

BASIC DESIGN STUDY REPORT
ON
TEMA OUTER FISHING HARBOUR REHABILITATION PROJECT
IN
THE REPUBLIC OF GHANA

JANUARY 1993

NIPPON TETRAPOD CO., LTD.

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BASIC DESIGN STUDY REPORT

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NIPPON TETRAPOD CO., LTD.

国際協力事業団

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PREFACE

In response to a request from the Government of the Republic of Ghana, the Government of Japan decided to conduct a Basic Design Study on the Tema Outer Fishing Harbour Rehabilitation Project, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Ghana a study team headed by Mr. Osamu Hashimoto, Deputy Director, Fishing Port Construction Division, Fishing Port Department, Fisheries Agency and constituted by members of Nippon Tetrapod Co. Ltd. from 22 August to 30 September 1992.

The team exchanged views with the officials concerned of the Government of Ghana and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Ghana in order to discuss a draft report and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Ghana for their close cooperation extended to the teams.

January, 1993



Kensuke Yanagiya
President

Japan International Cooperation Agency

January, 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

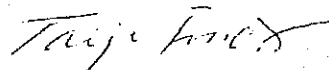
We are pleased to submit to you the basic design study report on the Tema Outer Fishing Harbour Rehabilitation Project in the Republic of Ghana.

This study has been made by Nippon Tetrapod Co., Ltd. (NTC), based on a contract with JICA, from 19th August, 1992 to 29th January, 1993. Throughout the study, we have taken into full consideration of the present situation in the Republic of Ghana, and have planned the most appropriate project in the scheme of Japan's grant aid.

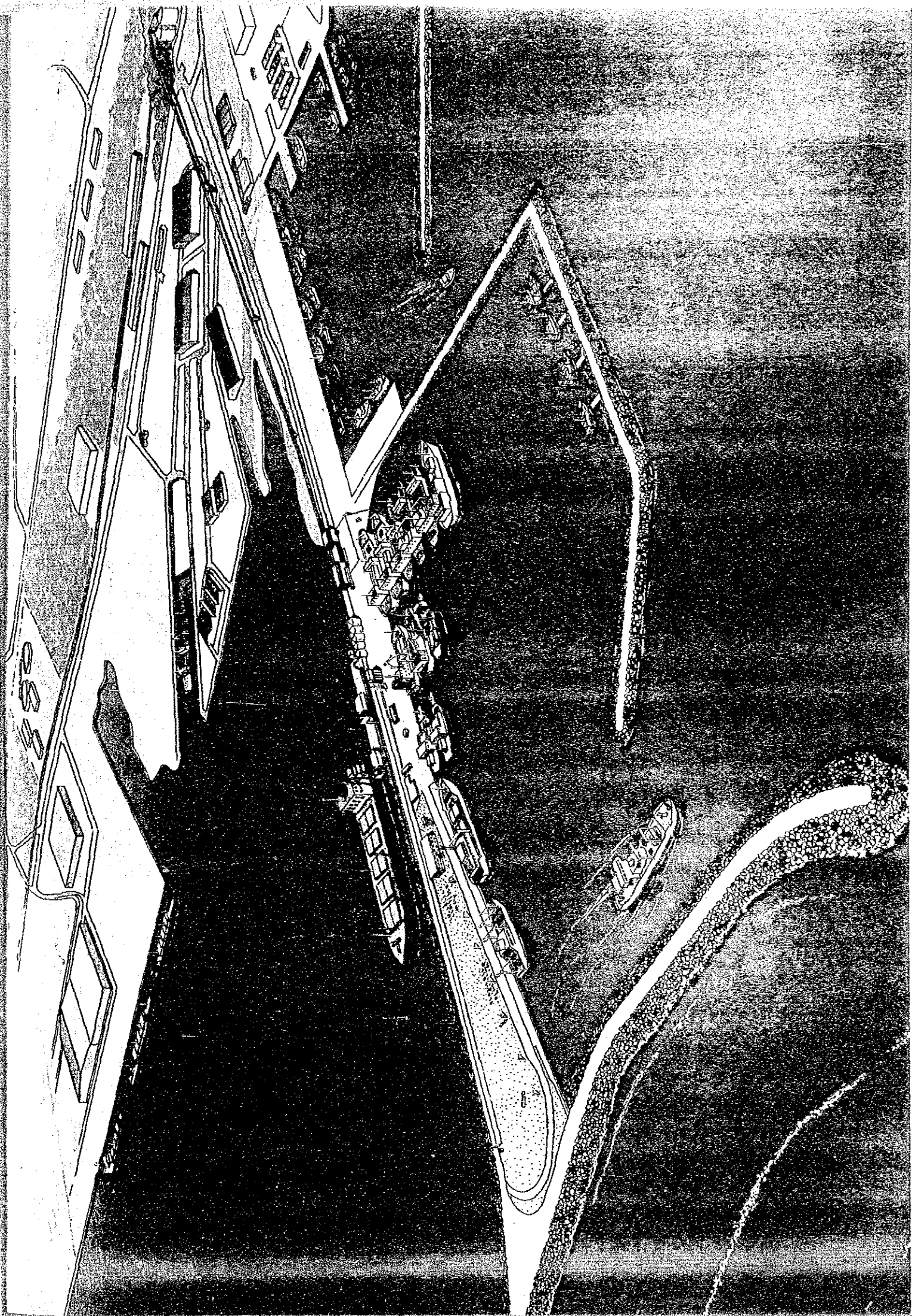
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, the Fisheries Agency and Embassy of the Republic of Ghana in Japan. We also wish to express our deep gratitude to the officials concerned of the Ministry of Finance, the Ministry of Transport and Communications, Ghana Ports and Harbours Authority, JICA Ghana Office and Embassy of Japan in the Republic of Ghana for their close cooperation and assistance during our study.

