

(2) Detailed refining operations and the end use of products from Nigerian crude oil.

(3) Setting environmental quality standards.

1.5 Methods

The approach used to achieve the objectives of this study consists of an extensive literature review. Thus, the study relies primarily on secondary data gathered from United Nations publications; Nigerian Government publications; international journals; library books; Nigerian local news media and published research reports.

In compiling the data it was necessary to visit the respective libraries of the Nigerian Embassy in Washington, the Nigerian High Commission in Ottawa and the United Nations Library in New York. Some information was obtained through associates of the author who reside in Nigeria.

A major problem encountered in this study was associated with data collection, particularly those relating to blowouts, vessel mishaps

and pipeline breaks, which have occurred in Nigeria during the last two decades. The data problem, however, was not unexpected in view of an absence of recorded information in a developing country like Nigeria.

1.6 Organization of the Study

The socio-economic and environmental problems which occur as a consequence of petroleum development in Nigeria are approached from three dimensions--international, regional and national.

Chapter II presents international and regional arrangements under the auspices of the United Nations bodies for control of oil pollution in the marine environment.

Chapter III constitutes a survey of national legislation and regulation dealing with offshore petroleum development and marine pollution. United States legislation and regulations are discussed in depth, the reason being that the United States has extensive experience in offshore oil exploitation and has created a network of regulatory authorities handling pollution problems (Hardy, 1973; Mackay, 1975).

Chapter IV represents an economic analysis of pollution problems and policies that could be adopted by governments to address pollution issues.

Chapter V focuses on the Nigerian petroleum development, particularly crude oil and its socio-economic and environmental effects.

Chapter VI examines the Nigeria natural gas extraction and its socio-economic and environmental effects.

Chapter VII constitutes the summary, conclusions and recommendations based on the findings from Chapters I-VI.

1.7 Importance of the Study

A number of studies have been done in the past on petroleum development in Nigeria but the scope of these were limited to benefits from crude oil exploitation. Very little is mentioned about the destruction of the environment caused by oil development. Pollution resulting from the activities of the oil companies constitutes a cost of development which is imposed on society as a whole. This study is therefore intended to bridge the apparent gap in what is known about the impact of petroleum development in Nigeria and is designed to assist the Nigerian policy-makers in addressing issues relating to oil pollution of the environment.

Marine pollution by oil is not unique to Nigeria for many other countries have entered the race to develop offshore resources. Hopefully, the recommendations made here will prove a useful source of information to oil producing nations and ultimately provide techniques for dealing with this kind of pollution, without interrupting the processes of oil development.

GLOSSARY OF TERMS

Barrel (bbl)	Means the standard oil barrel which equals 42 U.S. gallons or 35 Imperial gallons.
Dollars	Refers to U.S. currency wherever used.
Hydrocarbon	Chemical combinations of varying hydrogen and carbon ratio such as are mixed in and composed crude oil.
Lessee	Recipient of an oil and gas lease.
LNG	Liquified Natural Gas.
Marine Pollution	Expert United Nations bodies define Marine pollution as "introduction by man directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazard to human health, hinderance to marine activities including fishing, impairment of quality for use of sea water and reduction of amenities" (Cited in Hardy, M. (1973) 'Offshore Development and Marine Pollution' Ocean Development and International Law (Vol. I).
Reserve	That portion of the identified resource from which a useable mineral and energy commodity can be economically and legally extracted at the time of determination.

CHAPTER II

OFFSHORE DEVELOPMENT AND MARINE POLLUTION: LAW AND ENFORCEMENT

2.1 Offshore Development

The dilemma facing most nations today in the context of energy resources development is how to direct energy extraction, production and consumption without damaging the natural environment upon which all life ultimately depends. In the absence of a suitable alternative energy source the world has continued to place heavy reliance upon fossil fuels. An apparent outcome of this dependency is the rapidly expanding search for oil and gas in the offshore areas, as exemplified by the extensive explorations and development being undertaken by oil companies in the North Sea, the Mediterranean and Africa. The urge to solve the energy problem and maintain the life style among industrialized nations, coupled with the desperate effort among less developed nations to achieve some degree of economic development, has necessitated direct governmental intervention in the oil industry. This action tends to overlook the risk of pollution, and poses special hazards to the marine and coastal environment.

Oil pollution can be caused by several factors, for example, leakage from vessels; marine collisions (vessels/vessels, vessel/fixed, platforms or other offshore oil facilities; bilge pumping; tank cleaning; loading and unloading of tankers; rupture of submarine pipelines and storage facilities; operational mishaps in offshore drilling and production including well blowouts; leakage from substrata and

drainage from onshore facilities; for example, from rivers or from dumping waste oil into sewers [See Table 2.1].

Pollution of the marine and coastal environment became a world-wide issue a few decades ago. No doubt the universal concern about marine pollution by oil was provoked by several spectacular accidents, notably the wreck of the Torrey Canyon in 1967 and the Santa Barbara oil spill off California in 1970. Close to 95000 tonnes of crude oil entered the sea as a result of the Torrey Canyon disaster while in the Santa Barbara oil spill incident 2072 square kilometres of near shore and some 48 kilometres of beach were polluted by oil. These two major incidents made newspaper headlines and highlighted the case of marine pollution resulting from offshore oil drilling and transportation. The Torrey Canyon oil spill incident gave rise to two international conventions and two private arrangements which provide compensation for damage due to pollution. The two conventions are the International Convention on Civil Liability for Oil Pollution Damage, 1969 and the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971. The two private arrangements are the Tanker Owners Voluntary Agreement concerning Liability for Oil Pollution (TOVALOP) signed in 1969 by tanker owners and the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL) signed in 1971 by cargo owners. Both TOVALOP and CRISTAL supplement the existing public regimes in compensating persons, both public and private, for the costs of pollution damage, cleanup and preventive measures relating to oil pollution damage.

Prior to Torrey Canyon there have been in existence many important international regimes involving in part offshore oil

TABLE 2.1

ESTIMATES OF DIRECT OIL LOSSES
INTO THE WORLD'S WATER, 1969

Metric Tons per Year

	Loss	% of Total Loss
Tankers (normal operations)		
Controlled	30,000	1.5
Uncontrolled	500,000	24.0
Other ships (bilges, etc.)	500,000	24.0
Offshore production (normal operations)	100,000	4.8
Accidental spills		
Ships	100,000	4.8
Non-ships	100,000	4.8
Refineries	300,000	14.5
In rivers carrying industrial automobile wastes	450,000	21.6
TOTAL:	2,080,000	100

Source: Bradley, P. 1974; 'Marine Oil Spills: A Problem in Environmental Management.' Natural Resources Journal, Vol. 14, p. 337.

pollution. Further, there are other conventions relating to offshore oil pollution, apart from those associated with compensation of pollution victims, which have been ratified following the Torrey Canyon incident. Additionally, there are regional regimes dealing with discharges of oil and wastes from land-based sources dumping and pollution by offshore operations. These regional conventions suggest the need for harmonization of national environmental legislation. While the global regimes provide general recommendations to minimize pollution or abate spills, the regional arrangements envisage prosecution of polluters and severe penalties to achieve some degree of pollution control.

The purpose of this section is to examine the salient aspects of the important international regional regimes and some private arrangements as they relate to offshore oil pollution in order to gain a practical overall perspective.

2.2 International Regimes

Customary international law and the 1958 Territorial Sea Convention confer upon a coastal state sovereignty over its territorial sea. This sovereign right is extended by the Continental Shelf Convention, 1958 which bestows on a coastal state control over the seabed and subsoil of its continental shelf for purposes of exploration and exploitation of natural resources. The extent of the shelf is open-ended, in that the Convention extends national control to a water depth of 200 metres or beyond, where the depth of superjacent waters allows exploitation of natural resources.

Thus, following the existing conventions, almost all the seabeds of the North Sea, the Red Sea or the Persian Gulf are under national

control of the coastal states. By several bilateral agreements adjacent coastal states share the Continental Shelf beneath them. The International Court of Justice assists coastal states by setting forth principles to be used in making these delimitations.

The present regimes have thus given adjacent coastal states control over petroleum extractive activities on the seabed. A coastal state can issue licenses, and may specify in the licenses the terms and conditions in which petroleum development may be undertaken. Although the existing regimes have conferred sovereignty on the states over territorial seas and the right to exploit the seabed, these states have certain obligations to meet.

Among the noteworthy obligations are those specified in the High Seas Convention and the Continental Shelf Convention.

Under Article 24 of the High Seas Convention, 1958, states are required

> to draw up regulations to prevent pollution of the seas (by discharge of oil from ships or pipelines) or resulting from the exploration and exploitation of the seabed and its subsoil, taking account of existing treaty provisions on the subject. (New Directions in the Law of the Sea, p. 84.)

Article 5 of the Continental Shelf Convention, 1958, provides that the exploration and exploitation must not result in any interference with fundamental oceanographic or scientific research carried out with the intention of open publication. Further, the states are obliged to undertake in the Safety Zone (limited to 500 metres),

> ...all appropriate measures for the protection of the living resources of the sea from harmful agents... (New Directions in the Law of the Sea, p. 84.)

The Convention for the Prevention of Pollution of the Sea by Oil was established in 1954. This Convention prohibits the discharge of 'oil' (defined to include "crude oil" and "oily mixture") within certain zones. The 1969 and 1971 amendments removed the system of prohibited zones and in principle placed a total prohibition on all discharges of oil or oil mixture (except under carefully limited conditions). The Convention draws a line between pollution resulting from deliberate discharges and that which may result when a tanker loses its cargo accidentally, due to a storm, collision or by running aground. This Convention relates mostly to shipping rather than to the offshore oil extractive process itself. In fact, the specific pollution control regimes were, until the late 1960s, almost exclusively focused on vessel-source pollution, and it was because of the long-established, world-wide recognition of this hazard that control by regulation was instituted (Mason, 1979). Thus, on the basis of this Convention, many coastal states have passed legislation relating to discharge or spillage of oil within the shore or territorial waters, or water over which the state has some interest or responsibility. The Canadian Arctic Waters Pollution Prevention Act and the British Prevention of Oil Pollution are examples of such national legislation.

2.3 Inter-Governmental Maritime Consultative Organization (IMCO)

The Inter-Governmental Maritime Consultative Organization (IMCO) is one of the United Nations many specialized agencies interested in maritime problems. IMCO was created in 1958 and has since been involved in marine pollution, accidentally or deliberately caused by ships. Between 1969 and 1973, for example, four important conventions

were concluded under the auspices of the organization:

1. Convention Relating to Intervention on the High Seas, 1969. This Convention extended the right of a state to intervene in cases of marine casualties on the high seas involving oil, if that state's coastline or related interest are endangered.

2. Convention on the Prevention of Marine Pollution from Ships, 1973. This Convention includes provisions which would enable a state to inspect foreign ships within its ports for compliance with convention requirement. This Convention is intended to correct the weaknesses of the 1954 Convention for the Prevention of the Sea by Oil. The 1954 Convention failed to include any provision authorizing a state to inspect a ship.

The remaining two conventions relating to oil pollution damage are discussed under oil spill liability and compensation.

2.4 Liability and Compensation for Oil Pollution

The question of civil liability for oil pollution and compensation to victims is a stormy issue and one which international regimes do not sufficiently address. Prior to the Torrey Canyon incident in 1967 there were no adequate national or international legal regimes to compensate victims of oil pollution damage, or to enable governments to recover cleanup costs. But following the Torrey Canyon disaster many national and four international regimes were developed to ensure that persons who sustain losses as a result of oil pollution from vessel sources receive adequate compensation. Two of these international regimes were established under the auspices of IMCO while the remaining two (namely TOVALOP and CRISTAL) were private arrangements signed by

shipowners and cargo owners.

The two intergovernmental compensation regimes are:

I. The International Convention On Civil Liability for Oil Pollution, 1969.

This Convention assigns strict liability to the owner of a vessel carrying oil limiting his total liability for a single incident to $14 million or $134 per ton of his ship's gross tonnage, unless the incident is the result of "actual fault or privity of the owner", in which case liability is unlimited (New Directions in the Law of the Sea, p. 95).

The Convention shall function in conjunction with an International Fund built up by contributions from the cargo owners.

II. International Fund for Compensation for Oil Pollution Damage, 1971.

This 1971 Convention is supplementary to the 1969 Convention and has two principal purposes--(a) to provide compensation for pollution damage to the extent that protection afforded by the 1969 Convention is insufficient, and (b) to give relief to the shipowner in respect to the additional financial burden imposed by the increased liability of the 1969 Convention.

The Fund liability is limited so that the total amount payable by the shipowners and the Fund shall not exceed $30 million for a single incident. If the shipowner is unable to meet his liability, or no shipowner is liable, the Fund will be fully liable up to a maximum of $30 million. Persons in contracting states receiving an annual total exceeding 136050 tonnes of crude oil or fuel oil transported by sea are required to make contributions to the Fund. The Fund came into

effect on October 16, 1978.

The Fund is administered by a secretariat, an executive and an assembly. The assembly consists of the representatives of all contracting states. Claims may be brought against the Fund in the courts of contracting nations (New Directions in the Law of the Sea, p. 244).

2.5 Voluntary Compensation Schemes

I. Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP) was signed in 1969 by shipowners. The agreement was designed to provide a compensation for oil spill damage and cleanup cost, at least until the 1969 International Convention on Civil Liability for Oil Pollution Damage came into force.

The agreement's liability to oil pollution damage is limited to $160 per limitation ton (the approximate equivalent of $147 per gross ton, or $16.8 million, whichever is less). The agreement is administered by an organization known as the Tanker Owners Pollution Federation Limited.

TOVALOP has played a useful role in compensating governments for oil pollution damages and cleanup costs. It is noted, for instance, that the United States government recovered $1.1 million from TOVALOP following the oil spill resulting from the grounding of the Argo Merchant in 1976 (Beck, et al. 1979).

II. Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL): CRISTAL is a cargo owners' contract designed to provide supplemental compensation for tanker owners' cleanup costs and third-party damage claims, which other compensation schemes under other regimes cannot adequately handle. The Fund is

maintained by member oil companies' contributions, based on each company's annual oil movements or transfers. CRISTAL came into force in 1971.

2.6 Regional Regimes

Among the examples of regional regimes the following need to be considered:

I. Bonn Agreement, 1969: This agreement was signed by West Germany, Belgium, France, the Netherlands, Norway, Sweden and the United Kingdom to promote co-operative reaction towards marine pollution in the Channel, the North Sea and the Skagerrak. Each contracting country has an area of responsibility within which to estimate the importance and movement of oil spills, alert the other signatories and organize, if necessary with their assistance, appropriate preventive measures.

II. Oslo Convention on Control of Dumping from Ship and Aircraft, 1972: This Convention was signed on February 15, 1972 by the North Sea States (including Belgium, Denmark, Federal Republic of Germany, France, the Netherlands, Norway and the United Kingdom). The Convention was designed to regulate discharges into the Arctic Ocean and the North Atlantic. The parties consider that states bordering the North-east Atlantic have particular responsibility to protect waters of this region. Thus, the parties are obliged to prevent pollution of the sea by harmful substances. The substances are those "that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the seas". The Convention is ultimately directed against using the sea as

a sink for particularly noxious wastes which governments do not wish to have dumped on land (Fotheringham, et al., 1979).

The Oslo Convention extended its scope to include operations of offshore oil industry. After several years of deliberation on whether to exempt 'routine discharges' from oil platforms from its control, the Oslo Commission, in December, 1977, decided that rig debris fell within the scope of the Convention. The oil companies under a private arrangement operate a voluntary compensation Fund to meet claims for damage caused to fishing gear by rig debris.

III. Paris Convention, 1974: The 1974 Paris Convention was ratified by Holland, Spain, France and West Germany. The principal purpose of the Convention is to control land-based sources of marine pollution which is defined to include water courses which enter the sea; pipelines which carry wastes from the coast into the sea and man-made structures.

Under the Oslo and Paris Conventions, provisions are made for supervisory and monitoring arrangements to be established by the parties and monitoring arrangements to be established by the parties acting jointly or in co-operation with each other. In addition, there would be a Commission composed of representatives of the parties to supervise the implementation of the Conventions.

The Commission's function includes inter alia collection of information. The Oslo Commission is to receive records of dumping and to collect information about the state of the seas within the Convention area. The Paris Commission is to receive and disseminate information collected under monitoring schemes and in addition receive details of legislative and other implementation measures taken by the parties, as

well as the 'most detailed information available' about the listed substances likely to enter the maritime area of the Convention. This information is necessary in order to assist the Commission to evaluate the effectiveness of the Convention regimes and propose adaptations. The collection and distribution of information about each government's performance and the state of the seas in the various Convention areas should assist in identifying "backsliders, and so to keep governments up to the mark" (Fotheringham, et al., 1979, p. 198).

2.7 Joint Government/Industry Regional Approach

Joint government/industry approach to the pollution problem is now gaining a wide acceptance. Examples of this joint action in Europe, the Persian Gulf, Canada and the United States are supported extensively with trained personnel, specialized materials and equipment, telecommunication systems, helicopters and comprehensive contingency plans.

Under a 1972 agreement, 13 oil producing companies in the Persian Gulf, with the aid of the governments in the area, established the Gulf Area Oil Companies Mutual Aid Organization for the purpose of producing a joint capability to contain and clean up oil spills which otherwise could not be handled by one company. Each participant is understood to have accepted obligations to submit oil spill contingency plans and to keep on hand specified amounts of equipment and supplies to be made available to other participants in an emergency. Another example is the North Sea Operators Clean Seas Committee, which consists of offshore North Sea operators, grouped into local committees in Denmark, France, the Netherlands, Norway, Sweden, the United Kingdom

and West Germany. The Committee supports the establishment of permanent anti-pollution mechanism at locations near exposed zones in the North Sea (Jackson, Jr., 1975).

2.8 Concluding Remarks

Although considerable progress has been made during the last two decades to control pollution of marine and coastal environments, law and enforcement at international and regional levels are still not effective. Regional governmental agreements seem to be more effective than global international arrangements, but are still in the formative stages. International conventions lack special enforcement procedures and standards. They are no more than pious expressions of good intentions and hopes (Lay, 1973). In fact, the weakest part of international convention is characteristically the implementation, which is the only part of any practical significance.

The provisions of global conventions in most part are too broad and imprecise to constitute any deterrent. The conventions have laid down environmental objectives, but the onus is on the States to work towards the attainment of the objectives.

CHAPTER III

NATIONAL REGULATORY REGIMES

3.1 Regulatory Regimes: General

The most common response by national governments to socio-economic and environmental damages resulting from petroleum development has been regulation. Perhaps the use of regulation in controlling and preventing damages resulting from the activities of oil companies has gained wide acceptance because international conventions, notably the 1954 London Conference, have recommended the establishment of national committees to study and regulate oil pollution.

As observed in the earlier chapter, these international agreements do not provide enforcement procedures and to implement them most of the participating nations generally pass legislation and regulations to control pollution of the seas by oil, released in the course of drilling, production and transportation activities. This section examines the measures taken in terms of legislative and regulatory provisions by representative States. Selection of States for purposes of this review is arbitrary, but reflects perspectives from both developed and developing nations.

3.2 The United States

The United States has been involved in oil industry for decades and has experienced spectacular oil spills and a high incidence of mishaps on the sea, as shown in Tables 3.1 and 3.2. The U.S. Coast Guard's reports showed that between 1972 and 1976 an average of 12,291 oil

TABLE 3.1

MAJOR ACCIDENTS ON THE U.S. OUTER CONTINENTAL SHELF FROM 1953 TO 1972 ASSOCIATED WITH OFFSHORE PRODUCTION PLATFORMS

Offshore Platforms	Cause	Date	Oil Lost (bbls.)
Union "A", Santa Barbara California	Blowout	28 Jan. 1969	77,400
Shell St. 26 "B", Louisiana	Fire	1 Dec. 1970	52,400
Chevron MP 41 "C", Louisiana	Fire	10 Mar. 1970	30,950
MP gathering net and storage, Louisiana	Storm	17 Aug. 1969	12,200
Signal SS 149 "B", Louisiana	Hurricane	3 Oct. 1964	5,000
Platform, 24 km offshore	Unknown	20 July 1972	4,000
Continental El 208 "A", Louisiana	Collision	8 Apr. 1964	2,600
Mobil SS, 72, Louisiana	Storm	16 Mar. 1969	2,500
Tenneco SS, 198 "A", Louisiana	Hurricane	3 Oct. 1969	1,600

Source: Travers, W. et al., (1976), 'Drilling, Tankers, Oil Spills on the Atlantic Outer Continental Shelf'. Science, Vol. 194, p. 792.