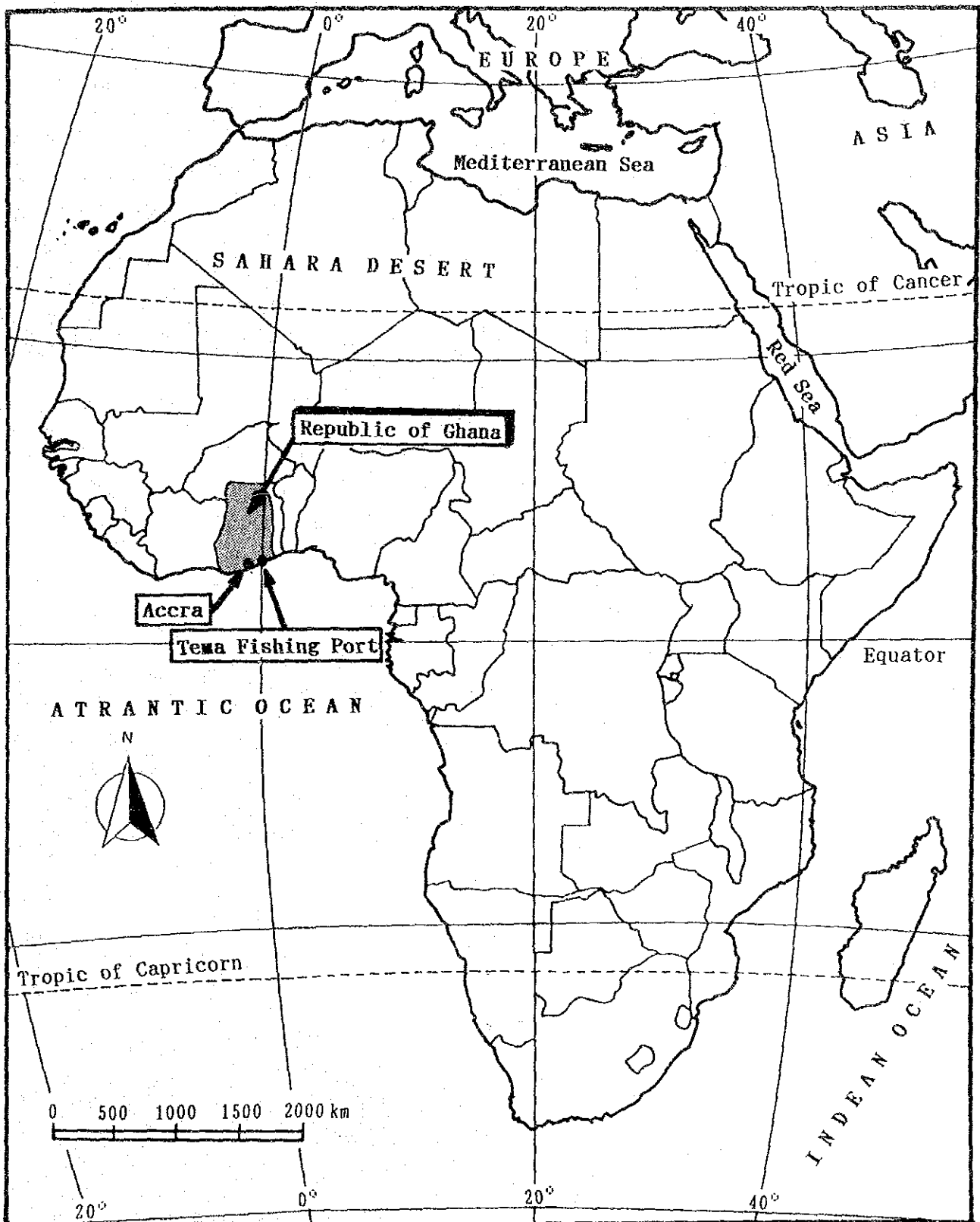
At last, we hope that this report will be effectively used for the promotion of the project.

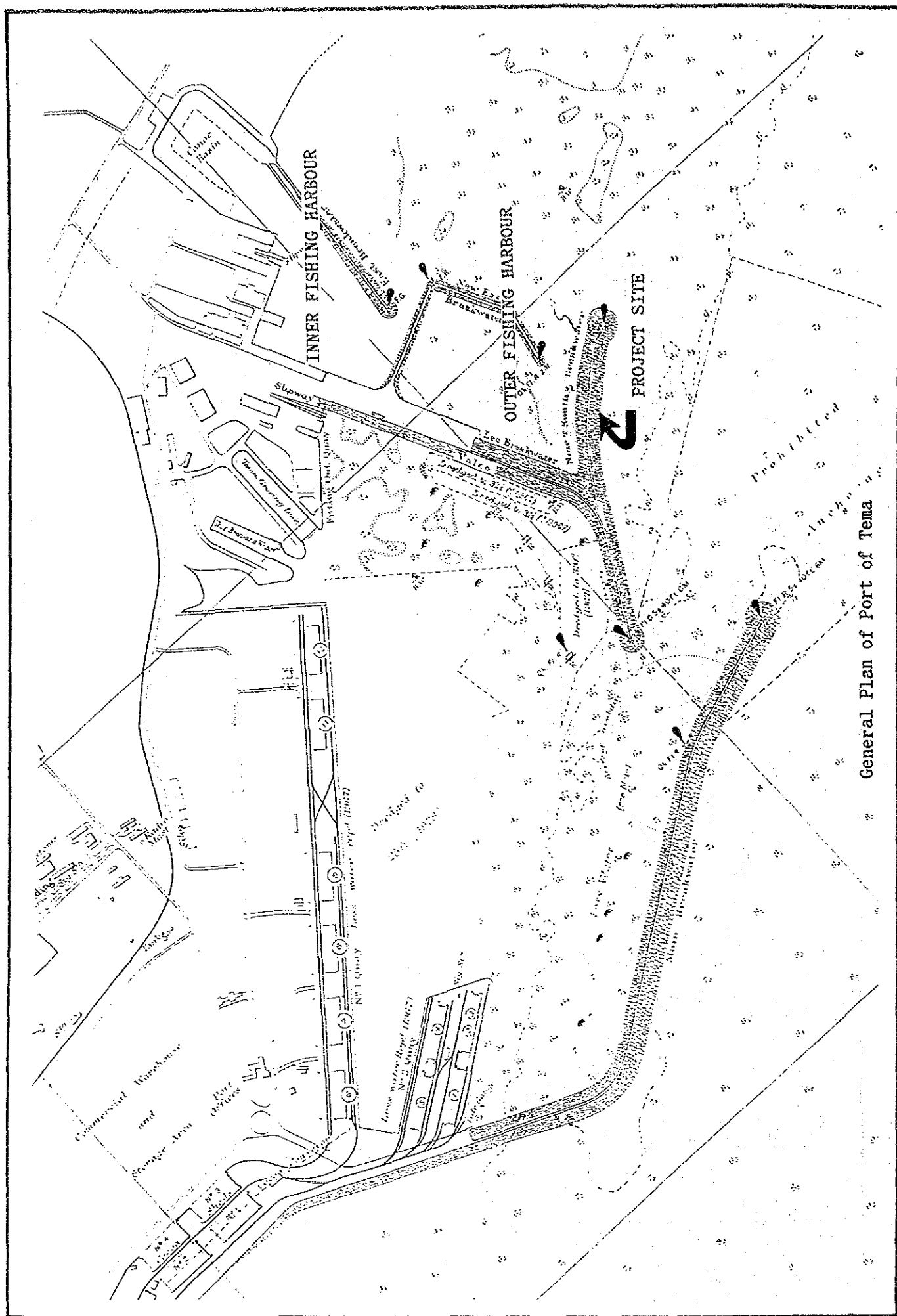
Very truly yours,



Taiji Endo
Consultant Leader
Nippon Tetrapod Co., Ltd.