TABLE 3.2

MAJOR ACCIDENTS ON THE U.S. OUTER CONTINENTAL SHELF, 1953 TO 1972, ASSOCIATED WITH DRILLING AND PRODUCTION

Results	Drilling	Production	Pipeline	Collision with Platform	Weather	Total
Number	19	15	4	2	3	43
Oil	0	3	4	1	3	11
Oil & Gas	2	7	0	0	0	9
Gas	17	2	0	0	0	19
Other	0	3	0	1	0	4
Oil Spills	2	10	4	1	3	20
Oil volume (1000 bbls.)	18.5 to 780	84 to 135.4	175	2.6	9.2 to 9.7	290 to 1100

Source: Travers, W. et al., (1976), 'Drilling, Tankers, Oil Spills on the Atlantic Outer Continental Shelf'. Science, Vol. 194, p. 792.

spills occurred every year in the United States (Mattson, 1979).

3.2.1 The U.S. Federal Legislation and Regulations

Oil pollution is a subject addressed by both federal and state governments. From the point of view of this study the most important federal measures designed to abate and control pollution are (a) the Outer Continental Shelf Lands Act, 1953, (b) the Federal Water Pollution Control Act, 1948, and (c) the Clean Water Act, 1970 and their subsequent amendments.

(a) The Outer Continental Shelf Lands Act, 1953 gives the Secretary of the Interior power to grant leases for exploration and exploitation and to make regulations with respect to lease operations, which are necessary for the prevention of waste and conservation of the natural resources of the Continental Shelf (U.S. Code of Federal Regulation U.S.C., s. 250.1).

Following the 1969 Santa Barbara disaster, the United States government was forced to adopt more stringent regulations covering the Outer Continental Shelf. Consequently, existing regulations underwent major revisions in order to give maximum protection to the environment. Under the revised regulations lease operators must receive approval from the supervisor in advance. Once a lease is approved there is no further alteration except on the grounds of 'Conservation of natural resources, protection of aquatic life, protection of human health and safety, property and the environment' (U.S.C., s. 250.30).

The lease operator is prohibited from polluting land or water and if the activities of the operator result in pollution of the sea, the lessee bears the cleanup costs. Should the lessee fail to remove

the pollutant appropriate government agencies have the right to do so, at the expense of the lessee. The liability of the lessee to third parties is governed by applicable state law. Furthermore, a lessee is required under the new regulations to submit drilling and development programmes well in advance, and such programmes must reflect measures designed to prevent and control pollution (U.S.C., s. 250.34).

The main features of the Federal Regulations relating to pollution are as follows:

> 250.43 Pollution and waste disposal.
>
> (a) the lessee shall not pollute land or water or damage the aquatic life of the sea or allow extraneous matter to enter and damage any mineral--or waste-bearing function. The lessee shall dispose of all liquid and non-liquid waste materials as prescribed by the supervisor. All spills or leakage of oil or waste material shall be recorded by the lessee and upon request of the supervisor, shall be reported to him. All spills or leakage of a substantial size or quantity, as defined by the supervisor, and those of any size or quantity which cannot be immediately controlled also shall be reported by the lessee without delay to the supervisor and to the Coast Guard and the Regional Director of the Federal Water Pollution Control Administration. All spills or leakage of oil or waste materials of a size or quantity specified by the designee under the pollution contingency plan shall also be reported by the lessee without delay to such designee.
>
> (b) If the waters of the sea are polluted by the drilling or production operations conducted by or on behalf of the lessee, and such pollution damages or threatens to damage aquatic life, wildlife, or public or private property, the control and total removal of the pollutant, wheresoever found, proximately resulting therefrom shall be at the expense of the lessee. Upon failure of the lessee to control and remove the pollutant, the supervisor, in co-operation with other appropriate agencies of the Federal, state and local governments or in co-operation

> with the lessee, or both, shall have the right to accomplish the control and removal of the pollutant in accordance with any established contingency plan for combatting oil spills or by other means at the cost of the lessee. Such action shall not relieve the lessee of any responsibility as provided herein.
>
> (c) The lessee's liability to third parties, other than for cleaning up the pollutant in accordance with paragraph (b) of this section shall be governed by applicable law (U.S.C., s. 311).

Under section 250.46, the lessee is required to "perform all operations in a safe and workmanlike manner"

(b) the Federal Water Pollution Control Act, 1948 deals primarily with pollution of navigable waterways within the United States. In 1972 the Act was amended and the objectives broadened to include control of oil pollution and hazardous substances from vessels and fixed structures. The sources of pollution dealt with under the Federal Water Pollution Control Act Amendment, 1972 include vessels, onshore facilities, and offshore facilities located "in, on or under, any of the navigable waters of the United States" (U.S.C., s. 311). Thus, discharge of oil or hazardous substances in quantities determined to be harmful by the Administrator of the Environmental Protection Agency is prohibited. The Act gives the President power to remove or arrange for the removal of oil spills 'unless he determines that such removal will be done properly' by the operators responsible for the spill. The President is authorized to develop a national contingency plan for the removal of oil and hazardous substances (U.S.C., s. 311).

Following a discharge, those responsible are required to report the incident to the Federal Government and failure to do so will attract

a $10,000 fine, or one year imprisonment. For each violation there is a civil penalty of up to $5,000. Actual costs incurred by the Federal Government to clean up the pollutant are reimbursed, unless the owner or lease operator can show that the discharge was occasioned by an "Act of God", an act of war, negligence on the part of the United States Government, an act or omission of a third party. With the exception of these circumstances, the discharger is liable to the government for the costs of removal and cleanup. In the case of vessel operations the maximum liability is $14 million, while in the case of offshore facilities the maximum liability is $8 million. There is no limit to a discharger's liability if the spill is a result of willful negligence or misconduct "within the privity and knowledge of the owner" (U.S.C., 311 f.).

(c) The Clean Water Act, 1970 prohibits the discharge of oil "into or upon" the waters of the United States, including the contiguous zone. Under the 1977 Amendment, the prohibition of oil spills was broadened to include:

> discharges...which may affect natural resources belonging to, appertaining to or under the exclusive management of The United States (Mattson, 1979, p. 315).

The Clean Water Act does not have any provision for compensation for loss of income or damages to property. The injured party has to seek for compensation under state law or common-law tort theory (Mattson, 1979). However, under 1977 Amendments the state or the Federal Government can ask for compensation for damages to natural resources by including such damages in the "cost of removal" of an oil spill (Mattson, 1979).

3.2.2 The U.S. State Legislation and Regulations

In response to offshore oil pollution hazards several states, especially those bordering the United States Outer Continental Shelf, have imposed rigorous state lease requirements. It is not within the scope of this study to discuss these state statutory and regulatory measures in detail. An example of such state laws is the Florida Oil Spill Prevention and Control Act which deals with the same subject matter as the Federal Water Pollution Control Act.

Most state regulations do not make any provision for limited liability; the spiller is liable for the full cost of cleanup, restoring river banks, and beaches and other damages. Moreover, some state laws have provisions for establishment of compulsory funds financed by fines and penalties. The North Carolina Oil Pollution Law, for instance, provides for the establishment of an Oil Pollution Protection Fund (OPPF). In case the discharger of pollutant is not traced, or fails to cleanup, the state of North Carolina can undertake the cleanup and be reimbursed, in the first instance, from the Fund, or, in the second instance, from the polluter (Frickie, 1975).

3.2.3 The Existing Compensation Scheme

The United States court has played a leading role with respect to compensation for damages and losses of income caused by oil spills. Compensation for such items have traditionally been sought under state law or common-law tort theory (Mattson, 1979). However, in case of damages to natural resources that fall under the state or federal jurisdiction, the state government or the federal government, whichever is applicable, can ask for compensation by including such damages in

the cleanup cost. The basis of property right of the states or the federal government in the natural resources is the parens patriae theory that states act as trustees for the citizens. In order to obtain a standing to act as a public trustee, a state will be able to demonstrate its own interest in the matter, that is, that it is not merely taking the place of a class of its citizenry (Mattson, 1979).

The parens patriae theory has applied in five federal District Courts involving oil spills since 1970 and in each case the state concerned was awarded costs in damages. Specific cases in which parens patriae theory was used are cited.

In California v. S. S. Bournemouth, the state recovered $7,900.32 in cleanup costs in an action against the vessel.

The second case, Maryland v. Amerada Hess, took place in 1972. The State of Maryland brought action against Amerada Hess to recover for "injury to the condition or quality of the waters of Baltimore harbour ...resulting from the oil spill..." (United States, 1972). In deciding the case, the District Court held that

> ...if the state is deemed to be the trustee...then [it] must be empowered to bring suit to protect the corpus of the trust...i.e., the waters...for the beneficiaries of the trust...i.e., the public (cited in Mattson, 1979, p. 318).

The Maine v. M/V Tamano oil spill case in 1973 brought up two important issues not considered in the other previous cases. The lower court has held that in order to maintain a parens patriae suit, a state must demonstrate that the alleged damage has an adverse effect upon a "substantial part" of its citizenry. The second issue was the Tamano defendants' argument that such a claim would result in double damages,

especially if they had to compensate the users of the natural resources for loss of use of land and loss of income from, and at the same time compensate the state for damages to, natural resources.

The District Court in Tamano held that the Tamano oil spill affected a "substantial part of the citizenry", since "...the environment of the State and the recreational opportunities and welfare of all her citizens have seriously suffered" (Maine v. M/T Tamano, 357 F. Supp. 1097 [D. Me. 1973]; Mattson, 1979).

Referring to the issue of double damages, the court maintained that this would not constitute an obstacle to Maine's claim since any monetary damages claimed by Maine citizens could be excluded from the state's recovery. The Tamano's owners and the pilots' association eventually paid the state $750,000, the clamdiggers $475,000 and the boat owners and other commercial fishermen $275,000, all payments amounted to $1.5 million (Burgess v. M/V Tamano [1974]; Mattson, 1979).

Another interesting case was Puerto Rico v. S. S. Zoe Collocotroni involving action brought by Puerto Rico to recover $13.2 million in damages done to a stand of coastal mangrove from an oil spill in 1973 (Commonwealth of Puerto Rico v. S. S. Zoe Collocotroni 11ER C2107 [DAR 1978]; Mattson, 1979). The court cut down the amount claimed in damages to $6.2 million after the trial. The Puerto Rico v. S. S. Zoe Collocotroni is an example of a case where "replacement cost" was used as a measure of environmental damage.

At trial the Commonwealth's expert witness, Phillip Sorensen, presented evidence that the organisms killed by the oil spill could be replaced by purchasing them from biological supply firms at prices ranging from 6¢ to $4.50 per individual. The Commonwealth biological

survey estimated that there were 1,138 fewer organisms per square metre in the oil affected area as compared to a nearby oil-free area. Accepting this survey, the judge multiplied the number of organisms so 'lost' by 6¢, to arrive at approximately $5.5 million, the damages compensable to the Commonwealth.

With respect to the damage claim for the stands of mangrove, the Court awarded only the costs of replanting the mangroves ($16,500 per acre). In addition, the Commonwealth would receive $36,000 annually for a five year monitoring and fertilizing programme, or a total of $550,500 in restoration costs (Mattson, 1979).

In awarding the costs the Court failed to consider some important facts. First, the mangrove area is still contaminated with petroleum hydrocarbons and therefore replanting will not restore the area to its state prior to the oil spill.

Secondly, the mangroves replanted will have to grow on oil-contaminated substrata and it is not very likely that the substrata can successfully support a mangrove community. Natural growth of mangroves has ceased in the most heavily contaminated areas.

Thirdly, oil pollution of substrata has long-term carcinogenic effects on the organisms living in the contaminated areas and so should not be considered equivalent to species living on clean substrata (Mattson, 1979).

Mattson (1979) criticizes the court decision on the grounds that the Commonwealth was not sufficiently compensated. From Mattson's point of view the Commonwealth should have been compensated for loss of a part of the substrata considered unfit, by the court, for mangrove replanting. The use of replacement cost in assessing damages is, in

Mattson's viewpoint, unsatisfactory because "it puts numbers on things that do not necessarily reflect their real value".

A major conclusion that can be drawn from these environmental lawsuits is that action through the courts has not proved very effective. Often, litigations have stretched over years, or even decades, without resolution. The judicial process may have some attraction but it has not proved to be an efficient environmental policy instrument.

3.2.4 The Superfund

The ordeal of long litigation that follows major oil spill prompted a change in the existing compensation scheme under which compensation for losses of income and damages to property have been sought under state law or common-law tort.

In 1974, the U.S. Congress required the Department of Justice to prepare a proposal for uniform law that would provide compensation for cleanup costs and damages from oil spill.

The comprehensive compensation scheme proposed is the "Superfund" bill, so called because it will provide funds to cover costs of cleanup, restoration and damages in cases where the limits of polluter's liability are exceeded, or where the polluter is not traced. The Superfund involves an establishment of a $200 million self-replenishing fund to be supported by a 3¢ per barrel tax on crude oil (U.S.A. 95th Congress, 1977; Mattson, 1979). The basic premise underlying the proposed Superfund is that it is unreasonable to leave a small segment of the society, such as the fishermen and the beach property owners, in the oil contaminated area to bear the whole pollution cost that should be shared by the entire oil consumers.

The Superfund would provide for a speedy recovery of damages

by third parties and require that the spiller eventually pay to the limit of his statutory liability. Under the new scheme, vessel limits of liability has increased from $100 per gross registered ton (grt) established in the old scheme to $300 per grt with a ceiling of $30 million in the House Version. Where damages are beyond the spiller's liability the Superfund will pay the excess with no ceiling on the liability of the fund.

The Superfund is designed to improve the positions of third party claimants in oil spill cases. The 96th Congress's versions of the Superfund legislation provide for recovery of damages for loss of use or damage to real or personal property, loss of income, loss of profits or impairment of earning capacity resulting from injury to or destruction of natural resources, loss of use of natural resources, loss of tax revenue for up to one year (United States, 95th Congress; Mattson, 1979).

The Senate version provides for recovery of damages for "the value of any loss of any natural resources damaged or destroyed" or (House Version) "damages for economic loss (from)...injury to, or destruction of natural resources" (Cited in Mattson, 1979, p. 321).

Under the Superfund the matter of compensation for damages to natural resources is dealt with by administrative process. Superfund confers on the President the trusteeship of natural resources over which the federal government "has sovereign rights or exercises exclusive management authority", including the 370 km fisheries management zone and the seaward limits of the Outer Continental Shelf. The states are given exclusive right to submit claims for damages to natural resources which are managed under state jurisdiction.

By providing for a strict liability for damages and costs, the Superfund bill removes the burden of proof of damage from the aggrieved individual, organization, state or federal government. Moreover, under the proposed legislation those who derive 25 percent of their income from marine related activities could claim damages in case of marine pollution.

3.3 The United Kingdom

The U.K. government leaves much of the responsibility of setting environmental standards relating to offshore activities to the operating companies by means of Model Clauses for licences and on the Classification Societies who inspect structures at every stage to ensure that they meet the proper specifications (Greenwood, 1979).

Schedules 4 and 5 of the Petroleum (Production) Regulations 1966 (Hardy, 1973) consist of model clauses for production licenses in seaward areas and for exploration licences, respectively. Under the Model Clauses,

> the Licensee shall maintain all apparatus and appliances and all wells in the licensed area which have not been abandoned and plugged as provided by Clause 13 thereof...in good repair and condition and shall execute all operations in or in connection with the licensed area in a proper and workmanlike manner in accordance with methods and practice customarily used in good oil field practice and without prejudice to the generality of the foregoing provision the licensee shall take all steps practicable in order
>
> (a) to control the flow and to prevent the escape or waste of petroleum discovered in or obtained from the licensed area;
>
> (b) to conserve the licensed area for productive operations;
>
> (c) to prevent damage to adjoining petroleum-

bearing strata;

(d) to prevent the entrance of water through wells to petroleum-bearing strata except for the purpose of secondary recovery; and

(e) to prevent the escape of petroleum into any waters in or in the vicinity of the licensed area.

The licensee is required under the regulations to comply with instructions issued from "time to time by the Minister" and to report to him "of any event causing escape or waste of petroleum" (Hardy, 1973).

The Prevention of Oil Pollution Act 1971 emphasizes the owner's or operator's liability for discharge of oil into the sea from a pipeline or as

> ...the result of any operation for the exploration of the seabed and subsoil or the exploration of their natural resources in a designated area...unless the discharge was from a place in his occupation and he proves that it was due to the act of a person who was there without his permission (express or implied).

The spiller if found guilty is liable to a fine of £50,000 on conviction or indictment to a fine. The seabed operator or the owner of the pipeline may not be guilty of an offence if he proves that

> ...neither the escape nor any delay in discovering it was due to any want of reasonable care and that as soon as practicable after it was discovered all reasonable steps were taken for stopping or reducing it (The Prevention of Oil Pollution Act, 1971, s. 6 [II]).

As regards enforcement of regulations against matters such as environmental damage (for example, pollution and certain safety regulations), there are many government departments with responsibilities for various activities at sea and different instruments have been used to

enforce the regulations (Greenwood, 1979). The instruments applied in many areas include documentation, licensing and inspection schemes. For matters such as fishing, offshore installation, safety-zone rules, pollution, the practice has been to enlist the assistance of the armed forces. The armed forces assist the civil authorities and civil power (the police) to enforce the regulations.

The use of naval and military personnel and equipment for response to accidents in the offshore areas has been criticized as being too elaborate and therefore expensive. Moreover, the argument in support of enlisting the assistance of the military and naval personnel ignores the role of preventive measures, "obliging offshore operators to institute a strict security regime (including personnel screening, tight monitoring of supply-boat and helicopter movements)" which in Greenwood's opinion is a better response to 'imaginable threats' than using the armed forces (Greenwood, 1979).

3.4 Norway

Unlike the United Kingdom government's policy which leaves the operating companies to specify the standards, the Norwegian government is very much involved to the extent of setting out in detail, specification of standards and operating procedures in Decrees and Regulations.

Under the provisions of the 1965 Royal Decree relating to Exploration for and Exploitation of Petroleum Deposits in the Seabed and its Subsoil on the Norwegian Continental Shelf, gas, oil and other kinds of petroleum must not be discharged in such a way as to result in pollution of the sea or air. Section 4 of the Royal Decree, 25 of

August, 1967, requires operators to carry out their activities "in safe manner in accordance with good oil field practice and with the regulations in force at any time". Care must be exercised

> ...to avoid any reasonable impairment or nuisance to shipping, fishing or aviation to avoid damage or risk of damage to marine life or to underwater cables or underwater installations and to avoid pollution or risk of pollution to the sea bed and its subsoil, the sea and the air (Cited in Hardy, 1973).

Should damage result from offshore operations the operator is liable under the Norwegian law of tort.

Responsibility for the enforcement of offshore regulations lies with various Ministries and Directorates with some concern in offshore activities. Following the result of a survey conducted in 1975 to ascertain the 'new' economic and environmental security tasks prompted by the North Sea oil activities, the duties of the Norwegian Coast Guard were broadened to include marine security, sovereignty and surveillance matters.

3.5 Malaysia

The Continental Shelf Act, 1966 and the Petroleum Mining Act, 1966 contain relevant sections of Malaysian legislation governing offshore development and marine pollution.