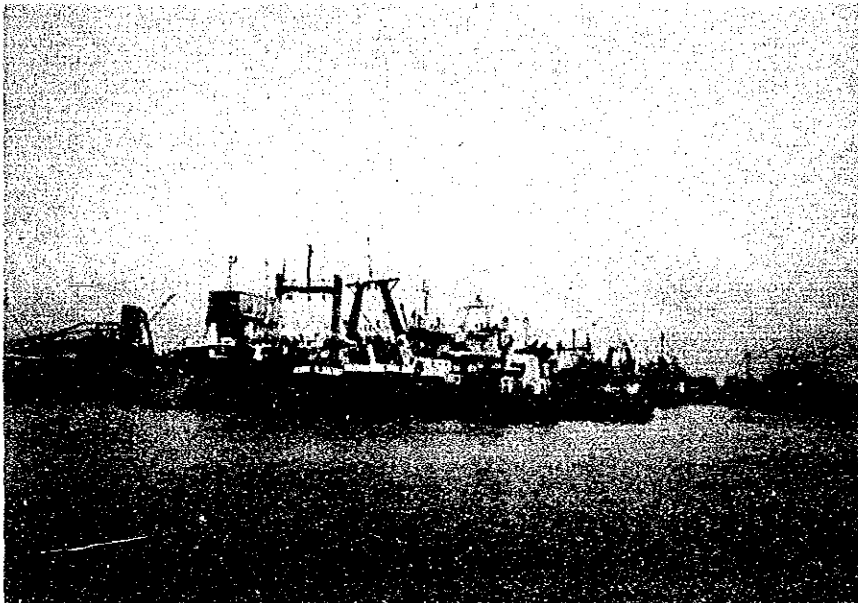




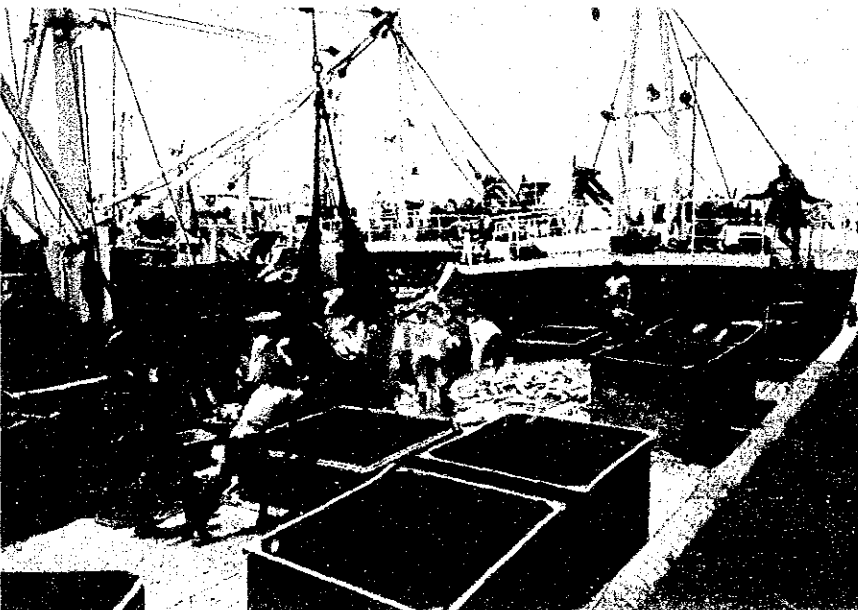
General Plan of Port of Tema



Project Site



Existing Wharf in
the Outer Fishing Harbour



Tuna-landing Work
on a deck of a fishing craft



N-S Wharf in
the Inner Fishing Harbour



Canoe Basin in
the Inner Fishing Harbour



Fish Market

SUMMARY

SUMMARY

The Republic of Ghana has a national land area of 238,537 km² and is located at latitude 5° and 11° N. and longitude 3° W. and 1°E. in the central western African region facing the Gulf of Guinea. The country has an estimated population of 1,340 thousand as of 1988.

The fishing industry successfully operates in much the same way as Senegal, producing about 300,000 tons annual catch. Ghanaian fisheries can be categorized into four sectors: Canoe fishing, Inshore fishing inside of the continental shelf, Deep Sea fishing using large freezer trawlers, and Tuna fishing operating purse seiners and pole-and-line vessels.

Artisanal canoe fishery is responsible for about 70 % of the total catch. Artisanal Fishing communities are scattered along a coastline of 560 km forming their own activity centers.

A total catch of 37,794 tons was landed in the tuna fishery sector in 1991. Tuna fishery plays an important role in supplying animal protein and earning foreign currency.

Active tuna fleets are based at Tema Fishing Harbour with the hinterland of Tema and Accra. Tema Fishing Harbour is comprised of two harbour areas: the Inner Fishing Harbour for inshore fishing fleets and the Outer Fishing Harbour for deep-sea-fishing trawlers. In 1990 the Inner Fishing Harbour was rehabilitated to improve efficiency of landing catches from inshore fishing vessels with assistance from the Government of Japan. The Outer Fishing Harbour are congested with fishing vessels due to the insufficient number of wharves and long idling. Poor security in the harbours results in pilferage of landed tuna. These circumstances resulted in moving Ghanaian fishing vessels to the Abidjan Port in the Ivory Coast to land fish for transshipment to the overseas country. This means a transfer of foreign currency to the Ivory Coast, and is a cause for concern for the Ghanaian Government in terms of lost opportunity of earning foreign currency and fishing firms spending money on additional steaming costs.

To overcome such problems, the Ghanaian Government commissioned a consultant to conduct a feasibility study on the fishing port requirements with

assistance from the World Bank. The study proposed promotion to establish a fishing base for tuna fishery at Tema Outer Fishing Harbour.

The Fisheries Law in 1991 makes it a matter of civil duty for fishing craft registered in Ghana to land catches in Ghana. Tuna fishing vessels with the Ghanaian flag have continued their operations accepting fishing-port services at the Tema Fishing Harbour, which plays a more important role as the base for the tuna fishing industry.

Under conditions of the serious congestion in the Fishing Harbour, however, existing landing wharves in the Inner and Outer Fishing Harbour can not accommodate all the fishing vessels including Ghanaian tuna fishing vessels. The shortage of landing wharves has resulted in unusual demurrage and deterioration in landing-tuna efficiency. To alleviate the congestion, the wharves in the Main Port served for the tuna fleet to land fish.

Countermeasures for the fishing vessels impede efficient management of the Main port and cause demurrage of tuna fishing vessels, to which low priority is given for berths in the Main Harbour.

The Government of the Republic of Ghana has made a request to the Government of Japan for a grant aid to rehabilitate the Outer Fishing Harbour to establish a tuna fishing base. This was proposed after the above feasibility study report with the World Bank assistance.

In response to the request by the Government of the Republic of Ghana, the Government of Japan decided to conduct a basic design study for the project and the Japan International Cooperation Agency (JICA) sent the study team to the Republic of Ghana for a period of 40 days from August 22nd to September 30th, 1992 to carry out a field study. In the study period, the study team collected and analyzed all data and information required, and held discussions with officials of the Government of the Republic of Ghana. The basic direction of the project has been settled as described in Minutes of Discussion signed on August 31st, 1992. The draft final report was presented and discussion meetings was held in the Republic of Ghana from November 17th to 30th, 1992.

The items requested by the Government of the Republic of Ghana are as follows:

- (1) Tuna Landing Wharf
- (2) Land Reclamation for Necessary Functional Facilities
- (3) Administration Building
- (4) Security Fencing with a Security-guard House
- (5) Unloading-tuna Service Equipment(Folklifts, Conveyer System)
- (6) Support Facilities
(Fuel and fresh water supply, Lighting, Sewage, Fire Fighting)

Based on the results of the field study and discussions with the officials of the Government of Republic of Ghana, the requested contents were fully examined and a basic design for the project has been conducted, following the policies as stated below.

- * A design of the face line of the wharf should be set out, with consideration for a safety area for ship maneuvering in the basin and a utilization plan for the reclaimed land.
- * Mobile cranes to directly improve landing efficiency should be proposed after examining the present fish landing activities.

An optimal basic design consisting of the following project components under a grant aid scheme has been worked out through modifications of the request as mentioned above.

- | | |
|------------------------------------|--------------------------------|
| * Tuna landing wharf | : 225 m |
| * Reclaimed land | : 19,950 m ² |
| * Administration building | : 1 unit (600 m ²) |
| * Security fencing | : 430 m |
| * Security-check house | : 2 units |
| * Unloading-tuna service equipment | : 3 mobile cranes |
| * Support facilities | |
| Water and fuel supply pipes | |
| Lighting | |
| Sewerage | |
| Fire fighting | |

The implementation of the project is divided into three phases.