Under the Continental Shelf Act the Head of State may make regulations relating to measures to take for the protection of living and natural resources and prohibiting or restricting any exploration of the continental shelf which could result in unjustifiable interference with navigation, fishing, or the conservation of living resources and others.

The Petroleum Mining Act of 1966 which deals with both offshore

and land operations, requires the operator to observe "good oil field practice" and to ensure that petroleum does not escape into any waters in the vicinity (Hardy, 1973). The specific provisions are contained in the "Model Petroleum Agreement in respect to Offshore Lands":

> 24. The Company shall adopt all practical precautions (which shall include the provision of modern equipment) to prevent pollution of the high seas or coastal waters by oil, mud or other fluid or substance which might contaminate the sea water or shoreline or which might cause harm or destruction to marine life (Cited in Hardy, 1973, p. 259).

The Company is liable to damage done to third persons and should pay "reasonable compensation". In addition, the company is required to indemnify the government "against all actions, costs, charges, claims and demands whatsoever" which may be made by a third party as a result of anything done under the agreement. It is a defence for the company if an offence is committed under "exceptional or unforeseeable circumstances" which are beyond its control and compliance with government orders.

For lack of information it is not possible to include here the enforcement procedure of the Malaysian regulations.

3.6 Ghana

The 1963 Mineral (Offshore) Regulations requires:

> 10 (1) Every licensee shall so conduct his operations as to ensure that
> (a) the sea is not endangered thereby;
> (b) no organic life is damaged thereby; and
> (c) that no mineral or water bearing formations or the seabed are damaged by the introduction therein of any extraneous matter;

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> (2) In order to comply with, but without prejudice to generality of, the foregoing sub-regulations, all waste products of wells shall be suitably disposed of (Cited in Hardy, 1973, p. 261).

Section 12(1) prohibits sub-surface storage of oil or gas within territorial waters. The licensee is required in a "Model Lease for Offshore Oil and Gas Operations" of 1969 to adopt "all reasonably precautions (which shall be provision of up-to-date equipment approved by the Chief Inspector of Mines)" to prevent pollution of

> the inland waters, rivers, water courses, high seas or territorial waters of Ghana by oil, mud or other fluid or substance which might contaminate the banks...cause harm or destruction to fresh water or marine life (Cited in Hardy, 1973, p. 262).

The licensee is also obliged to maintain apparatus and appliances in good repair and condition and to carry out operations in a proper and workmanlike manner in accordance with good oil field practice.

3.7 Joint Government/Industry Approach

Perhaps a joint government/industry consultation, co-operation and action may prove a more effective means of dealing with oil pollution than any arrangements under international, regional and national regimes. Since oil pollution often involves complex socio-economic and environmental consequences, perhaps no single organization--government or industry--can adequately deal with these issues. While the government can effectively handle broad social problems and socio-economic conflicts, it may lack the tools to deal with the more technical aspects of the question. On the other hand, the oil industry is unlikely to have enough skill to address social and socio-economic disputes, which are best managed by government. A joint government/

industry approach will therefore enhance the relative strengths and minimize the respective weaknesses of the only two parties.

Furthermore, joint government/industry approach will provide for cost-sharing between operators with governmental backup that could reduce the burden on the individual companies.

3.8 Summary and Suggestions

The nature of legislative and regulatory measures adopted by a particular State may be determined in part by local factors. Thus, generalization on the basis of the legislation and regulations of the five countries reviewed has to be done with caution.

A common weakness of most of the national laws is that they are in many respects too general and abstract to lead to an effective control of pollution. In some cases, for example, the United Kingdom, national authorities leave much of the responsibility for setting environmental and drilling safety standards to the operating companies. In Norway, too, it could seem that the government departments are left to do all the interpretation of the broad guidelines and powers, irrespective of the fact that departments do not have enough staff and time to contend with highly organized oil companies.

Hardy (1973) has suggested essential things that a coastal state should provide to achieve an effective control of marine pollution. These requirements are as follows:

(1) adequate information

(2) adequate supervision

(3) adequate technical knowledge and equipment

(4) suitable sanctions.

(1) National authorities need to have adequate information all the time. For instance, the national authorities should require information on the underlying geological structure, tides and weather conditions. Information on these may be obtained from the operating company and could be checked with information from national, regional or international monitoring programmes. Such information could reduce the chances of a blowout due to high subsurface pressure.

(2) Development of offshore resources requires adequate supervision. National authority should endeavour to establish a high safety standard and maintain close supervision and surveillance on the offshore activities. The national authority and the operating companies should monitor, inspect and evaluate each phase of development and production. Strict supervision and surveillance is possible on offshore operations because development and production facilities are, to a large degree, stationary. For the developing countries provision of adequate supervision will pose a problem, due to the shortage of trained personnel. Shortage of skilled manpower constitutes a limiting factor in most development activities in the developing countries. This issue calls for a need to establish essential training programmes for indigenous employees in the oil producing countries.

(3) The regulatory agencies should have staff with adequate technical knowledge and equipment. It may be necessary to include in the regulation that the equipment be tested, to ensure that it is in good working order.

(4) A joint government/industry consultation, co-operation and action will be encouraged since neither government nor industry has all the devices to effectively deal with oil pollution consequences.

Moreover, such a joint venture makes provision for cost-sharing between operators with governmental backup that could reduce the burden on individual companies.

(5) Lastly, the use of sanctions against the operator must be done with caution by the national authorities to avoid alienating the operating companies. If the regulations and sanctions happen to be too onerous, they would constitute a disincentive to the operating companies. Consequently, some companies may be forced to transfer their capital investments to other countries with less stringent regulations. Perhaps the developing world, presently plagued with lack of technology and capital necessary for development of petroleum resources, may not afford to see the major oil producing companies leave. Economic growth need not be sacrificed for a clean environment. Efforts must be made to pursue economic development objectives without the undesirable environmental side effects.

CHAPTER IV

POLICIES FOR REGULATING ENVIRONMENTAL POLLUTION

4.1 Direct Regulatory Control

The traditional approach to the pollution problem consists of direct regulatory policies embracing a set of rules which, if observed, may lead to achievement of set objectives. Regulations may be an outcome of legislative processes or may be set by a government commission. The enforcement powers provided by enabling legislation are usually vested in a government agency to authorize it to monitor behaviour and impose penalties where violation is detected.

Generally, direct regulatory control takes the form of prohibitions, requirement of standards, and others. Prohibition, for instance, can be a feasible control tool against discharge of dangerous substances while directives can be more appropriate for treatment and handling of certain wastes. The quantity of discharges can be limited either for an individual firm or for a group of firms discharging their wastes into the same receptor.

Where regulations are strong and enforcement effective, direct control can lead to substantial abatement of polluting activities. On the other hand, if the regulations are inadequate or ineffectively enforced they may not lead to the desired goals. Thus, irrespective of the form of regulation, standard-setting and enforcement processes are critical to the success of the control programme. Direct control approach has been extensively used in the United States, Japan and

European countries in environmental matters.

The Japanese assigned responsibility for setting environmental standards to the Environment Agency with a broad discretion as to the pollutants for which standards are to be set and as to the stringency of the stand. Usually the agency's first task is to set the ambient standards that are used to determine the level of discharge for industries. The final standards that are applicable to industries seem to be an outcome of bargaining processes between the agency officials and managers from the private industries. Standard-setting goes through an administrative procedure and is usually confidential. There is hardly any appeal to judicial or quasi-judicial bodies. However, the agency officials take into consideration the plant's existing technology, economic ability, cost and availability of an alternative control system before setting standards for particular plants (Mills, 1978).

Sweden relies on permits granted to polluters for pollution abatement. A facility likely to generate serious pollution must apply for a permit to the National Franchise Board of Environmental Protection. Permit applications must contain detailed information and must be subjected to public hearing. Unlike Japan, Swedish procedure emphasises public participation and allows permit decision to be appealed only to the government. In the United States permit decisions can be appealed to state and federal courts. The board sets guidelines for discharges usually after consultation with industry representatives. The officials who set the guidelines normally take into account the potential damages from a particular facility and the cost of pollution abatement and technology available. Mills (1978) is of the view that the Japanese and Swedish pollution control programmes have been effective. However, the

most difficult problem encountered by a control agency is to permit discharge levels that equate marginal abatement costs among sources. Mills (1978) points out that there is no way to know how close the Swedish board has come to achieving that end.

A major argument against the use of the direct control approach to the pollution problem is that it leads to costs twice as great as those incurred under programmes based on market-oriented policies (Kneese and Bower, 1968; Baumol and Oates, 1979). Freeman III, et al. (1973) argue that the government agency would never have adequate information to determine for each discharger the least-cost technological mix for obtaining a given reduction in waste discharges. Where several dischargers are subjected to the same regulation, the total cost of achieving pollution control would be higher than necessary due to differences in the marginal costs of treatment for each discharger.

Finally, unlike market-oriented policies direct control does not give incentive to dischargers to manage residual flows once they comply with the regulations.

4.2 Alternate Policies for Pollution Control

Economists have consistently promoted market-oriented policies--effluent charges, effluent rights and subsidies as alternatives to the traditional direct regulatory approach because of the many advantages these policies have over the direct control.

4.2.1 Effluent Charges

An effluent charge is a price imposed by a government to be paid for every unit of discharge of a particular pollutant into the environment. The scheme involves establishment of schedule of fees which the

polluter pays to a control commission or a government agency, according to the amount of discharge and the type of pollutant emitted. The schedule of fees can be adjusted upward or downward, to reflect the desired level of water quality or ambient air, though in an ideal system the fees would reflect the amount of damages caused by the pollution. Thus, the imposition of the charge compensates the public for the use of the environment and would naturally compel the industries to cut back on waste discharges. The scheme is based on the 'polluter pay' principle which in essence implies that an individual who pollutes the environment should pay the cost of cleanup. Individuals are therefore compelled to internalize the cost of pollution.

How are the charges determined?

A level of effluent charge that would lead to the desired water quality or ambient air would be carried out by experimentation but the initial charge would be set so as to induce the least-cost system. Kneese and Bower (1968) suggest that the ideal way to determine an effluent charge is to set the charge per unit of waste equal to the marginal damage per unit of waste discharges. Dischargers will cut back on emissions until the marginal cost and marginal benefit of abatement are equated. The initial charge set is critical to the success of the scheme. Kneese and Bower (1977) suggest that a suitable approach is to undertake a cost study in sufficient detail to ensure that the initial charge established is not far from the minimum required to achieve the desired environmental quality standard. The appropriate level of effluent charge is substantially determined by the degree to which society wants to reduce discharges, the assimilative capacity of the waste receptor and the kind of pollutant. All these elements present some economic as well

as technological and political problems which economics alone can not solve.

Advantages

Economists have identified major advantages which the effluent charges scheme have over the traditional approach of setting standards and imposing penalties on violators.

First, a system of effluent charges requires less information than other traditional approaches when the objective is the minimization of the costs associated with water quality management. This is especially the case where the water quality standard is set or where charges reflect the damage costs and the costs are approximately additive for different pollutants (Kneese and Bower, 1977).

Second, Kneese and Bower (1977) argue that the effluent charge procedure would enable each waste discharger to adjust in the most efficient way for his particular circumstances. Each polluter has a number of options to reduce cost. A polluter, for instance, could withhold wastes in temporary storage, adjust the production process, change the output mix, change the raw materials, or use a combination of these procedures.

Third, the effluent charge system achieves a given degree of pollution control at least cost by equating the marginal cost of abatement at all sources. On the other hand, a set of effluent standards that are uniform for all firms will lead to marginal abatement costs that are different among firms if they do not face the same marginal cost functions. Thus, a uniform effluent standard would lead to a higher total cost of abatement than would be the case under an effluent charge procedure (Baumol and Oates, 1979; Kneese and Bower, 1968).

Dewees (1981) points out the limitation of the least-cost argument. He states that minimizing the total cost of abatement from several sources is of interest only if the effect of a unit of pollution discharged from one source is identical to that of a mixed environment, such as a section of river, or small turbulent lake. Where the environment is not perfectly mixed, effluent discharge from one firm will generally result in a marginal damage that is different from that caused by another firm.

Fourth, economists have argued that effluent charges procedure might provide positive incentive for research and development of new techniques of residual management. Effluent charges procedure induces polluters to develop technology for pollution abatement since this is the only way of eliminating paying the charges. Penalty charges for violating standards should provide the same incentive for developing technology that would enable a firm to meet the standard, but once the standard is met there might not be incentive to develop further technology. However, this argument is based on the assumption that the standard is fixed. Under a flexible standard the advantage of effluent charge over effluent standard with respect to technological progress is not obvious.

Fifth, an effluent charge programme poses less administrative problems than the common standards and enforcement approach since, at least in theory, the activities of the control agency could consist primarily of setting the fee schedule, monitoring effluents and establishing control systems with each polluter. According to Oates and Baumol (1975) the enforcement mechanism of effluent charges is relatively automatic since unlike the direct control system they are free from the uncertainties of the outcome of the judicial hearing, including the

possibility of penalties that are in most cases lenient.

A noteworthy case where effluent charges have been effectively used appears to be the control of water quality in West Germany's Ruhr Valley, the site of many heavy industries. The rivers of the Ruhr Valley could have been among the most polluted in Europe, but since the creation of the Genossenschaft (river authority) in 1904, industrial wastes have been successfully treated by co-operatives financed by effluent charges imposed on the members. In North America there are few instances in which effluent charges have been used successfully for pollution abatement. These include, for example, sewerage fees in Otsego, Michigan, in Springfield, Missouri and in Winnipeg, Manitoba (Oates and Baumol, 1975). The major reason why effluent charges have not been widely used in North America seems to be the opposition from the public, industry, business and labour.

Public

The question of which environmental policies would receive public support would depend generally on the public perception of pollution problems. If, perhaps, the public views pollution as a threat to health, a form of exploitation by the spoilers, or a damage to environment, people will be inclined to protest and demand an outright prohibition of the polluting activities.

In this case effluent charge policy will not gain public support since it does not offer an appealing protection against an activity that is widely viewed as evil (Holden, 1966). The public tends to regard effluent charge as a licence to pollute. Although economists reject this public view, yet it is widespread and has a limiting effect on the efficacy of effluent charges. In the United States for instance, the

effluent charge programme has not gained wide acceptance. When a tax on leaded gasoline was proposed in 1970 there was a general belief that it would allow oil companies to raise the price of gasoline and not necessarily cut down the production of leaded gasoline.

Industry

Practical experience from the United States reveals that industry has consistently opposed effluent charges when they were suggested for two major reasons. First, industry argues that effluent charge constitutes a double burden because the policy compels firms to pay for pollution as well as for any remaining discharge. The total cost will be greater for an effluent charge scheme than a standard and enforcement approach unless the efficiency gains of the effluent are great, or the remaining amount of effluent is minimal. Second, an effluent charge scheme would particularly hurt small firms which generally do not enjoy economies of scale in pollution control (Anderson, 1977). However, Anderson (1977) comments that it is not clear why an effluent charge would be more burdensome to small firms than effluent regulations which did not allow a special break to small firms.

From a business viewpoint effluent charge policy would be inflationary and would discriminate against the poor and small refiners. Lerman (1977) speculates that business has opposed effluent charges because they might eventually become another source of public revenue. Furthermore, paying an effluent charge by business would be a clear admission to wrongdoing.

Labour

Labour in the U.S. rejected the use of effluent charges as a weapon to force polluters to reduce effluent discharges. The major

arguments against this policy tool include damage to consumers, the public view that effluent charge is a licence to pollute, an apparent lack of belief that pricing has any incentive effect and the view that charges would be inflationary. Labour supports the general public view that the financial burden of effluent charges would be shifted to consumers with no effect on pollution discharge. Thus, Lerman (1977) suggests that labour has been as opposed to effluent charges as business.

4.2.2 Effluent Rights

An effluent right is a permit sold by a government to enable the buyer to discharge a particular pollutant at a specified rate for a stipulated period of time. Under the effluent right scheme the environmental agency stipulates the maximum total rate of pollution emission applicable to a province, region, or the whole country. Individuals are then issued permits enabling them to discharge wastes at a rate such that the total waste discharges will not exceed the desired total discharge of the particular pollutant. Once issued the pollution rights are transferable. The pollution rights scheme creates a market for the right to discharge with the market price determined not by government but by an interplay of supply and demand.

Effluent rights scheme is claimed by economists to offer the advantages same as the effluent charges programme. These advantages are already discussed.

4.2.3 Subsidies

The subsidies programme involves offering positive financial inducements to dischargers, to enable them to undertake some pollution control strategies, for example, purchase and install pollution abatement equipment. These inducements can take the form of reductions in income

or property taxes, or cash payment to cover a portion of the cost.

The subsidies scheme has some major disadvantages. First, the design of an effective and equitable system of subsidies poses a problem. Since subsidies are 'payments' to the polluter to reduce waste discharges it is to his interest to set a high level of waste discharges initially so as to receive substantial payments. On the other hand, individuals who pollute little get the smallest financial reward.

Second, the subsidies scheme can degenerate into a general subsidy of business unless steps are taken to limit the programme to a specific treatment process, rather than the more general form of adjusting production processes, material recovery, output change, or a combination of those procedures that might be part of the least-cost pollution control strategy. The scheme therefore discourages firms from searching for possible alternatives. It is not unlikely that firms would adopt a set of technological options to qualify for government assistance.

Third, the subsidies programme does not cover the full cost of the actions and so has to be supplemented with some form of sanction or incentive, for example, effluent charges to induce polluters to reduce wastes discharges.

In practice, subsidies have been more extensively used in the United States than effluent charges. The federal government has been involved in a programme of subsidization of municipal waste treatment plants and in tax credits to business for the installation of pollution control equipment, The history of the subsidization programme in the United States is however not encouraging. The scheme fails to curtail industrial pollution. The failure is in part due to the fact that the subsidies cover only plant construction but not operating costs. Thus,

many facilities are not effectively used. Furthermore, inappropriate location of many plants have resulted in the continued deterioration of many major U.S. waterways (Oates and Baumol, 1975).

Subsidies have also been used in Canada to encourage the installation of pollution control equipment or at least to encourage compliance to abatement programmes (Dewees, 1981). The subsidies scheme in Canada has taken the form of refunds of provincial sales tax, pollution loans up to $250,000 and accelerated capital cost allowances. According to the Ontario Ministry of the Environment, the subsidy programme is used to remove the argument for delay that has commonly been advanced by industry (Ontario Standing Resources Development Committee, 1979, pp. 3-4(a); Dewees, 1981).

4.2.4 Moral Suasion

Moral suasion involves an appeal to conscience allowing polluters to exercise their best judgement. This approach to environmental problems is most feasible in cases involving an unanticipated emergency in which there is no other recourse. Furthermore, the emergency may be such that authorities do not have enough time to turn to any other control measures. Moral suasion could be effective where contingency plans have not been established prior to the emergency. Perhaps the efficacy of moral suasion is dependent upon the social pressures and a sense of urgency which induce individuals to respond quickly and effectively to public appeal. This response is shortlived because as soon as the emergency is over the sense of high moral purpose is likely to slip away. Thus, moral suasion has no potential for a long-term programme.

4.3 Summary of Policies

The survey of tools for environmental policy shows three main categories:

1. Direct Control
   - (a) Prohibitions
   - (b) Permits
   - (c) Technical specifications (or standards).
2. Economic incentives
   - (a) Effluent charges
   - (b) Effluent Rights
   - (c) Subsidies
3. Moral Suasion (an appeal to conscience).

4.3.1 Comments

It should be noted that the list is not exhaustive nor made up of mutually exclusive policy tools. Each policy instrument has its advantages and weaknesses. Thus, no single measure seems adequate to achieve a successful pollution control in all circumstances. A mix of policies may be required in most cases of pollution. A striking example is the marine oil pollution which resembles other water pollution problems but has some characteristics not common in other water pollution problems. Bradley (1974) identifies these characteristics as follows:

(1) Oil spillage is intermittent and unpredictable as to time and place
(2) Oil spillage both from ships and from offshore drilling operations often occurs under less spectacular circumstances and may not be observed except by operators responsible.

Furthermore, pollution may be deliberate or routine or it may be accidental or intentional. In this circumstance a mix policy will be required

to effectively control the pollution. To control deliberate pollution, for example, oil discharges from ships, governments can establish preventive regulation, prohibition and apply sanctions against violators. In contrast, an effective operating procedure can be laid down by a government commission to reduce the probability of oil pollution occurring as a result of human error. Such incidents include collision or oil rig blowouts. Oil pollution occurring during a normal routine operation may be checked by setting a standard. Bradley (1974) suggests that governments should establish a "performance standard" for industries. Performance Standard is measured by the quantity of oil discharged.

4.4 Conclusions

A government has a wide variety of options at the policy level to address pollution problems. Efficacy of the options adopted depends to a large degree upon the characteristics of the particular polluting activity and the associated environmental circumstances. The optimal policy would obviously include a hybrid of many approaches including direct control and market-oriented policies.

A government agency or commission invested with powers to enforce pollution control measures should ensure that environmental quality targets are set with due consideration to costs, because the attainment of goals specified in the environmental legislation may not always be desirable from an economic standpoint.

Finally, the levels of environmental quality to be attained in a society depend upon the ideals and values of the people.

CHAPTER V

NIGERIAN PETROLEUM RESOURCES DEVELOPMENT

5.1 Legal Framework for the Nigerian Petroleum Industry

Under the existing laws and regulations, all mines and minerals, including oil fields, oil mining, geological surveys and natural gas come under the Nigerian Federal Government's jurisdiction (The Constitution of the Federal Republic of Nigeria 2nd Schedule Sec. 4 [36]).

Exploration and production activities are the most important phase of petroleum development in Nigeria. Thus, a review of legislation governing these major activities in the oil sector would illuminate the nature of legal relations between the Nigerian Government and the operating oil companies. The main components of the Petroleum Legislation are--the Concessionary Legislation and Petroleum Profits Tax Ordinance. The Concessionary Legislation deals with exploration, prospecting and mining aspects of petroleum development. The Petroleum Profits Tax Ordinance which came into effect in 1959 laid down the procedure for assessment of the oil companies' taxable profits and the sharing of profits between the Government and the companies.

5.1.1 Exploration Concession

Operating companies are required to obtain exploration licences before engaging in geological and geophysical investigations in the concessionary areas (Schatzl, 1969). Until the Mineral Oil Ordinance which standardized the procedure for granting concessions came into effect in 1959, operating companies could spread exploration activities over many

years. With the passage of the Mineral Oil Ordinance exploration licences became valid for one year. The licences are subject to renewal or extension for another year. Exploration licences confer upon the holder the right to explore concessionary areas only. The Nigerian Government is not obligated to convert expired exploration licences into prospecting or mining concessions.

5.1.2 Prospecting Concession

At the end of the exploration period, oil companies can apply to the Minister of Mines and Power for conversion of exploration licences into prospecting concessions for oil-bearing areas.

Prospecting licences for the mainland and three-mile coastal areas differ in some respects from prospecting licences for the Continental Shelf. The major difference lies in the duration of the licences. Licences for prospecting in the mainland areas and the three-mile coastal area are valid for three years and subject to renewal once for two years. On the other hand, prospecting licences for the Continental Shelf area are valid for four years and subject to renewal once for three years. The validity of prospecting licences for the Continental Shelf is extended over a longer period because, from the Federal Government's viewpoint, offshore prospecting is more difficult and time-consuming than onshore prospecting.

Once a prospecting licence is granted, the operating company has the right to drill, extract, export, and also refine crude oil. However, the licence holder is required to commence geophysical work six months after obtaining the licence. This is to ensure that the concessionary areas are developed in a record time. Furthermore, a

licence holder is required under the Oil Prospecting Licence sec. (14) to train Nigerians in skilled, technical and administrative jobs. By this provision, the government wished to ensure that the oil companies meet their personnel requirements by undertaking the training of local people for the jobs in the oil sector. A third major obligation on the part of the operating companies consists of payment of rents and royalties to the government once production starts.

5.1.3 Mining Concession

Oil companies are required under the Oil Mining Lease to surrender expired oil prospecting licences or convert them into Mining Lease. Oil mining licences granted for mainland areas are valid for thirty years, but in the case of the Continental Shelf licences are valid for forty years (Schatzl, 1969). Extension of licences for the two mining areas is allowed for similar terms. The operator's obligation with respect to the training of Nigerians for jobs in the oil industry and payment of rents and royalties is restated in the Oil Mining Lease.

The Mining Concession was amended by the 1969 Petroleum Decree. Under the decree, the validity of mining licences is reduced from forty to twenty years. Furthermore, concession holders are required to surrender at least half of the areas covered by the Oil Mining Lease, after ten years of operation, to the government. An operator may be granted a licence or lease subject to participation by the Nigerian Government, on terms to be negotiated. All these changes affected concessions granted after 1968.

The decree introduced additional obligations in respect of

concessions. First, concession holders should submit within five years a programme for utilization of natural gas discovered in the concession areas. Second, the concession holder must submit detailed programmes for training and recruitment of Nigerians. Furthermore, the operator must guarantee that within ten years Nigerians will hold 75 percent of the total managerial, professional and supervisory positions, including at least 60 percent of each individual grade. Additionally, all skilled, semi-skilled and unskilled workers recruited by the operating companies must be Nigerians (Schatzl, 1969).

5.1.4 Petroleum (Drilling and Production) Regulations (1969)

Petroleum (Drilling and Production) Regulations established in 1969 laid down certain minimum drilling standards in general terms.

Under the regulation, the licensee or leasee must maintain all apparatus, appliances, boreholes, and wells in good condition. The operator should ensure that all activities are carried out "in proper workmanlike manner in accordance with these and other relevant regulations and methods and practice accepted....as good oil field practice" (Hardy, 1973). Furthermore, operating companies must not allow escape or waste of petroleum or its escape into any water courses, including river, estuaries and harbours.

5.2 Petroleum Profit Ordinance

At the early stages of petroleum resources development in Nigeria the terms negotiated by the Nigerian Government with the Shell-BP included relatively low concession rents, a 12.5% royalty rate, a 50/50 profit sharing formula based on realized prices and a large

capital allowance. All these fiscal arrangements which came under the Petroleum Profit Ordinance were favourable to the Shell-BP. But as time went by it became obvious that these terms were unfavourable to Nigeria because the use of realized prices in calculating taxable profits meant that oil revenues accrued to the government fell as oil prices dropped throughout most of the 1960s. Thus, by 1966 and thereafter, the terms were amended to take into account the changed conditions.

In October 1966, the capital allowance was reduced under the 1966 Income Tax (Amendment) Decree. In the following year, the 1967 Petroleum Profit Tax Amendment Decree provided for the establishment of posted prices, the payment of royalties and taxes based on posted prices and the 'expensing' of royalties. Further amendment was introduced by the 1969 Petroleum Decree providing for a 51 percent state participation in all new concessions granted under the Decree.

Current royalty rates for crude oil are as in Table 5.1. The rates are the same for natural gas.

TABLE 5.1

CRUDE OIL (ON ROYALTY VALUE)

Area	Royalty Rates
Onshore	20%
Offshore up to 100 Metres Water Depth	18½%
Offshore beyond 100 Metres Water Depth	16 2/3%

Source: Akpe, S. (1980) "Natural Gas Exploration in Nigeria" The Nigerian Trade Journal Volume 27, p. 18.

In establishing the current royalty rates the government took account of difficulties encountered by offshore operators and the length of time required to develop offshore oil. Consequently, royalty rates for offshore production are lower than onshore production. The current rates are a part of the government's incentive to boost oil exploration announced in 1977 by the Federal Commissioner for Petroleum, Colonel Muhammed Buhari.

5.2.1 Profitability

Major oil companies including Shell, Gulf, Mobil, Agip-Phillips, Elf and Texaco-Chevron operate under joint ventures with 60 percent NNPC participation. Each of these equity producers pay royalty and tax on their equity share liftings at 20 percent and 85 percent respectively. Royalty is expensed against tax. However, a lower tax rate usually 65-75 percent applies to new fields during their early stages of development.

The government posted price is set at a level to allow oil companies to make a nominal profit margin of 80 cents per barrel after deduction of royalties and taxes. However, the actual profit margin may be as low as 40 cents per barrel, depending on the individual cost schedule (Quinlan, 1980).

The current state sales price for Bonny Light 37° API is $40.2 per barrel. The price has progressively increased in recent years (See Table 5.2). The government increased the production cost allowance from $1.00 per barrel to $1.10, in U.S. money. The costs of exploration per barrel of output are higher in the Niger Delta than in the Gulf Region. Thus, from the producers' standpoint, a more realistic

profit margin in Nigeria should be $1.10 per barrel and not 80 cents. However, the NNPC's recommendation for a profit raise favours $1.07 per barrel (Table 5.3).

The operating and development costs per barrel of output are higher in Nigeria than in the Middle East, probably due to the difficulties imposed by the harsh environment of the Niger Delta. An international comparison of crude oil product cost (see Table 5.4) indicated that the total costs of production per barrel of output in Nigeria amounted to 30.7 cents. In the Gulf Region the total production costs ranged between 1.0 cent to 1.8. The total costs of production were derived from operating and development costs. Assessments and duties paid by the oil companies to the producing countries and transport costs from ports of export were not included (Schatzl, 1969).

It should be noted that an international comparison of crude oil production costs does not give a true picture of production costs since the oil companies usually do not publish detailed statements about their cost structure. Thus, the figures in Table 5.4 are only approximations.

In Nigeria, the current production costs may be lower than the 1964 figures since crude oil production has increased since the last decade.

TABLE 5.2

OFFICIAL CRUDE OIL PRICES FOR
BONNY LIGHT 37° API (IN U.S. DOLLARS)

December 1978	October 1979	January 1980	April 1980	December 1980	January 1981
14.12	23.49	29.99	34.71	37.02	40.02

Source: Oil and Gas Journal April 28, 1980, p. 44.

TABLE 5.3

TAKE FROM OIL PRODUCTION

	$/barrel	% of Official Sales Price		% government take
1977, 80 cents/barrel Company margin				
Official sales price	14.61			
Royalty	3.10	21.22	}	87.68
Petroleum production tax	9.71	66.46		
Margin	.80	5.47		
Technical production cost	1.00	6.84		
1980, 80 cents/barrel Company margin				
Official sales price	34.21*			
Royalty	7.56	22.10	}	94.45
Petroleum production tax	24.75	72.35		
Margin	.80	2.34		
Technical production cost	1.10	3.22		
1980, $1.07/barrel margin (suggested)				
Official sales price	34.21*			
Royalty	7.49	21.90	}	93.66
Petroleum production tax	24.55	71.76		
Margin	1.07	3.12		
Technical production cost	1.10	3.21		

*Official sales price for Bonny Light 37° API was increased to $34.71 per barrel.

Source: Quinlan, M. (1980) 'New Exploration Offer Expected' Petroleum Economist Volume XLVII No. 5.

TABLE 5.4

INTERNATIONAL COMPARISON OF CRUDE OIL PRODUCTION COST

Area of Production	Year of investigation	Operating costs cents per bbl.	Development Investment per Initial daily bbl. in U.S.-$	Development costs cents per bbl.	Total costs cents per bbl.
U.S.A.	1961/62	18.0	3,250	138	156.0
Venezuela	1962-64	6.5	863	55	61.5
Libya	1963/64	2.2	149	132	15.2
Algeria	1962-64	3.9	656	423	45.9
Nigeria	1964	2.7	590	28	30.7
Iran	1962-64	1.0	130	8	9.0
Iraq	1962-64	1.2	69	34	4.2
Kuwait	1962-64	1.8	157	8	9.8
Saudi Arabia	1962-64	1.5	160	8	9.5

Sources: Schatzl, L. (1969) Petroleum in Nigeria Oxford University Press, p. 33; Petroleum Press Service Vol. XXXIII, No. 5, p. 177.

5.3 Government Participation and Control

The Nigerian Government strategy for effective control of the petroleum industry has been to increase involvement in the industry through 'participation'. The ultimate means to achieve this control would be through the state-owned Nigerian National Petroleum Company (NNPC), formerly known as the Nigerian National Oil Corporation (NNOC) The company was established in July 1971 to serve as,

> the instrument of feeding back to government knowledge and information about the national oil scene and international oil activities. It should also be a ready medium for the implementation of specific government policies (particularly on the national front) in any or all of activities connected with industry--instrument for exerting very salutary influences on all others in competition with it (Government Role in the Nigeria Oil Industry, p. 13).

Thus, the establishment of NNPC symbolized the beginning of an effective Nigerian Government role in the oil sector, followed later by several participation agreements with the operating companies.

The NNPC is active in exploration, production, transportation and marketing of crude oil. The company's specific functions include the following:

- exploration and prospecting for and mining or otherwise acquiring, processing and disposing of petroleum;
- marketing of petroleum;
- constructing, equipping and maintaining tank farms, depots and other facilities;
- management of government investments in oil companies in which the government is a participant (Third Development Plan, 1975-80).

5.3.1 Production Arrangements

Oil companies operate under three types of arrangement negotiated with the Nigerian Government. These arrangements include:

1. Joint Venture

The major oil producing companies including Shell, Mobil, Agip-Phillips, Elf, Texaco-Chevron, Panocean, have joint venture arrangements with the Nigerian Government. The state-owned company has a 60 percent share in the venture.[2] As a partner in the joint venture arrangement, the Nigerian Government shares in the production from the concession in proportion to the country's ownership interest. This amounts to about 1.5 million barrels per day. In addition, the government collects tax and royalty on the companies' share of the production so that the benefits to the country are two-fold. The state-owned company contributes its due share of project finance but generally allows the foreign partners to plan and carry out their projects.

A joint management committee supervises investment, management and production policies of the companies in joint venture with the NNPC. Although the Federal Government and the NNPC's representatives are in a majority in the joint management committee, control of daily activities is still in the hands of the operating companies (Arnold, 1977).

2. Production-sharing Contracts

Only one oil company--Ashland--is currently operating under

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[2]Following the Nationalization of the company's interests, the Nigerian Government's participation in NNPC-Shell joint venture increased from 50 percent to 60 percent.

production-sharing contract negotiated in 1973. Under this arrangement, Ashland is required to finance exploration, development and production. The company obtains in return about 40 percent of the production for investment recovery and for royalty. After tax, the balance of output is shared between the government and Ashland. The government gets 65 percent for the first 50,000 barrels while the company gets the remaining 35 percent. After the first 50,000 barrels, the balance is share 30 : 70 percent in the government's favour.

3. Permits

Permits involving service-contract terms are granted to oil companies to undertake exploration and drilling activities in the Niger River Delta, the Anambra, Benue, Chad, Niger and Sokoto basins. The permits do not convey on the holders the right to any oil discovered, except the right to a remuneration volume of crude and the first option to purchase specified quantities in addition to this at state prices. The permit holder is required to finance exploration, development, and production. Permits are valid for a maximum of five years and thereafter if no discoveries are made the contract terminates without any obligation on the government or the operator. On the other hand, if explorations are successful, the operator will be repaid his investment and paid a remuneration in crude oil. In addition, the company will have the first option to purchase "certain fixed quantities" of oil produced.

Although this type of contract is designed to induce companies to extend their activities in regions outside the Niger Delta, only 11 permits of 72 have been taken. The permit holders are the Agip, Elf and Nigus Petroleum. The Major Companies seem to show no interest in

this arrangement because they considered that the rewards were not substantial enough to compensate for the risk and the high costs involved in moving equipment to remote areas.

In summation, the most popular arrangement which permits the Nigerian Government some degree of control over the oil industry is the joint venture. This arrangement allows the government to share in the production from the concessions, to collect tax and royalty on the companies' share and to gain some practical experience by participating in the exploration, drilling and production activities.

5.3.2 Major Constraints

Shortage of skilled manpower has been a limiting factor in the governments effort to exercise effective control over the oil sector. Arnold (1977) comments that "there are still not enough Nigerians to supervise and run the industry despite training programmes by the major oil companies. Mr. Justice Ayo Irikefe (1980) has observed in the probe of the 2.8 billion naira (about U.S. $4 billion) missing from the account of NNPC that:

> some of the NNPC staff who were supposed to watch and record the quantity of oil extracted daily at the various exploration bases are not literate enough to engage in any meaningful dialogue with the expatriate staff of the oil companies...all personnel met at various oil terminals were mere illiterates who did not know why they were at the terminals (National Concord, May 24, 1980, p.1).

The shortage of skilled manpower in Nigeria underlines the need to expand training programmes. The government response to the problem has been to establish the Petroleum Training Institute specifically designed to train personnel for jobs in the petroleum industry.

Moreover, two universities in Nigeria offer courses in Petroleum Engineering.

5.3.3 Petroleum Training Institute

The Petroleum Training Institute was established by Decree No. 37 of 1972 to provide technology and skilled personnel required in the petroleum industry. Specific objectives of the institute are as follows:

- to replace most of the expatriate technicians (operators and supervisors) working in the industry by trained indigenous manpower;
- to organize booster courses for personnel already employed in the industry;
- to undertake problem-solving or operational research relative to petroleum.

Technicians constitute three-quarters of the total workforce and are mostly in short supply. Popo (1980) Registrar and Secretary to Petroleum Training Institute Governing Council observed that shortage of Manpower would continue "unless effort is intensified in training technicians" for the oil industry.

5.4 Crude Oil and Gas Transportation

The bulk of crude oil and gas produced in Nigeria is transported from the field of production to storage tanks at refineries for local consumption or to tanker loading facilities for export by means of a pipeline system. The pipeline system is extensively used because most of the oilfields are located close to the coast and in the offshore which makes transportation by roads, train or inland waterways difficult.

During the rainy season for example, road transport facilities are heavily flooded bringing oil traffic close to a halt. The only reliable means of transport that can serve all the year round is therefore the pipeline system.

Shell-BP operates a Trans-Niger Pipeline about 225 km long which cuts across the Niger Delta and connects the crude oil fields of Ughelli, Kokori, Driemu Olomoro and Uzere in Bendel State (formerly Mid-Western Region) with Port Harcourt and the Bonny export harbour (see Fig. 5.1).

Gulf Oil operates an underwater pipeline which connects the offshore field of Okan with an offshore loading berth for oil vessels.