(1) Phase 1

- * The tuna landing wharf
- * Reclaimed land

(2) Phase 2

- * The tuna landing wharf
- * Reclaimed land
- * Seawall

(3) Phase 3

- * The tuna landing wharf
- * Seawall
- * Reclaimed land
- * Office and toilet buildings
- * Fencing and security boxes
- * Mobile cranes
- * Support facilities

Implementation of the first-phase project will require 3 months for detailed design and 11 months for construction, the second-phase project will require 3 months for detailed design and 12 months for construction works, and the third-phase of the project will require 3 months for detailed design and 10.5 months for construction.

Ghana Ports and Harbours Authority(GPHA) is an executing agency and responsible for operation and administration of the project facilities. GPHA successfully completed "Tema Outer Fishing Harbour Rehabilitation Project" financed by the Government of Japan and several projects financed by the World Bank. No difficulty is expected in the management. It is also obvious that about 48 million cedis for operation of the project facilities will be annually budgeted by GPHA.

Benefits from the implementation of this project are expected to be as follows:

- (1) Increase in fishing operations and increase in catch after provision of the tuna fishing wharf with improved fish handling equipment, and improvement of preservation of fish freshness with betterment of landing efficiency.
- (2) Prevention of pilferage of landed fish, improvement of soundness of fishing firms' management, and collection of accurate fish statistics.
- (3) Alleviation of congestion in the main harbour.
- (4) Appropriate application of *"The Fisheries Law"*.

The project is expected to directly contribute to the promotion of tuna fishing and efficient management of the Main Port, producing indirect benefit by producing constant supply of animal protein to the people and encouraging the private sector to construct a cold store. Urgent implementation of the project with a grant aid assistance from the Government of Japan is felt to be highly important and appropriate with respect to the project's contribution to the people and the national economy of the Republic of Ghana.

The following recommendations are expected to effectively improve management of the fishing harbour:

- (1) The new tuna landing wharf should be solely used for tuna fishing vessels with utilizing the existing facilities for laying-by and preparation for fishing operation.
- (2) A sufficient basin area for safe maneuvering should be established.
- (3) Efficiency in handling fish should be improved.
- (4) The outer fishing harbour area should be strictly secured as a bonded area.

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LOCATION MAP

GENERAL PLAN OF PORT OF TEMA

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CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background

The Republic of Ghana is located in the middle of West Africa facing the Guinea Bay with a 560 km long coastal line. With an average of 2.6% annual increase, the country's population is expected to reach 20,000,000 in the year 2000 from the estimation based on 13,740,000 of the population in 1988 .

The Ghanaian economy is supported primarily by agriculture, mining and forestry. These sectors account for about 44% of GDP, with the agriculture sector playing a central role in providing employment opportunities and earning foreign currencies.

As for the sources of food supply, particularly that of animal protein, the country is largely dependent on fishes landed. The Ghanaian marine fishery has averaged about 300,000 tones annually in recent years. Sardines, horse mackerels and black porgies account for some 265,000 tones, and skip-jacks and tunas for the remaining 35,000 tones.

The Ghanaian Government perceives the marine fishery as the supply source of animal proteins, the provider of employment opportunities and the means of earning foreign currencies, and promotes the fishery. As one link of such efforts, the Tema Inner Fishing Harbour was rehabilitated in 1990 under the grant aid programme of the Government of Japan to promote the fishery industry by easing congestion in the Inner Harbour and improving the landing efficiency.

Due to insufficient landing facilities and pilferage of landed fish in the Tema Port area, Ghanaian tuna fishing vessels transferred their landing station to Abijian Port in Ivory Coast.

After 1991, all the vessels under the Ghanaian flag are obliged to land all their catch within the country in order to prevent the drains of foreign currencies and to increase the fish supply for domestic consumption. As the tuna fishing vessels consequently shifted their activities to Tema Port, there occurred a shortage of landing facilities which resulted in port congestion.

In order to ease the congestion in fishing harbours and increase catches by efficient operation of tuna fishery, the Ghanaian Government planned to rehabilitate the Tema Outer Fishing Harbour for accommodating the tuna fleet and requested implementation of the project under the Japanese grant aid scheme.

1.2 Dispatch of Study Mission

In response to the above mentioned request, the Government of Japan decided to conduct the basic design of the Project and the Japan International Cooperation Agency (JICA) organized the basic design study team headed by Mr. Osamu Hashimoto, Deputy Director of Fishing Port Construction Division, Fishing Port Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, and sent the mission to the Republic of Ghana for site investigation for 40 days from August 22 to September 30, 1992. Having discussed with the Ghanaian officials and collected data, the mission signed Minutes of Discussion on August 31 with the officials of the Government of Ghana.