A new set of pipelines about 2800 km is to transport refined oil from the refineries at Warri, Kaduna, Port Harcourt to the main storage locations as follows:

Warri refinery to Ikorodu

Ikorodu " to Lagos

Warri " to Kaduna

Kaduna " to Northwestern Nigeria

Port Harcourt refinery to Eastern Nigeria

5.5 Socio-economic and Environmental Impacts of the Oil Industry

The export of Nigerian crude oil started in 1957 but it was not until the 1970s that petroleum began to make substantial impact on the economy. The most apparent contributions of the oil sector to the Nigerian economy are reflected in the enormous oil revenues that have accrued to the Nigerian Government and the improvement in the country's foreign exchange earnings. Although the development of petroleum

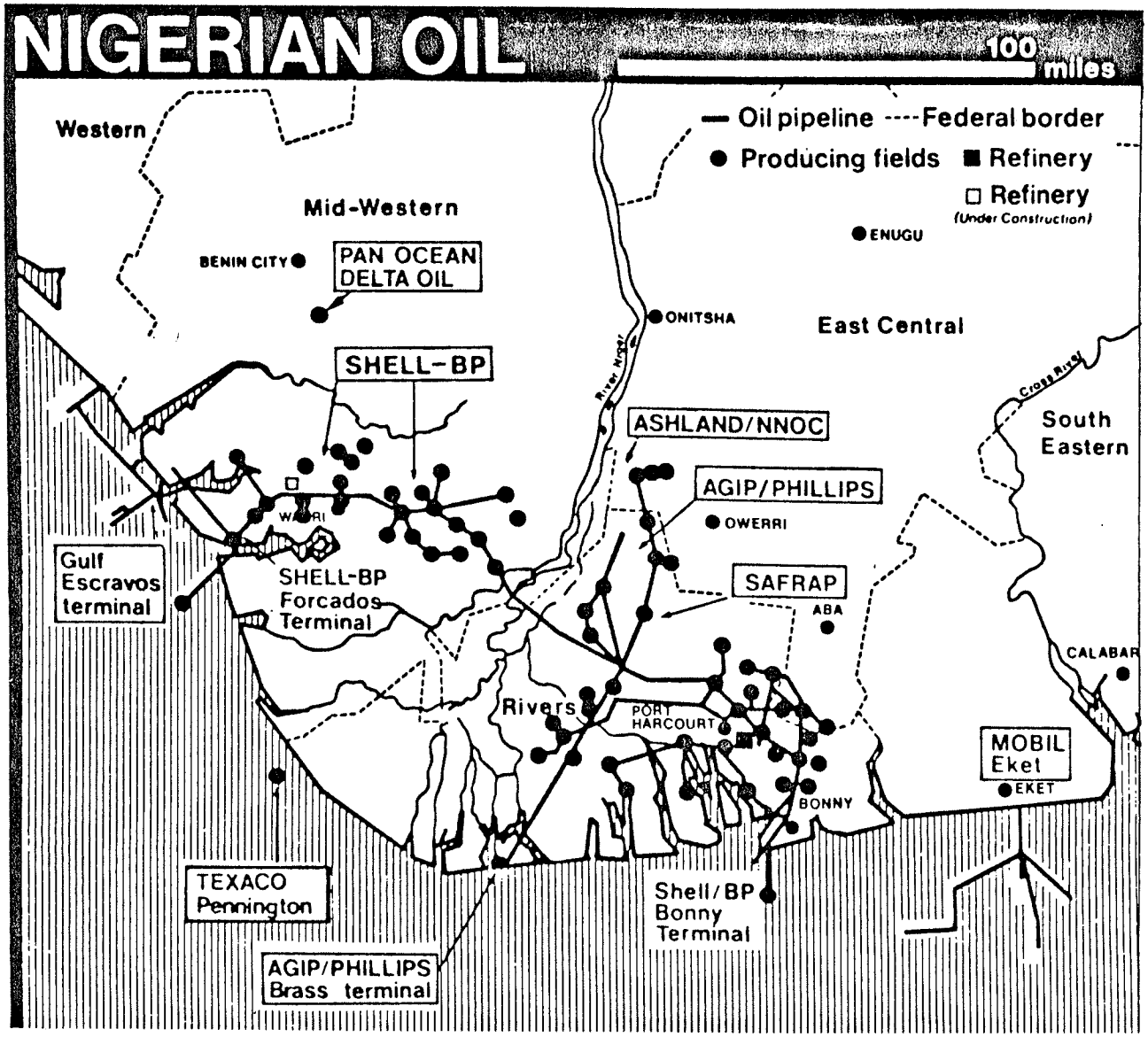

FIGURE 5.1 Nigerian Oil

resources created employment opportunities for Nigerians, direct employment effect on the economy has been quite neglible; the reason being that petroleum industry is highly capital-intensive.

5.5.1 Oil Revenues

The 'oil crisis' which started in 1970 and reached a peak in 1973 marked the beginning of what may be perceived as an oil boom in Nigeria. The 'oil crisis' was prompted by a number of factors among which were--the changing relation between oil companies and governments of the oil producing countries, and between the supply and demand for crude oil, an accelerated world-wide inflation, and the changes that resulted from the political crisis in the Middle East (Penrose, 1976). A combination of these factors created a milieu which enhanced the bargaining position of oil producing countries vis-à-vis the international oil majors. Under the aegis of the Organization of Petroleum Exporting Countries (OPEC) oil producing countries exerted overwhelming influence on the prices of oil in international markets (Table 5.5).

Nigeria joined the OPEC in July 1971 and has since then improved its bargaining position vis-à-vis the oil companies operating within its territory. The Nigerian Government derives most of the oil revenues in the form of concession rents, royalties, profit taxes, participation interests, premiums, harbour dues, other sources. Since the oil boom, government revenues from these sources have been on the increase except in 1975 following a drop in production. Oil revenues fell further in 1978 due to oil glut of 1977 which forced oil exporting countries to cut back their production (Tables 5.6 and 5.7). The

TABLE 5.5

OPEC: OFFICIAL CRUDE OIL PRICES

Dollars a barrel			Dec 1978	Jan 1980	Dec 1980	Jan 1981	% incr. over 1978
Abu Dhabi	Zakum	40°	13.17	27.46	33.46	33.46	154
	Murban	39°	13.26	27.56	33.56	33.56	153
	Umm Shaif	37°	13.04	27.36	33.36	33.36	156
Arabian	Light	34°	12.70	26.00	30.00	32.00[a]	151
	Med	31°	12.32	25.45	29.45	31.45[a]	155
	Heavy	27°	12.02	25.00	29.00	31.00[a]	158
Iranian	Light	34°	12.81	30.00	35.37	37.00	189
	Med/Heavy	31°	12.49	29.27	34.37	36.00	189
Iraq	Kirkuk	36°	12.88	26.18	32.18	36.18	181
	Basrah	35°	12.66	25.96	31.96	35.96	184
Kuwait		31°	12.22	27.50	31.50	35.50	191
Qatar	Dukhan	40°	13.09	27.42	33.42	37.42	186
	Marine	36°	13.00	27.23	33.23	37.23	186
Algeria	Saharan	44°	14.10	33.00	37.00[b]	40.00[b]	184
	Zarzaitine	44°	14.05	33.00	37.00[b]	40.00[b]	185
Libya	Brega	40°	13.85	34.67	37.00	41.00	196
	Sarir	38.9°	13.29	34.12	36.40	40.40	201
Nigeria[c]	Bonny	37°	14.12	29.99	37.02	40.02	183
Indonesia	Minas	35°	13.55	27.50	31.50	35.00	158
Venezuela	Oficina	34°	13.99	28.75	34.85	38.06	172
	Tia Juana	24°	12.39	24.51	29.03	32.03	159

a) Effective 1st November, 1980. b) Excluding premium of $1.25 - $3.00 for buyers without exploration agreements. c) Including 2 cents/bl. harbour dues.

Source: Petroleum Economist February 1981, p. 48.

TABLE 5.6

ESTIMATED OIL REVENUES OF NIGERIA 1970-78

	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total Amount in U.S. $ Millions	411	915	1,174	2,000	8,900	6,570	7,900	9,600	8,200
% increase		+ 55.08	+ 28.31	+ 70.36	+ 345	- 26.18	+ 20.24	+ 25.52	- 14.58

Sources: Baker, J. (1977) "Oil and African Development", Journal of Modern African Studies, 15, p. 189. Petroleum Economist, June 1979, Vol. XLVI, No. 6, p. 224.

enormous increase in government revenues recorded in 1973-74 was as a result of increased crude oil production in Nigeria, the increase in crude oil prices during the period and the favourable fiscal arrangements obtained by the government from the operating companies as a result of the latter's improved bargaining position (Madujibeya, 1976). Currently, oil sales provide 80 percent of government revenues and 90 percent of Nigeria's foreign exchange earnings.

5.5.2 Crude Oil Production

Nigeria's crude oil production escalated during the boom years. By 1963 production level was at 0.77 million barrels (bbls) per day, and thereafter attained a peak at about 2 to 3 million bbls a day in 1974. However, in 1975 production dropped and then stabilized at about 2 million bbls per day until 1977 when a glut forced oil producers to cut down their production level. Thus, in 1978 Nigeria's crude oil production dropped to about 1.5 million bbls a day (Table 5.7).

Although crude oil production levels have been determined primarily by the world market demands, Nigeria's level of production has been, to some extent, determined by the governments conservative policy which sets a ceiling on the daily production at 2.15 million bbls per day.

5.5.3 Employment Opportunities

The oil industry created employment opportunities for Nigerians. From the early stage of the industry's development, Nigerians were recruited for jobs such as the building of access roads and bridges, the cleaning of drilling sites, transportation of materials and equipment, the building of staff housing, and other related activities.

TABLE 5.7

CRUDE OIL AND NATURAL GAS PRODUCTION
IN NIGERIA, 1957-80

Year	Oil Production (million bbl)	Gas Production (Million m^3)	Gas/Oil ratio (m^3bbl)
1957	0.14		
1958	1.874	45.560	24
1959	4.094	139.834	33
1960	6.367	144.260	23
1961	16.802	309.834	18
1962	24.624	486.483	20
1963	27.914	625.406	22
1964	43.997	1028.836	23
1965	99.354	2406.026	24
1966	152.427	2935.947	19
1967	117.120	2668.127	23
1968	51.906	1413.228	27
1969	197.225	4125.524	21
1970	395.841	8037.048	20
1971	559.328	12796.325	23
1972	665.281	16796.193	25
1973	750.050	19831.504	26
1974	815.748	20624.234	25
1975	651.393	18436.672	28
1976	756.141	20831.428	28
1977	758.991	20322.946	27
1978	695.488	15756.373	23
1979	*848.920	*5756.374	..
1980	*791.028	*22300.000	..

*Estimate

Sources: Annual Report, Ministry of Mines and Power, Lagos: AAPG Bulletins; Egbogah, E., et al., 1980; 'Possible New Oil Potential of the Niger Delta', Oil and Gas Journal April 14, 1980, p. 182.

Expatriate staff held all the supervisory and management positions because there were not enough Nigerians with adequate training to fill these positions. However, with the passage of time, Nigerians were recruited by the oil companies for training for managerial and supervisory functions, seismic and drilling operations. The oil industry organized training programmes for local people, partly in response to the 1969 Petroleum Decree and the provision in the Mining Concession which obligated concession holders to employ Nigerians in management, supervisory and professional positions, and to ensure that all skilled, semi-skilled and unskilled workers recruited were Nigerians. By 1976 for example, the oil industry employed a total of about 4,500 Nigerians. Additionally, ancillary firms which are dependent on the oil industry employed about 15,000 Nigerians (Madujibeya, 1976). Since the oil industry is highly capital-intensive in comparison with agriculture or manufacturing it is not expected that the industry will generate substantial direct employment in future. Generally, oil industrial growth comes in the form of expansion of capital investment in equipment for secondary recovery and not expansion of employment.

5.5.4 Oil-induced Problems

The negative impact of Nigeria's oil boom has been more remarkable on agriculture than any other sector of the local economy. The oil boom has been accompanied by a decline in agriculture. The collapse of the agricultural sector is reflected in the drop in Nigerian agricultural exports and the increase in food imports.

Prior to the boom years, the local economy was mostly dependent upon agriculture as the main source of export products and foreign

exchange earnings. The major export products include cocoa, palm oil and kernels, timber, rubber, cotton and groundnuts. Exports of these commodities declined as Nigeria progressively attained the status of a major world oil producer. By 1976, Nigeria's export consisted almost entirely of crude oil, while other commodities contributed little to the total export value. The decline in cash crop-agriculture is obviously in the export figures for groundnuts (Table 5.8).

TABLE 5.8

EXPORTS OF GROUNDNUTS
(MILLION TONNES)

Year	Export	Export as a Percentage of Total
1972	454000	42.43
1973	270000	25.23
1974	114000	10.65
1975	178000	16.63
1976	42000	3.92
1977	12000	1.13
1978	50	0.01
	1070050	100

Adapted from: Freund, B. (1978) 'Oil Boom and Crisis in Contemporary Nigeria' Review of African Political Economy No. 13, p. 97.

Since the oil boom the bulk of groundnut production is consumed locally and only a small proportion is exported. The figures in Table 5.8 represent the amount of groundnuts sold to the marketing board for

export.

For palm produce and cocoa the cause of decline in production has been the growing scarcity of migrant labour. The drift of rural dwellers to the cities has contributed to food shortages in Nigeria. Cities offer more job opportunities than the rural areas. Jobs could be found in industries, commerce, administration and construction. In Rivers State, for example, there has been a tendency for labour to switch from agriculture to the oil industry for better wages.

It is estimated that food production in Nigeria increases at the rate of 2.0 percent per annum while local demand increases at the rate of 4.5 percent per annum. Thus, some importation of food items such as rice, wheat, sugar, meat, fish and others is necessary. The most spectacular increases have been in rice imports (See Table 5.9).

TABLE 5.9

RICE IMPORTS
(MILLION KILOS)

Year	Amount	Percent change
1975	15	—
1976	45	+ 200
1977	246	+ 447

Adapted from: Freund, B. (1978) 'Oil Boom and Crisis in Contemporary Nigeria' Review of African Political Economy No. 13, p. 97.

Admittedly, the Nigerian Government is deeply worried about the decline in agriculture. Nigeria has a population of over 80 million which depend upon the agricultural sector for food and raw materials

for the local industries. One can therefore appreciate the government's concern about the revival of agriculture. Thus, agriculture has been given a high priority in the national development programmes.

In 1976, the federal military government launched Operation Feed the Nation in an attempt to solve the growing food shortages. Although this programme did not yield the desired result because Nigeria lacked enough trained personnel to implement the programme, it demonstrated the growing concern in the food shortages.

Under the civil government, agriculture continues to receive priority attention. In the current National Development Plan 1981-85, about 13 percent of the total capital investment of federal and state government will go to agriculture. The planners envisage an annual growth rate of 4 percent in the agricultural production. Specific government activities in this sector during the present plan period will include a direct assistance to small farms in the form of extension services, fertilizers, credits, tractors and implements, grain storage facilities, improved seeds and land clearing. Other government activities include the provision of access roads to the farms to facilitate the distribution of farm products and the provision of irrigation facilities to enable farmers to grow crops all the year round (Fourth National Development Plan, 1981-85).

Hopefully, if these activities are implemented they may result in improvements in agricultural production. Since some of these programmes designed to bring about improvements in agriculture are on a long-term basis, it is premature at this stage to make any conclusions about their success or failure.

No doubt, the Nigerian Government's policy in utilizing the oil

revenues to improve agriculture and other key areas of the economy, such as the industrial and manufacturing sectors, is commendable. The shift of labour from agriculture to other sectors can be checked if a comprehensive rural development programme is undertaken. The programme would include provision of essential amenities and price incentive to make agriculture an attractive occupation.

5.5.5 Social Problems

Nigerian cities, especially Lagos, have taken on 'the character of gold rush towns' attracting migrants from the rural areas. Thus, over the past few years most Nigerian cities have experienced population increases due to rural-urban migration and natural factors. For example, between 1963 and 1967, the population of metropolitan Lagos increased by 40,000; migrants accounted for two-thirds of this figure. The average annual growth rate of the population in Lagos, Kaduna, Port Harcourt (excluding the war years) was over 10%, 8% in Kano (Schatzl, 1973). The tendency in some cities is towards over-urbanization. Too much urbanization creates many social problems like housing shortages, breakdown in facilities, due to excessive utilization. Admittedly, all these problems are a consequence of a booming economy.

5.5.6 Environmental Effects of Oil Development

The first attempt to develop a national environmental policy in Nigeria was an outcome of the 1972 United Nations Conference on Human Environment held in Stockholm (Third Development Plan, p. 292). In the Third Plan, environmental problems were identified under two broad categories--'primary' and 'secondary'.

Primary environmental problems are associated with underdevelopment and attendant poor living conditions characterized by slum housing, inadequate water supply, lack of sewerage and proper facilities for

waste disposal, etc.

Secondary environmental problems on the other hand are spill-over effects of economic activities: primarily manufacturing and mining. These activities create air, land and water pollution which have harmful effects on human and marine life.

A National Co-ordinating Committee on Human Environment was set up to deal with environmental problems. This Committee is to function in co-operation with similar committees at state level. The attention of the Committee seems to focus on the primary environmental problems. While a number of programmes (including public housing development, provision of infrastructure facilities such as sewerage, water supply, were introduced in the Third Plan in response to the primary problems, there were no programmes to control pollution problems classified as 'secondary' problems.

There are no anti-pollution laws at national or state level, though the Federal Government and the Rivers State Government have given indication to introduce anti-pollution legislation (Daily Times, March 13, March 3, 1980). This announcement came in response to the Funiwa blowout. The absence of a specific programme to deal with pollution problems implies that there is no explicit policy for pollution problems. The Nigerian Government has merely recognized the existence of the pollution problems but directed no effort to solving them. The Funiwa-5 oil spill underlines the need for a well defined environmental policy followed with comprehensive programmes to control pollution.

5.6 Funiwa-5 Oil Spill and its Significance

The Funiwa-5 Oil Spill 1980 will always be remembered in the

history of petroleum development in Nigeria. The incident is significant in terms of the quantity of oil involved, the area affected by pollution and the public outcry provoked.

The incident involved an estimated 280,000 bbls of oil spewed into the sea, affecting close to 100 kilometres of the coastal area of the Niger Delta. The winds and waves in the Atlantic Ocean drove the oil further than 30 kilometres inland along the creeks of the Niger Estuary, affecting over 200 towns and villages with a population close to 250,000 (West Africa, March 10, 1980, p. 427).

5.6.1 Niger Delta

The Niger Delta consists of an extensive coastal sedimentary basin and offshore deposits laid down by the River Niger millions of years ago. The delta covers most of Yenogoa, Degema and parts of Port Harcourt areas of Rivers State and settlements on the southern parts of Bendel State (Fig. 5.2).

The Niger Delta is a difficult environment for human existence. The delta consists of mangrove swamps, fresh-water swamps and tropical rainforest. The mangrove swamps stretch along the coast about 48 to 64 kilometres broad and are flooded by several metres of brackish water in the rainy season. The swampy mangrove forestland supports little agriculture. "There is so much water around that the people shop and visit their friends in canoes" (Fig. 5.3). These harsh environmental conditions account for the sparse population in the region. On the average, the delta supports a small population of about 20 per square kilometre.

The Ijaws make up over one-half of the total population. Other

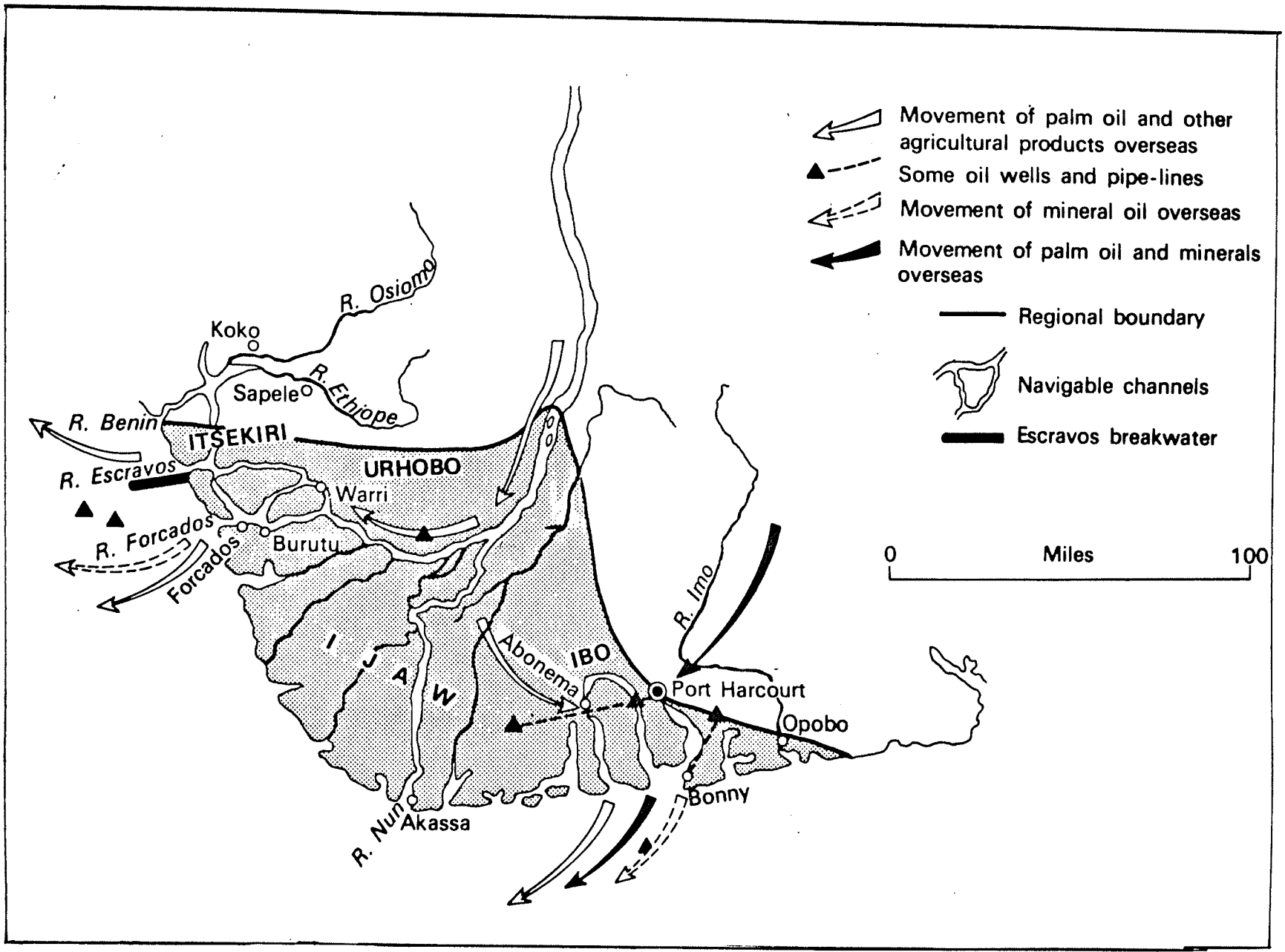

FIGURE 5.2 The Niger Delta

FIGURE 5.3 | A Typical Village in the Niger Delta

Source: Iloeje, N. P. (1965). A New Geography of Nigeria, p. 189.

ethnic groups are Ibos who settled on the north and eastern section of the delta, the Urhobo and Itskiri settled on the western section (Fig. 5.2).

Human existence in the delta depends much on water. Fishing is the main occupation of the inhabitants and thus the major source of revenues. The forestland in the delta is not good for agriculture. Consequently, the local food requirements with the exception of fish and other marine food are supplied from upland areas. The inextricable relation between human and water in the Niger Delta raises the fear that major contamination of the rivers, coastal waters or sea by oil released in the course of drilling, production or transportation especially in the offshore would have disastrous impacts on human and marine life. The Funiwa-5 Oil Spill incident has underlined this fear.

5.6.2 Cause of the Funiwa-5 Blowout

The Texaco offshore rig explosion that generated an enormous oil spill was a result of human error (Sunday Times, February 8, 1981, p. 20). The blowout was attributed to inadequate monitoring of the high pressure in the formation. Most of the oil reservoirs in the Niger Delta are located at shallow depths. Moreover, most of the oil traps are in the region of rollover anticlines associated with growth faults (Egbogah, E., et al., 1980; Schatzl, 1969). The rollover anticlines are several kilometres in length and a few kilometres wide; they extend east-west and run almost parallel to the coastline (Egbogah, E., et al., 1980).

The geologic conditions which generated the Santa Barbara Oil Spill of early 1969 in the Dos Cuadros Offshore Oil field off California

bear some resemblance with those conditions that brought about the Funiwa-5 blowout. The Santa Barbara offshore rig blowout was attributed to the failure of the oil company to plan sufficiently to meet the following conditions:

- extreme shallowness of oil reservoirs;
- abnormal high surface pressures and
- active local faulting (Travers, et al., 1976).

During drilling sub-surface fluids (consisting of water, gas, air) can be released through cracks created by active faulting. Under this condition, control of the pressure of the sub-surface fluids poses a problem, and the pressures have to be tempered by the weight of the column of drilling fluid. High pressure zones can be identified ahead of time and planned for so that chances of a blowout can be eliminated or at least minimized.

5.7 Consequences of the Funiwa-5 Oil Spillage

5.7.1 Ecological Impacts

The oil pollution affected the inland areas because the Niger Delta is exposed to high-energy dynamic environment of the Atlantic Ocean which accelerated the spread of the oil into tidal rivers, creeks and lagoons.

West Africa (10 March, 1980) reported that "...at the beginning (of the spill) fish floated dead on the surface of the river waters and were washed up on the beaches." Daily Times reported that "thick flakes of brownish crude oil laced the stunted stems and dried leaves of dead plants and on the edges lay the dead remains of crabs whose smell suffused the wet air." Oil killed the crabs and many have been

picked for food and have caused sickness" (Daily Times, March 7, 1980). Oil contamination extended upland, where "farms were soaked and crops poisoned. Oil formed a crust over the rivers and drinking water smelled bad" (Daily Times, March 11. 1980). An observer claimed that "marine life is all gone, breathing roots of the mangroves are dead."

The Texaco Oil Company's official statement about the incident which was published in the Daily Times of March 8, 1980 admitted that there were damages to "some seedling mangrove trees and possible loss of mollusks in swamp areas but little or no loss of birds, marine life was observed or confirmed."

Contrary to the company's claim, it is doubtful how an oil spill of such magnitude could not have affected the marine life. Texaco did not confirm or deny the report that a number of fishing ponds such as the Mbikiri Fish Pond were contaminated by oil. The owner of Mbikiri Fish Pond claimed that he derived an average of about $12,000 in U.S. currency per month from the pond.

5.7.2 Long-Term Effects

In the absence of comprehensive studies on the damage done to the marine life by Funiwa-5 oil spillage it is difficult to evaluate the full ecological effect of the pollution in long-term or short-term basis. However, studies done elsewhere to determine the effect of oil-water system on living things may be informative.

A preliminary result of a national 'mussel watch' programme managed by the United States Environmental Protection Agency indicates that there is a higher hydro-carbon concentration on the shellfish off Massachusetts and Mississippi than many other areas (Technological

Review, December/January, 1979, p. 16).

A study by Donald Malins and associates of Northwest and Alaska Fisheries Centre in Seattle shows some aquatic organisms turn hydrocarbons into longer-lived chemical substances that are known to "affect the health of animals including the formation of tumor..." (Technological Review, 1979, p. 16).

Drs. E. B. Overton and J. L. Saseter of New Orleans Biorganic Studies at the University of New Orleans comment that

> Upper most among reasons for interest in the existence and source of aromatic hydrocarbons in the environment is the knowledge that several are known carcinogens to man... (Technological Review, 1979, p. 16).

5.7.3 Social Impacts

The Nigerian media carried a report about human misery that was engendered by the pollution of drinking water, fishing ponds, coastal waters and farms in the affected area. The oil pollution affected more than 200 towns and villages with a population over 250,000 (West Africa, 10 March, 1980). Villages that were worst hit due to their proximity to the source of the pollution were Koluama One, Koluama Two, Fish Town, Otuo and Sangana (Daily Times, 28 February, 1980).

Since there were no official reports on the death toll associated with this incident it is not possible to state the number of individuals who lost their lives as a result of pollution-induced diseases. It was, however, claimed by the people from the affected areas that some children died after drinking contaminated water. Some children, too, died from food poisoning. Causes of sickness reported by medical doctors in the oil affected area were associated with oil contamination. A school

teacher reported that there were cases of diarrhea and cholera among school children (Daily Times, 7 March, 1980).

Widespread oil pollution-induced diseases apart, the pollution threatened the traditional basis of human existence in the Niger Delta. People were evacuated from the polluted areas to camps in the safe places, leaving behind their property and occupations. Thus, individuals, especially the fishermen, lost some income during the emergency.

The damage to mangrove ecology constitutes an enormous loss to the natives. A three-year scientific study completed by a Toronto-based Foundation of Canada Engineering Corporation (FENCO) reveals that mangroves in the riverine areas of Southern Nigeria have high economic values.

Mangrove wood, according to the report, can be used in industries for many purposes (including production of wood cement, rail sleepers, telephone poles, high density particle boards, etc.). There are an estimated 30,000 hectares of exploitable mangroves in Rivers State, capable of supplying 560000 m^3 of wood (New Africa, July, 1977, p. 653).

The Funiwa-5 Oil Spill engendered high emotions among the inhabitants of the Rivers State, who received the direct impact of the pollution, and the Nigerian public generally. The incident caught the attention of the public and provided a focus for growing environmental concern. Furthermore, the incident revived the issues of the oil revenue distribution formula which has been since the post-independent years a sensitive and unsettled area in Nigeria, though the issue seemed to have been forgotten after the adoption of a nineteen-state structure. The creation of Rivers State during the Military regime seems to meet the demand of the inhabitants of the eastern part of the Niger Delta for

control of their own affairs including the resources.

The inhabitants of Rivers State were intensely emotional over their predicament and the failure of the Texaco Oil Company and the Federal Government to respond promptly to the spill and the problems generated. Texaco was criticized for not reporting the incident promptly to the authorities and for the meagre relief materials sent to the victims. Texaco spent a total of about U.S. $900,000 in relief materials while the Federal Government and the Rivers State Government spent about U.S. $4 million and U.S. $2 million, respectively for the same purpose (Daily Times, March 6, 1980).

Emotions were high among the public. Melford Okilo, Governor of Rivers State, wondered "why the state which produced the most precious mineral should be allowed to suffer in the midst of plenty" (Daily Times, March 10, 1980). Similar frustration was expressed by Chief Alfred Diete Spiff, former Military Governor of Rivers State, in his comment that "the much talked about oil boom is now oil doom" (Daily Times, February 26, 1980). President Shehu Shagari announced, in response to the pollution incident, that anti-pollution legislation would be introduced in the National Assembly. The President urged the NNPC to negotiate with Texaco for compensation for damages (Daily Times, March 13, 1980).

A group called the Nigeria Political Science Association has urged the Federal Government to introduce 'tough regulations' that will ensure that lives and property are protected against oil spillage in Nigeria. Furthermore, the association suggested that individuals who were damaged by pollution should be given adequate compensation.

The pollution incident provided a forum for the oil producing

Rivers State to attack the existing oil revenue distribution formula.

All offshore areas in Nigeria are under the federal jurisdiction and thus all revenues deriving from offshore production accrue to the Federal Government. Under the existing revenue-sharing arrangement only some portion of revenues from onshore production is distributed to the states. With effect from April 1974, oil producing states were entitled to 20 percent of the oil revenues and the remaining 80 percent goes into the distributional pool. States receive their shares of oil revenue from the distributional pool according to population. The major oil-producing states have small populations in comparison with non-producing states. Rivers State, for instance, has a population of 1.5 million while the former Western State, a non oil-producing state has a population of about 9.4 million (1963 Census). Present distribution is based on the 1963 population figures.

The existing distribution formula by which the proportion of oil revenues going to the state is determined on the basis of population of the states does not favour the oil-producing states, especially Rivers State. The main oil-producing states in Nigeria, namely, Rivers State, Bendel, Anambra and Imo seem to be in favour of oil revenues distribution according to area of derivation.

Before the Revenue Allocation Commission headed by Dr. Pius Okigbo, Governor Okilo argued that

> God or Allah deposited oil in this difficult area of the Rivers State of Nigeria because He knew it would require enormous amounts of money to develop (West Africa, 10 March, 1980, p. 439).

The Commission has completed hearings and submitted recommendations to

the Federal Government for consideration. The reports await the National Assembly's debate.

5.7.4 The Media

The Nigerian news media played a major role in capitalizing on both local and national emotions. The media were criticized by Texaco Oil Company for deliberately over-estimating the damages caused by the Company's recent oil spill. The media were also critical of the government's delaying tactics in bringing about anti-pollution legislation. The Daily Times commented that "it is embarrassing that Nigeria is yet to be reasonably prepared to cope with the polluting effects of exploration and exploitation" (Daily Times, February 13, 1980).

The Daily Times explains that there has been so much 'foot-dragging' in initiating anti-pollution legislation because it is not quite clear whether the higher revenue shares sought by the oil-producing states should be tied with primary responsibility for combating pollution.

Perhaps, the reason why the State Governments have not introduced legislation in respect of oil industrial activities is because they want to avoid getting into jurisdictional conflict with the Federal Government. It is noted that all minerals and mining activities in Nigeria, including oil mining, are within the federal jurisdiction. It is therefore not unreasonable to assume that the Federal Government should initiate laws and regulations dealing on pollution from petroleum resources development activities. As noted in the case of the United States, the State Governments can enact their own laws and regulations on this subject provided that they do not run into conflict with the federal laws.

One of the main issues raised by the Funiwa-5 Oil Spill is the

need for a national contingency plan for emergency cases like oil pollution disaster. This will ensure that there is some degree of co-ordination of efforts among agencies and departments associated in one way or the other with the pollution problems. Furthermore, a national contingency plan will enable the agencies and departments to know the area of their responsibility in emergency cases.

Absence of a national contingency plan has been the reason for lack of co-operation between the Rivers State branch of the Nigerian Red Cross and the State Emergency Relief Committee set up by the State Government to look after the oil affected areas. A national contingency plan will thus help to reduce frictions between agencies or departments involved in providing services to pollution victims.

It seems too that an independent body could have been appointed in the absence of an administrative agency to negotiate with Texaco for compensation for damages. The NNPC was detailed by President Shehu Shagari to negotiate for compensation for damages. It seems that NNPC is not the right body to negotiate with Texaco for compensation. It should be remembered that NNPC is in joint venture with Texaco and is operated like any other oil company on a commercial basis. Compensation for damages or loss of income is an area that requires exercise of judgement based on equity. A profit-oriented national oil company like the NNPC may not be a good mediator between Texaco, NNPC's foreign partner, and the victims of pollution who may demand compensation for damages or loss of income.

5.8 Potential Sources of Pollution

Refineries are potential sources of air and water pollution in

Nigeria. A most serious pollution associated with refineries is sulphur dioxide emission. Sulphur dioxide released in high concentrations can cause corrosion of metals, building materials and fabrics, and aggravate lung problems. Refineries can cause water pollution, due to waste discharges into the sea, rivers, lakes and other water basins.

In Nigeria there are presently three refineries on stream--Alese Eleme, Warri and Kaduna. Plans are on the way to construct a fourth refinery, probably to serve the export markets. The capacity of Warri and Kaduna refineries are rated at 100000 bbls per day; Alese Eleme, the country's oldest refinery, operates at a capacity rated at 60000 bbls per day. The fourth refinery is likely to be of 100000 bbls per day capacity. As the number and capacity of refineries in Nigeria increase the probability of air and water pollution increases

Though Nigerian crude oil has low sulphur content compared with crude oils produced in the Gulf Region and Venezuela, the probability of air pollution resulting from refineries and other energy equipment based on gasoline is not completely eliminated (see Table 5.10).

To check pollution from this source, the Federal and State Governments should set ambient air quality standards and effluent standards in the case of water pollution. To ensure that the level of air and water quality desired are met, the government should back up enforcement activities with fines in case of violation.

Industries and utilities which are presently utilizing gasoline for energy should be encouraged to convert to natural gas, which is sulphur free and less expensive than oil.

There are other oil industrial activities apart from exploration, drilling and refinery operations that can result in a major oil

TABLE 5.10

CHARACTERISTICS OF MAJOR WORLD
CRUDE OIL EXPORT STREAMS

Designation of Crude Oil	Producing Country	Gravity °API	Pure Point °c	Percent Sulphur
Arabian heavy	Saudi Arabia	28.2	-34	2.84
Arabian light	Saudi Arabia	33.4	-34	1.80
Iranian heavy	Iran	30.8	-21	1.60
Kirkuk	Iraq	33.5	-29	1.40
Kuwait	Kuwait	31.2	-18	2.50
Brega	Libya	40.4	- 1	0.21
Hassi Messaoud	Algeria	44.4	-24	0.14
Bonny Light	Nigeria	37.6	+ 2	0.13
Minas	Indonesia	35.2	+32	0.04
Taching	China	33.0	+35	0.04
Tyumen	USSR	34.0	-20	0.97
Romanshkinskaya	USSR	32.6	-29	1.61
North Slope	U.S.A.	26.8	-21	1.04
--	Venezuela	26.0	---	1.52

Source: Oil and Gas Journal, March 29, 1976.

pollution. These activities include crude oil transportation and distribution by ocean-going tankers, pipelines, railroad tankers and motor vehicles.

Oil spillage from tankers has been a major source of oil pollution of marine and coastal environment as exemplified by the Torrey Canyon Oil Spill of 1967. As noted in Chapter II, this source of pollution has been most spectacular and has provoked reactions from the international community, leading to the establishment of several international, regional and national regimes.

In Nigeria, all crude oil destined for export markets are transported by tankers with a load capacity up to 300,000 tonnes. In fact, the Nigerian state-owned NNPC has a tanker subsidiary with a tanker fleet consisting of tankers of between 80,000 and 200,000 tonnes each. Tankers call at Bonny and Escravos crude oil export terminals to collect crude oil for Nigeria's customers in the United States, Western Europe, South America and Africa. About 95 percent of crude oil produced in Nigeria is exported.

Pipelines are extensively used for local transportation and distribution of oil and gas. For example, Gulf Oil Company use underwater pipelines to transport crude oil from offshore Okan oilfield to storage tanks before it is shipped. Often, oil spills result from pipeline rupture. In the United States, pipelines contribute substantially to pollution of the United States Continental Shelf (see Table 3.2). In Bendel State of Nigeria, a major oil pollution resulting from pipeline leaks was reported at Abari. According to a Shell-BP official, "the spillage started from old underground pipelines" (Daily Times, 24 March, 1980, p. 1).

Motor tankers and railroad tankers are important means of distribution of oil to local customers. Oil discharges from these sources are mainly due to accidents.

In summation, oil pollution in Nigeria can result from petroleum resources development activities, including drilling, production, refinery and transportation. Of all the oil development activities, offshore drilling and production has provoked major concern in Nigeria because of well blowouts which usually result in substantial oil spills. Since oil spills may be accidental, as in the case of well blowout and shipwrecks, or intentional, for example, tank cleaning, the Nigerian Government should address the pollution problems according to circumstances under which they occur. To control deliberate oil discharges, for example, the government can establish preventive regulation, prohibition and apply sanctions against offenders. The probability of accidental oil discharges can be reduced by instituting effective operating procedure. On the other hand, oil pollution resulting from a normal routine operation may be checked by setting a performance standard measured by the quantity of oil discharged by the operator.

5.9 Dealing with Oil Spills

Technology is now on hand to contain and treat oil spill in the sea and control waters. The operator can use chemical or mechanical techniques.

1. Chemical treatment involves the use of dispersant chemicals to reduce the oil to small droplets in the upper water layer. This process helps to speed up decomposition of droplets by bacteria (Quinlan, 1980).

There are presently improved types of dispersant chemicals less

toxic than the ones used hitherto. The improved dispersant chemicals clean the water surface and thus cause little or no harm to seabirds. The cleanup operation is also enhanced by spraying dispersants from the air.

2. Mechanical treatment of an oil spill involves the use of a floating barrier to contain the oil and increase the thickness of the oil slick. This technique accelerates recovery of the oil from the water layer. Booms are laid in a defence line to check the movement of the oil. Once the oil is contained it can be removed by applying a number of techniques.

In the case of major spills there are samples of equipment, like Oil Recovery International's 'Force 7' which are claimed to be effective for removal of oil. With 'Force 7' equipment floating oil is absorbed on the net of polypropylene fibres trailed behind a vessel; the net is wound aboard and the oil squeezed out by rollers.

Springsweep (Fig. 5.4) consists of a rigid boom harnessed to the side of the collection vessel and a floating 'Trail boom' through which oil is pumped into the ship's tank. Springsweep equipment recovers oil at the rate of 40 tonnes per hour depending on the viscosity. A major disadvantage in the use of this type of equipment is that oil is picked up with some sea water and thus reduces the amount of oil recovered (Quinlan, 1980).