The objective of this investigation is to understand the project background and the details of the request, to assess the effect and validity of the project under a grant aid programme, and to work out basic design of the details and scope which are considered necessary and optimal for the project.

The study mission investigated the following items to study feasibility of the grant aid programme.

- 1) Understanding of the Project background and details of the request
- 2) Confirmation of priorities of the project details
- 3) Visit to the project site and its surrounding areas
- 4) Assessment of damages at the harbour and port facilities
- 5) Survey of natural conditions (topography and sounding surveys)
- 6) Investigation on construction related matters
- 7) Evaluation of the scope of construction works to be paid by Ghana

This Report discusses the result of further home studies on the project components, the proposed layout, the construction, the project cost, the administrative management and the validity of the project based on the findings of the above study.

The list of mission members, the schedule, the list of main interviewees and the Minutes of Discussion are attached to this report.

CHAPTER 2

BACKGROUND AND THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2.1 Country Profile

2.1.1 Topography

The Republic of Ghana extends from the latitude 5° - 11° NS and the longitude 3° - 1° WE over about 238,537 km², and is located in the middle of West Africa facing the Guinea Bay. The country borders Togo on the east, Burkina Faso and Ivory Coast on the north and west respectively. It faces the Guinea Bay on the south with the coastal line extending for about 560 km. Most of the land is comparatively flat, with an extensive and substantially flat marshland along the coast on the south. The central part around Lake Volta is also extensively flat. From the northwest to the north, the land becomes higher and hilly with the highest hill being lower than 900 m.

There are only a few rivers, the biggest River Volta being flowing from north to south into the Guinea Bay. The world's largest artificial lake created after the completion of Akosombo Dam in 1966 has the area of 8,600 km² and is named Lake Volta.

The coast on the south consists of mostly sandy beaches with occasional cliffs. As the sand discharge from River Volta decreased with the completion of Akosombo Dam and the supply of literal drifts became scarce, coastal erosions are observed at several places along the coast.

2.1.2 Socioeconomic Factors

(1) Economy

The Republic of Ghana is supported primarily by agriculture, with slightly less than 70% of its working population engaged in agriculture-related production. According to Appendix A-2.1-1 showing GDP breakdown by industries, GDP in the agriculture and fishing industries accounts for more than 40% of total GDP, followed by about 35% of service industry and 16% of manufacturing industry. Appendices

A-2.1-1 and 2 show changes of GDP in 5 years from 1987 to 1991 in terms of nominal prices and real values for 1975. The GDP growth rate is about 3 to 6%, and was about 5% for 1990/1991.

Cocoa is the most prominent agricultural product of the country, accounting for slightly more than 9% of GDP. Other products are mostly foods such as cassava, yam, maize, and plantains. Manufacturing activities center around light industries such as textiles and food processing, with some heavy industry and chemical industry engaged in aluminum refining/processing and oil refining utilizing abundant electricity generated at Akosombo Dam. The mining industry produces predominantly gold, followed by diamond and bauxite. Its output accounts for slightly less than 9% of GDP.

(2) International Trade

Table 2-1 of the Appendix shows the actual state of Ghana's international trade.

Aluminum tops the list of exports in terms of volume, followed by cacao beans and oil products. Industrial materials such as alumina, clinker and cokes are the major import items, followed by foods such as rice. Table 2-2 reveals that the trade deficit continued for six years from 1984 to 1989 except in the year 1988.

Table 2-1 Major Trade Items (1989)

Export (FOB)

Items	Amount(\$mill)	Ratio(%)
Cocoa	408	50.5
Gold	160	19.8
Timber	81	10.0
Electricity	87	10.8
Total export	808	

Import (CIF)

Items	Amount(\$mill)	Ratio(%)
Crude oil	151	13.7
Consumer goods	104	9.4
Intermediate goods	325	29.5
Capital goods	482	43.7
Total import	1062	

(Source: Statistical Service)

Table 2-2 Trade Balance (mill. cedi)

	Import	Export	Balance
1984	21,887.3	19,396.0	- 2,491.3
1985	47,155.3	33,489.8	-13,665.5
1986	93,358.0	78,179.9	-15,178.1
1987*	174,779.8	143,303.9	-31,475.9
1988*	185,605.0	205,705.0	20,100.0
1989*	346,983.0	275,290.0	-71,693.0

(Source: Statistical Service)

(3) International Balance of Payments

The current account deficit for 1989 was \$300 million and that for 1990 was \$480 million. The balance of capital accounts continues to be in black at \$200 million or above on account of aids from foreign countries and international organs. The overall balance for 1987 and thereafter has been in black at \$100 million or above, 1990 ending in black at slightly less than \$900,000. The country had the official outstanding external debt of \$2.9 billion for 1989 and \$3.1 billion for 1990. Their debt service ratio lowered from 68% in 1988 to 58% in 1989, and to 40% in 1990.