Spinning disc skimmers (Fig. 5.5) consists of a spinning steel or plastic disc which holds the oil on their surfaces. Once the oil adheres to the disc it can readily be wiped out and collected. It is claimed that the equipment is 95 percent efficient. It is usually operated some distance from the source of the spill to allow the oil to

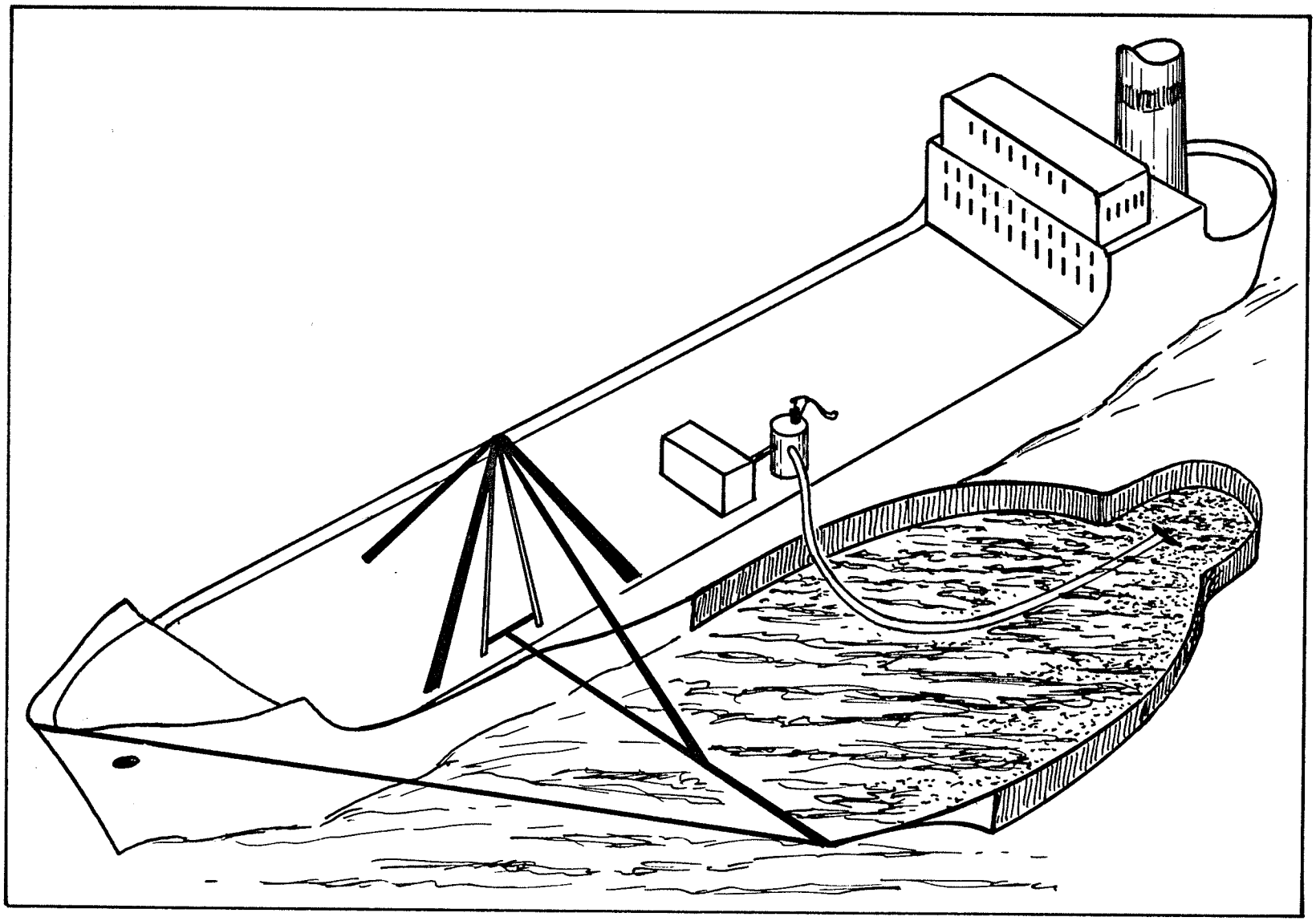

Figure 5.4 Springsweep Principle

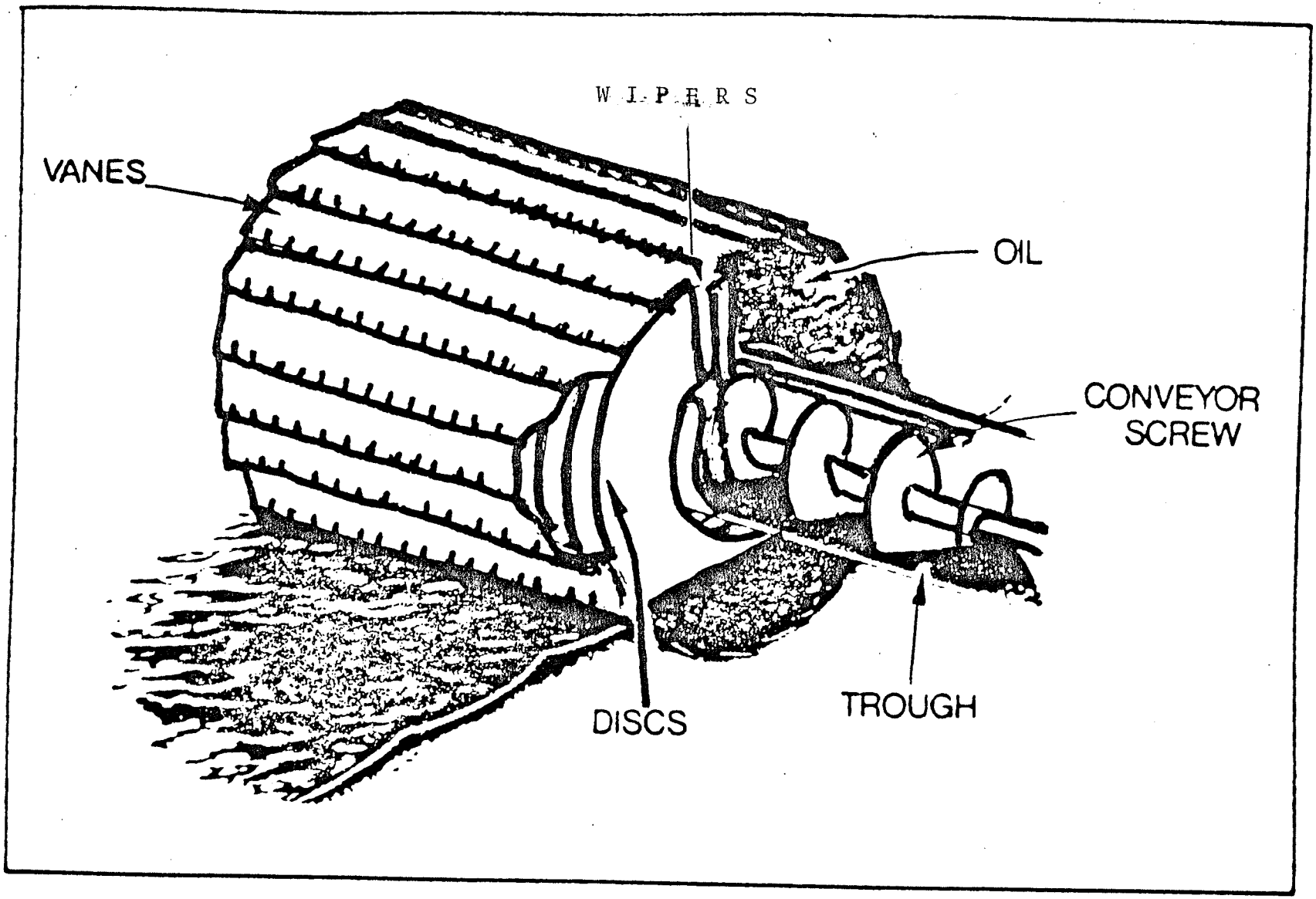

FIGURE 5.5 Spinning Disc Skimmers

form a thick emulsion by the time it gets to the skimmers.

Generally, the effectiveness of booms in containing the oil is reduced by wind and waves which drives it under or over the booms. Another disadvantage in using booms is that it creates a disposal problem. Oil picked up from the sea usually forms some form of emulsion with sea water and is therefore an unsuitable feedstock for refining. The oil will have to be disposed on land.

Since the Nigerian Continental Shelf, rivers and lakes are exposed to major oil spills due to large-scale petroleum resources development activities, the Nigerian Government should ensure that oil companies especially offshore operators in Nigeria keep specified amounts of equipment and supplies to be used in an emergency. Such equipment should be effectively used to contain and remove oil from the sea or any other water body.

Each operator should be required to submit an oil spill contingency plan. Since some major oil spills may not be handled by one company, it is recommended that oil companies form a mutual aid organization for the purpose of providing a joint capability to contain and clean up major oil spills. As noted in Chapter II the joint approach to oil pollution has been practiced successfully in the Gulf Area. Small companies which usually face high production costs will benefit from this type of arrangement.

Where oil companies fail to adopt a co-operative approach to the pollution problem the Federal Government may give subsidies to companies to enable them to provide equipment. The subsidies can take the form of reductions on profit taxes.

5.10 Comments

The general minimum drilling standards laid down in the Petroleum (Drilling and Production) Regulations bear some semblance of the national legislation and regulations examined in Chapter III. Like those regulations the Nigerian Petroleum Regulations are too general and abstract to constitute a deterrent to pollution occurrences. The drilling regulation seems to be based on the principle of--moral suasion--which involves an appeal to conscience allowing polluters to exercise their best judgement. The regulation seems to appeal to the operating companies to adopt safety measures. Thus, it fails to provide any form of operating procedure or sanctions in case of violation.

The most glaring weakness of the regulation is the failure to lay down operators' liability for damages or loss of income as a consequence of pollution resulting from oil spills.

Perhaps, the Nigerian Government's liberal attitude in the past to pollution issues was inevitable in view of the need to attract foreign companies to develop the Nigerian petroleum resources. Nigeria like other developing countries lacked investment capital, technology and skilled personnel which are prerequisites for petroleum development. To provide these essential ingredients, Nigeria needed the assistance of foreign oil companies. Consequently, the Nigerian Government did not wish to be too strict about the quality of the local environment. Another reason for overlooking the environmental aspect of the petroleum development in the regulations may be due to Nigeria's inexperience in petroleum industry and attendant problems.

Foreign oil majors have through years of experience accumulated necessary skilled personnel, technology, as well as large amounts of

capital. In addition, the oil majors control distribution and marketing outlets. Consequently, the role of the producing countries are limited to royalty and tax collecting, a role which as years pass by, the Nigerian Government strives to reverse through compulsory and effective participation.

5.11 Conclusions

The Nigerian Petroleum Legislation does not adequately address the socio-economic and environmental problems that are associated with the oil industry. The oil industry has provided an enormous wealth to Nigeria but underlying this wealth are environmental pollution and other associated socio-economic problems.

The laws and regulations governing the oil industrial activities do not make any provision with respect to compensation of victims of oil pollution.

The oil industry did not create any appreciable direct employment opportunities nor made any direct significant contribution to the development of human resources in Nigeria.

The failure of the industry to adequately fulfill some of the many expectations of Nigerians may be partly due to the laws and regulations governing the industry and in part due to the nature of the industry itself. The Federal Government, the State Governments and the oil companies operating in Nigeria should work together to ameliorate some of the problems associated with the oil industry.

CHAPTER VI

NATURAL GAS EXPLOITATION IN NIGERIA

Natural gas exploitation in Nigeria does not stand as a separate industry from other hydrocarbon resources. The activities of the Nigerian petroleum industry for the management of oil and gas are in close union, not only because the nation's legal framework specifies federal control of all hydrocarbon resources through the NNPC, but also because natural gas is in most cases discovered in association with oil deposits. Presently, gas production is based on the incidental discovery of gas dissolved under pressure in an oil accumulation. An average of 21.2 m^3 of natural gas is produced per barrel of crude oil. Natural gas is produced presently at the rate of about 57 million m^3 per day. The annual gas production since 1958 is presented in Table 6.1. There are large deposits of natural gas unassociated with crude oil but these reserves are not exploited.

6.1 Legal Framework for the Nigerian Natural Gas

The aspect of the Petroleum (Drilling and Production) Regulations that specifically deals with the natural gas exploitation is the provision requiring all the oil producing companies to submit programmes indicating how the natural gas produced in their concessions will be utilized. The purpose of this provision is to enhance gas conservation.

6.2 Problems in Developing Natural Gas as a Usable Resource

The development of Nigerian natural gas as a usable resource is

TABLE 6.1

NATURAL GAS PRODUCTION IN NIGERIA,
1958-78

Year	Gas Production (Million Cubic Metres)	Percentage Change
1958	45.560	—
1959	139.834	+ 207
1960	144.260	+ 3
1961	309.834	+ 115
1962	486.483	+ 57
1963	625.406	+ 29
1964	1028.836	+ 65
1965	2406.026	+ 134
1966	2935.947	+ 22
1967	2668.127	- 9
1968	1413.228	- 47
1969	4125.524	+ 192
1970	8037.048	+ 95
1971	12796.325	+ 59
1972	16796.193	+ 31
1973	19831.504	+ 18
1974	20624.234	+ 4
1975	18436.672	- 11
1976	20831.428	+ 13
1977	20322.946	- 2
1978	15756.373	- 22

Sources: Annual Report Ministry of Mines and Power, Lagos: AAPG Bulletins; Egbogah, et al. (1980). 'Possible New Oil Potential of the Niger Delta,' Oil and Gas Journal, April 14, p. 142.

inhibited by the lack of sufficient demand for the gas and problems associated with transportation.

Since 1963, natural gas has been supplied for commercial and industrial use. The main consumers include the Electricity Corporation of Nigeria (now National Electric Power Authorities [NEPA]), the Trans-Amadi Industrial Area at Port Harcourt (including the Michelin Tyre Factory, the Glass Bottle Factory and the Alcan Aluminium Rolling Mill) and industries at Aba (including Aba Textile Mill, Star Brewery, Lever Brothers and associated industries) and the Ughelli Glass Factory. All these industries are located close to the oilfields for the effective utilization of natural gas. The industries at Aba and Port Harcourt receive their gas supplies from the Imo River oilfield while NEPA Power Stations at Ughelli and Afam are connected to Ughelli and Afam oilfields respectively. Due to the lack of export markets and insufficient demand for gas in Nigeria most of the gas produced in the course of oil exploitation is flared. In 1977, for example, out of 1.7 billion m^3 of gas produced in the month of February, only 46.5 million m^3 was utilized; 15.7 million m^3 was used by the petroleum industry for energy purposes and 30.8 million m^3 was sold (Ministry of Petroleum and Resources, 1977). Out of the current production of 57 million m^3 per day only 10 percent is utilized; 90 percent is burned off (Akpe, 1980).

Oil companies operating in Nigeria are reluctant to undertake investment in equipment for gas collection. From the industry's viewpoint, investment in gas collection is expensive, and at the present level of demand oil companies are not optimistic about return on their investment.

A second major factor restraining the development of natural gas

is lack of transportation facilities. An efficient distribution of natural gas could be accomplished only by the use of pipelines which are usually costly to provide. Economically, it is not feasible to invest in gas supply lines if the market is not large enough to guarantee a reasonable return to investment.

Due to lack of transportation facilities and geographical location of Nigeria in relation to the major gas consuming countries, export of Nigerian gas has not been developed. All the prospective export markets (U.S.A., Western European countries) are not close enough to be supplied by pipelines. The transportation difficulties place Nigeria in a disadvantageous position vis-à-vis other gas producing countries like the USSR, Canada, Mexico and Algeria. All these countries have competitive advantages over Nigeria, in terms of their nearness to the major gas consuming countries. Canada, for example, supplies gas to the United States by pipelines; the USSR finds it more convenient to supply gas by pipeline through Austria to other Western European customers. The only feasible means of supplying Nigerian gas to the overseas market is by liquefaction and shipment. Until arrangements to export the gas are completed it would seem that the oil companies would continue to flare a large proportion of the gas which they produced. Natural gas is burnt at the flow stations, ranging from seven to nine metres high. Though this practice may seem inevitable, the socio-economic and environmental impacts are significant enough to justify some major policy actions to explore alternative uses for the gas.

6.3 Prospects for Natural Gas Utilization

The limited demand for the natural gas does not indicate that

natural gas development in Nigeria is doomed for ever. On the contrary, the prospects for future development are excellent. Several projects which will require natural gas for energy purposes and as a raw material have been proposed. These projects and their future natural gas requirements are presented in Table 6.2.

Expansion of the market for natural gas in the future depends to a great degree upon the successful implementation of the plans associated with these projects. It can be seen that the Liquefied Natural Gas (LNG) Project will supply the largest local market for the gas, followed by the National Electric Power Authorities (NEPA).

6.3.1 Liquefied Natural Gas (LNG) Project

The Nigerian public has expressed concern about the gas being wasted because this practice leads to a waste of resources and damage to the environment. The petroleum regulations deal with gas conservation, but fails to be specific about the socio-economic and environmental aspects of the problem. However, in response to the provision of the regulations requiring companies to find alternative uses for the gas, the Shell-BP initiated a study in 1969 for an LNG project that would utilize the gas discovered in the company's concessions.

Other oil companies, including Gulf, Agip/Phillips, proposed similar LNG projects. The Federal Government supported the companies proposal to establish LNG plants but preferred a single project to multi projects. Thus, all the projects proposed by the oil companies were merged into one big project under the Bonny LNG Limited. The Bonny LNG Limited will utilize 100 percent of the gas collected by each of these companies.

Participation in the Project is as follows:

Nigerian Government	60.0%
Shell-BP	10.0%
Phillips	7.5%
Agip	7.5%
Elf	5.0%

The Project will cost about 10000 million in U.S. dollars. The production capacity of the proposed plant is estimated to reach 16670 million m^3 per year (Quinlan, 1981).

The prospective markets for the plant's output are the United States and Western Europe. Eight Western European gas companies (including Ruhrgas, Brigitta, Thyssengas, Gas de France, Snam, Distrigaz, Gasunie and Enagas) had signed an agreement with the NNPC to purchase 50 percent of the plant's output. Similar agreement is expected to be worked out between the NNPC and the United States gas companies as soon as the companies get the United States Government's permit.

Meanwhile, it appears that the LNG Project is moving at a slower pace than was originally anticipated because the Federal Government failed to allocate a fund for the project under the government's Fourth National Development Plan for the period 1981-85. The Federal Government has major shareholdings in the project and its associated pipelines and shipping facilities. This implies that the Federal Government will bear the greater part of the cost of the project which in its view would constitute a drain on government funds. However, a total of 561 million in U.S. dollars was allocated to prepare the site for the plant, and to start construction work by the end of the plan period. The failure to allocate enough funds to enable the project to start will probably delay gas export beyond the plan period.

TABLE 6.2

ESTIMATED AVERAGE DAILY
NATURAL GAS REQUIREMENT

Project	Natural Gas Requirement (in Million cubic metres)	Percent of Total
Liquefied Natural Gas (LNG)	56.63	66
NEPA Sapele Power Station	5.10	6
Ajaokuta Steel Complex	3.40	5
Aladja Steel Plant	3.96	5
Proposed NEPA Lagos Power Station (With Provision for Industrial Consumers)	11.33	13
Abuja (Federal Capital Territory Projected Need)	2.83	3
One Nitrogenous Fertilizer Plant	1.84	2
	85.09	100

Adapted from: Akpe, S. M. (1980) 'Natural Gas Exploitation in Nigeria,' The Nigeria Trade Journal Volume 27 No. 1.

6.3.2 Alternative Uses

1. Petrochemical Industries

Natural gas can be gainfully used in the development of a national petrochemical industry involving the manufacture of chemicals from petroleum derivatives using natural gas as raw material. Petrochemical has become a major industry in countries like the United States and Canada which have large reserves of hydrocarbons (Nova An Alberta Corporation, 1980). Theoretically, almost any organic chemical can be produced from any portion of crude petroleum or natural gas, subject,

however, to costs of processing, technical capabilities and availability of various hydrocarbon components (Purdy, 1958).

The Nigerian Federal Government is still exploring the possibility of establishing a chemical complex that will produce polyvinc$_y$l chloride for manufacture of plastic shoes, raincoats, etc.; polyethylene for manufacture of plastic packaging materials; and caustic soda for soap making.

A polypropylene plant is under construction near Warri refinery. The capacity of the plant is estimated at 35000 tonnes per year of plastic. Propylene, which is the main feedstock for the plant, will be supplied from the refinery.

2. Nitrogenous Fertilizer Plant

Nitrogenous fertilizer plant utilizes natural gas as a raw material. There is great need for this type of project in Nigeria in view of the growing demand for fertilizer for agricultural purposes. For example, the consumption of nitrogenous fertilizers in Nigeria increased from 2721 tonnes in 1963 to 26303 tonnes in 1967. Present levels of demand for fertilizers may have increased as a result of direct government assistance to farmers, in the form of financial aid, fertilizers, provision of storage equipment and others.

Pullman-Kellogg was awarded a contract to construct a fertilizer plant that will use natural gas to manufacture ammonia-based fertilizers. The plant will be capable of producing 1000 tonnes per day of ammonia, 1500 tonnes per day of urea and other products.

3. Iron and Steel Industry

Natural gas will be required for the proposed Ajaokuta Steel Complex and Aladja Steel Plant at the rate of 3.40 million m^3 and 3.96

million, respectively.

6.4 Natural Gas Pricing

Natural gas sales in Nigeria are subject to a single price system. Under this arrangement the NNPC acts as the middleman between the oil companies and the gas consumers. The NNPC buys the natural gas from the producers and delivers to the consumers by pipelines. The field price for natural gas is set by the government. In effect from January 1, 1978 the field price for gas is 20.1 Kobo (40¢ in U.S. currency) per MCF[1] though the price is allowed to rise annually. Consumers obtain their supplies of gas at the uniform price but subject to differences in the cost of transportation. However, this arrangement does not include bottled gas supplied from refineries to individual households.

At the present price, the natural gas has a competitive cost advantage over other energy sources. In 1963-64, for example, the Shell-BP supplied the Afam power plant with natural gas at a price of 15 pence (or 30 K) per 28 m^3. With a gas operated power plant energy costs per kilowatt hour (Kwh) of generated electricity amounted to 0.30 pence (or 0.60 K); in the same year energy costs in a coal operated power plant at Oji River amounted to 0.61 pence (or 1.22 K) per Kwh and 0.59 pence (or 1.18 K) per Kwh in Ijora Power Station in Lagos (Electricity Corporation of Nigeria, 1964)

The low price set up in 1978 enabled industries and utilities to purchase gas at almost the same price as in 1973-74. Industries and utilities should therefore convert to gas for energy purposes so as to

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[1] 1 MCF = 1000 cubic feet.

take advantage of the low price. In this way the local market for natural gas will expand and gas flaring will be minimized.

Although the low price may discourage operating companies from investing in equipment for gas collection, the Federal Government takes into account the investment cost and problems involved in operating in a difficult environment like the Niger Delta. Thus, in 1978, the government brought the royalty rates for gas in line with those for crude oil. The old and new royalty rates for natural gas are presented in Tables 6.3 and 6.4. Royalty rates are lower for oil companies operating in the offshore areas which are generally considered to be a more difficult environment than the mainland for crude oil and gas exploitation.

TABLE 6.3

NATURAL GAS ROYALTY RATE
(ON SALES PRICE)

Area	Rate
Onshore	0.0167/MSCF
Offshore - Inner Zone (up to 10 miles)	8% (On Sales Price)
Offshore - Outer Zone (more than 10 miles)	6.4% (On Sales Price)

Source: Akpe, S. M. (1980) 'Natural Gas Exploitation in Nigeria,' The Nigeria Trade Journal Volume 27 No. 1.

TABLE 6.4

NATURAL GAS ROYALTY RATE

Area	Royalty Rate
Onshore	20%
Offshore up to 100 M Water Depth	18½%
Offshore beyond 100 M Water Depth	16 2/3%

Source: Akpe, S. M. (1980) 'Natural Gas Exploitation in Nigeria,' The Nigeria Trade Journal Volume 27 No. 1, p. 18.

The royalty at the new rate is based on income from gas operations.

6.5 Nigeria's Natural Gas Reserves

Three types of natural gas are discovered in Nigeria--unassociated gas, dome or gas-cap gas and oil gas or solution gas.

Unassociation gas or free gas occurs without being in association with crude oil. Dome or gas-cap gas occurs in the gaseous form on top of an oil accumulation. The third type of gas referred to as oil gas or solution gas is dissolved under pressure in an oil accumulation. Due to a fall in pressure, oil gas is released from oil when brought up to the surface.

Oil gas is at present the only type of gas being produced, and therefore being flared by oil companies. This type of gas constitutes about 20 percent of Nigeria's total proven reserves of natural gas estimated at 75 trillion cubic feet (about 2.124 trillion cubic metres). The above figure is equivalent to about 17 billion barrels of crude oil

reserves (Akpe, 1980). Compared with Nigeria's crude oil proven reserves estimated at 20,000 million barrels it would seem obvious that Nigeria will call on natural gas when crude oil reserves have been exhausted.

Natural gas has the potential to become a major source of revenue to the government and a reliable source of energy for industrial, commercial and home use. In addition, natural gas gives impetus to the development of petrochemical and steel industries. There is therefore great need for efficient and good management of this resource.

6.6 Environmental Impacts of Natural Gas Exploitation

Gas flares and gas processing plants are known sources of air pollution. The nature of the environmental damage from these sources depends upon the quality of the gas. The most serious air pollution problem associated with gas processing plants is the sulphur dioxide emission. Usually, gas processing plants remove hydrogen sulphide from gas before it is supplied to the consumer. Hydrogen sulphide is an unwanted product which can either be converted to sulphur or, in the case of a small plant, flared into the atmosphere, becoming sulphur dioxide. In Alberta, for instance, the gas processing plants account for about 884 tonnes per day, or 68% of sulphur dioxide emission in the province (Kennedy, 1979).

Sulphur dioxide released in high concentrations from sources including sour gas flares and gas plant incinerators can cause an unpleasant odour, damage to vegetation, corrosion of metals, building materials and fabrics and intensifies respiratory illness.

Gas producing areas in Nigeria may not be exposed to most of

the problems associated with sulphur dioxide emissions because the Nigerian natural gas presently produced in association with oil is sulphur free.

The chemical analysis of oilfield gases from nine oilfields is shown in Table 6.5. The methane content of the gases is about 90 percent. Other components of the gases are mostly heavy hydrocarbons including ethane and propane. The nitrogen and carbon dioxide content of the gases is very low and so do not reduce the heating value of the gases. The heating values of all the oilfield gases are not below 950 British Thermal Units (BTU) per cubic feet.

Although Nigerian natural gas is of high quality in comparison with Alberta gas, a study done by Isichei, et al. (1976) shows that high concentrations of gas flares may cause serious environmental damage. Isichei, et al. (1976) observe that:

1) Air soil and leaf temperatures increased and relative humidity of the air decreased within 110 m. of six flare sites near Port Harcourt.
2) Leaf chlorophyll content and internode length of some plant species which were close to the flares decreased.
3) The flares led to creation of bare areas as large as 30 to 40 metres in radius around the flare stacks. Between a distance of 80 to 100 metres from the stacks, the species composition of the vegetation was affected by the flares.
4) Close to the flares, the total number of species decreased while the proportion of C_4 and competing plants increased.[1]

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[1] C_4 plants are those which tend to have a high temperature optimum for photosynthesis without an unduly high respiration rate.

TABLE 6.5

CHEMICAL ANALYSES OF OILFIELD GASES FROM SELECTED OILFIELDS

	Afam %	Bomu %	Ebubu %	Imo River %	Korokoru %	Aparu %	Umuechem %	Obigbo %	Ughelli %
Nitrogen	0.2	—	—	—	—	0.3	0.5	—	—
Carbon dioxide	1.7	3.4	1.0	1.5	1.7	1.3	1.1	1.1	2.1
Methane	81.0	89.8	81.5	86.5	82.7	84.9	79.6	97.0	88.1
Ethane	6.5	3.4	9.9	5.6	6.2	8.5	7.6	1.5	6.3
Propane	5.9	0.6	4.7	3.1	6.3	3.6	5.2	0.1	1.8
Iso-butane	1.3	0.7	0.9	1.0	1.2	0.6	1.1	—	0.3
Butane	2.0	0.2	1.2	1.0	1.8	0.8	1.6	—	0.3
Pentane	1.4	1.9	0.8	1.3	0.1	—	3.3	0.3	1.1
	100	100	100	100	100	100	100	100	100
Specific Gravity	0.732	0.650	0.705	0.680	0.708	0.665	0.715	0.575	0.650
Pressure in Psig	175+30	175	175	175	50	175+30	175+30	175	300+46

Sources: Schatzl, L. H. (1969) Petroleum in Nigeria Oxford University Press Ibadan, p. 41; Canadian Industrial Gas Ltd. (1964) Utilization of Natural Gas in the Nigerian Economy Part II Section p. 12, External Aid Office, Government of Canada, Calgary, Alberta.

From the results of the Isichei, et al. study it may seem that the ecological effects of the gas flares are confined to areas close to the flares and therefore limited in scope. However, the effects of the gas flares could assume a wider dimension in future than has been the case at present. If nothing is done to stop flaring the gas produced in association with oil, more areas would probably be affected by the flares when more crude oil deposits in the Niger Delta or elsewhere are exploited.

The impact of waste gas flares on the economy of the oil producing areas could be significant. Although the extent of damage to crops is not known yet the effects of flares on crop yields can be substantial. The Niger Delta is not particularly a food producing area though small-scale farming is going on in some parts of the region.

Since natural gas presently produced and flared is sulphur free the potential health hazard usually caused by sulphur dioxide emissions from gas flares may be quite negligible. Perhaps, when all the projects mentioned earlier start operation they will supply a ready market for the natural gas, and there will be no major reason for the oil companies to burn off the gas. The environmental air pollution from this source will be nearly eliminated.

In all cases of air pollution the most appropriate policy option open to the government is to set an ambient air quality standard usually enforced by a government agency.

A major threat to the environment seems to be the extensive network of pipelines which will be required to deliver gas to the plants utilizing natural gas for energy purposes or as a major raw material. The new projects are spatially dispersed and are quite a

distance from the oilfields. To achieve an effective distribution of gas from the oilfields to the consuming centres, there must be some extension of the present gas lines and addition of new lines. Although pipelines are a reliable means of transporting gas especially through the swampy and forested areas like the Niger Delta, there are potential environmental problems associated with the gas lines.

First, pipelines in some cases run across farmlands and thus take up a part of the land set aside for agriculture.

Second, pipelines run through forest and wilderness areas and thereby disturb wildlife and reduce the esthetic value of the wilderness. The oil producing areas in Nigeria are not a known habitat for wildlife. The pipelines extending from the oilfields to the oil refinery at Kaduna are a threat to the wildlife habitat in Northern Nigeria.

The potential for environmental pollution resulting from pipeline leaks is more in oil pipelines than in gas pipelines because the crude oil contains some sulphur. It is noted that sulphur dioxide causes corrosion of metals and so accounts for most pipeline leaks.

Because of actual and potential environmental damage associated with pipeline systems, the government should require the oil companies to undertake an impact assessment study before constructing gas lines. Gas pipelines should be checked by the owners to ensure that leaks are detected and stopped.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

The Nigerian oil industry is the leading sector of the economy providing the Nigerian Government enormous revenues and foreign exchange earnings which have enabled Nigeria to implement its National Development Plans without much dependence upon foreign assistance. The oil industry presently contributes 80 percent of total government revenues and 90 percent of total foreign exchange earnings. Since the oil industry requires less labour and more capital for expansion of activities, it has contributed little in creating direct employment opportunities and in the development of human resources in Nigeria. In sum, the oil industry's major contributions are reflected in the increased revenues accrued to the government and improvement in Nigeria's foreign exchange earnings.

However, underlying the enormous oil wealth are socio-economic and environmental problems that characterize the Nigerian oil boom. Since the oil boom agriculture which was once the leading sector of the Nigerian economy has declined. A major factor which has contributed to the decline in agriculture is the oil which gave the impetus to rural migration to the cities. Consequently, the oil boom resulted in a shift of labour from agriculture to construction, commerce and trade. Nigeria's agricultural exports have declined. Furthermore, the local food supply to about 80 million Nigerians has dropped to the extent that Nigeria has to import food, including commodities such as palm oil

and rice which were once among the export commodities. The Federal Government has given priority attention to agriculture by providing direct financial assistance to farmers and undertaking several projects including irrigation and plantation. Future improvements in agriculture will ultimately depend upon the success of the government programmes in this sector.

Oil pollution which is a spill-over effect of petroleum resources development is the focus of this study, though it is a subject that has not really caught the attention of most studies on the Nigerian oil industry. Major oil spills in Nigeria result from drilling and production as exemplified by the Funiwa-5 Oil Spill 1981. Other potential causes of pollution include oil and gas pipeline ruptures, tanker wrecks, railroad tanks derailment, motor tank collisions. Natural gas flares contribute to the pollution of the environment. The gas flares damage the vegetation and physical environment around the gas flare stacks. Nigeria has no anti-pollution laws and therefore no comprehensive environmental protection programme. The Funiwa-5 Oil Spill and associated problems have highlighted the need for an anti-pollution programme in Nigeria.

Oil pollution is a problem that has not been adequately addressed by legislation at international, regional and national levels. Several international conventions were concluded under the auspices of the United Nations. The Convention for the Pollution of the Sea by Oil established in 1954 prohibits the discharge of oil into the sea. The High Sea Convention, 1958 and the Continental Shelf Convention, 1958 were directed against oil pollution resulting from the exploration and exploitation of the offshore resources. Each of these Conventions

requires state party to the agreements to draw up regulations to prevent pollution of the marine and coastal environment. Regional agreements such as those signed by the North Sea States and the Gulf States, respectively, are designed to protect regional waters from pollution. A regional approach to the pollution problem is still on a formative stage. A major weakness of international conventions is that they do not provide any special enforcement procedures. The conventions are too broad that they do not constitute a deterrent to polluters. However, international and regional regimes have provided inducement to States to enact legislation governing oil exploration, production and transportation.

An overview of legal frameworks governing the oil industrial operations in the United States, the United Kingdom, Norway, Malaysia, Ghana and Nigeria shows that the general approach to the oil pollution problem resulting from the operations consists of direct regulatory policies embracing a set of rules which if observed may lead to the achievement of environmental quality objectives. Thus, regulations are an outcome of legislative processes or are set by a government commission. The United States has anti-pollution laws and regulations at both federal and state levels. The United States Courts have provided useful legal instruments for settling pollution cases. However, the long drawn-out, and sometimes inconclusive, litigations following major oil spills have led to the establishment of a Superfund to ensure that the third parties are promptly compensated for damages and loss of income.

The incorporation of lease operator's liability for oil spill pollution damage and cleanup costs in the United States and the United

Kingdom conforms with the principle "polluter pay".

The legal framework governing the oil industrial activities in Nigeria does not include operator's liability to the third party injured by pollution. Furthermore, the legal framework is not specific about the nature of penalty for violation of drilling and production regulations. The implication of this is that Nigeria was unable to deal effectively with oil spills that occurred in the country. Furthermore, there is no provision for oil pollution liability and compensations. As a consequence, the injured parties did not know whom to approach--government or oil company for redress.

This could have not been the case if Nigeria had incorporated into the petroleum legislation oil operator's liability and compensation for damages resulting from oil spills. The haphazard manner in which the Nigerian Government and the Texaco Oil Company handled the economic, social and environmental problems created by the Funiwa-5 Oil Spill in Rivers State reflected a complete absence of environmental plans for dealing with side effects of petroleum resources development. In the absence of plans for emergency cases such as oil spills, there would always be confusion between parties who might be required to render services.

Economists have argued that the use of direct regulatory policies to control pollution does not lead to a least-cost pollution control. Thus, economists have promoted market-oriented policies: effluent charge (or tax on pollution), effluent rights and subsidies as alternate to direct regulatory approach. An effluent charge is a price imposed by a government to be paid for every unit of discharge of a particular pollutant into the environment. Effluent rights are

permits sold by a government to enable the buyer to discharge a particular pollutant at a specified rate for stipulated periods of time. On the other hand, subsidies are positive financial inducement to dischargers, to enable them to undertake some pollution control measures. Economists claim that market-oriented policies can lead to least-cost pollution and give sufficient incentive to polluters to cut back their effluent discharges.

Another policy option, though not market-oriented, is moral suasion (an appeal to conscience) effective for emergency, especially if there are no contingency plans.

Since oil pollution occurs under varying circumstances it is recommended that government approaches this problem with a mixture of environmental policy tools, including the traditional regulatory control approach and market-oriented tools.

7.2 Conclusions

The Nigerian oil industry has provided an enormous wealth to Nigeria but underlying this wealth are socio-economic and environmental problems.

The existing laws and regulations governing all the oil industrial activities have failed to address oil pollution and associated socio-economic problems.

Since all minerals and mining activities are under the Nigerian Federal Government's jurisdiction, it is the responsibility of this government to initiate remedial or preventive measures to ensure that spill-over effects of petroleum resources development are controlled. Nigeria cannot afford to repeat the mistakes made by the

industrialized countries in terms of giving a low priority to a clean environment. An environmental programme has to be included within the overall scale of national priorities.

Nigerian economic survival for the most part depends upon oil wealth. Thus, Nigeria should not trade economic growth for a clean environment but effort should be made to avoid environmental side effects of petroleum resources development. The ideals and values of the society are the determining factors for the level of environmental achievement and quality of life in Nigeria.

7.3 Recommendations

(1) The Nigerian Government should develop an environmental policy programme covering all aspects of the environment. This will necessitate establishment of a responsive and effective environmental organizational structure.

(2) Anti-pollution laws should be passed by the Federal Government to control pollution in all parts of Nigeria. This calls for the establishment of a single powerful agency with a regional office in each state. The Federal Government Agency will co-ordinate the activities of state agencies. Each state should have environmental agencies at state and municipal levels. A single purpose pollution control agency at the national level can deal more efficiently with state agencies than a multipurpose agency. Moreover, the public will find it easier to deal with one agency than a multipurpose agency.

(3) There should be a Contingency Plan for control of oil pollution and other incidents which may have adverse effects on the physical environment and people. The contingency plan may involve the

Environmental Agency, Police, Red Cross, Department of Fisheries, Transport, Communications, Emergency Relief Organization, oil companies and other agencies or departments that may be required to render some service in the emergency.

(4) The government should establish a Compensation Fund to be administered by the federal pollution control agency. The fund will be supported by a tax per barrel of oil at the well site. The fund will ensure that people are compensated for damages and loss of income without going through long and often inconclusive litigations.

(5) The government should impose strict liability for damages done to private and public property. The polluter should be responsible for the cost of cleanup.

(6) When necessary, operating companies may be required to carry out environmental impact assessment before embarking on drilling and production. Guidelines should be prepared by the federal pollution control agency.

(7) The operating companies may be asked to adopt a joint responsibility for pollution control. This will require dividing the area of operation into zones. The most experienced company will be the co-ordinating company in each zone. It is however up to the operating companies to organize a way to deal with oil pollution. The government should intervene if the company responsible fails to cleanup.

(8) Nigeria may need to co-operate with the neighbouring States of West Africa in areas such as monitoring and information on the state of the marine environment.

Regional co-operation in these areas is necessary since oil pollution can transcend jurisdictional boundaries. Though

some of the member states of the Economic Community of West African States (ECOWAS) are not oil-producing states, the community can provide a forum for regional co-operation on environmental matters.

The federal agency will provide the liaison between Nigeria and other parties to the arrangement.

Some of the recommendations made may provide the basis for legislation; others are designed to offer general guidelines.

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