(4) Inflation Rate

Table 2-3 shows changes in the inflation rate from October, 1990 to March, 1992. The rate was substantially below 3% of that of the previous month, and showed a lowering tendency in the mid-term of 1991. The inflation rate shows a gradual declining tendency, and dropped from 37% of the latter term of 1990 to 13% of 1992, showing a stabilizing tendency. There was observed in March, 1992 a slight increase tendency in the inflation rate compared to the previous month.

Table 2-3 Changes in Inflation Rate

Month/year	Inflation rate over previous month(%)	Annual inflation rate @broken down by month(%)
October, 1990	-0.51	36.23
November	1.24	36.89
December	2.62	37.25
January, 1991	1.68	36.90
February	2.75	35.96
March	2.60	34.86
April	1.67	33.52
May	0.85	31.99
June	1.03	30.19
July	-0.21	28.08
August	-0.63	25.94
September	-0.53	23.71
October	0.13	21.79
November	0.30	19.97
December	0.23	18.03
January, 1992	0.23	16.33
February	1.84	14.81
March	2.22	15.39

(5) Population

Population census was conducted twice in 1970 and 1984. The census result is outlined in Table 2-4.

Table 2-4 Population Movement

1970	1984	Increase Ratio	Annual Increase
8,559,313	12,296,081	43.7%	2.6%

The population in 1988 is estimated at 13,740 thousand and about 20 million in the year 2000.

2.2 Framework of Economic Recovery Programme and Structural Adjustment Programme

The Government of Ghana initiated a three year Economic Recovery Programme in 1984 to stabilize economy and to rehabilitate economic and social infrastructure. The Government implemented the following macro-economic policies with a particular emphasis on improvements of foreign exchange and trade structure.

- Depreciation of the exchange rate of the cedi
- Establishment of export retention schemes for exporters to easily access to foreign currency for importation of essential operational import
- Harmonization of tariffs and interest rates
- Liberalization of trade

These measures were intended to dismantle price, distribution, import and exchange controls, and their effects became apparent promptly, achieving growth as indicated by 6.3% GDP in 1984-1986 and 4.2% in 1987. The inflation rate lowered to 11% in 1985 from 122% in 1983, but rose again to 39% in 1987, and has been fluctuating at 20 - 30% thereafter. The Government published the Structural Adjustment Programme in 1988 - 1990 to reinforce the economic structural reforms. Following broad objectives for structural reforms were set for implementation in the second phase.

- * To achieve an average annual real GDP growth rate of 5% which will improve real per capita income by about 2% per annum.
- * To reduce the average annual rate of inflation to 10 % by 1990.
- * To generate significant overall balance of payment surpluses to ensure elimination of external payments areas
- * To expand employment generating capacity of economy in order to encourage new entrants into labour market
- * To increase the agricultural output
- * To improve the living conditions of the urban and rural poor

These policies helped the smooth recovery of Ghanaian economy until 1990 when the agricultural output dropped because of bad weather, cocoa prices

hovered in the international market, and crude oil prices sharply rose because of the Gulf Crisis. GDP growth rate recorded its lowest at 2.7% since 1984. The inflation rate rose to 37% from 25% of 1989, and the current account deficit increased to US\$ 479,000,000 placing the national economy in difficulties.

The Economy Recovery Programme was continued and brought about significant improvements in the major sectors of industry and realized considerable portions of the programme objectives.

Implementation of economic policies to encourage savings, investments and production is essential in order to secure stable macroeconomy. The investment environment should be improved by, for instance, the tax reforms for private industries and economic policies offering incentives for savings and investments are being planned in various areas. The Structural Adjustment Programme for various sectors were also drafted. These plans are believed to help eradicate poverty. If they succeed, the growth rate of real GDP for 1992-1994 is expected to reach 5.5% and the inflation rate down to about 5% at the end of 1992.

In the agricultural sector, "1991-2000 Medium Term Agricultural Development Programme" was drafted corresponding to the Economy Recovery Programme. The principal objectives are discussed below.

- *To encourage growth and development in the agricultural sector, to stimulate activities of private capitals, and to create an agricultural environment capable of producing competitive products with high yield;

- *To eradicate poverty, and to supervise excellent biological phase

Following points are emphasized regarding fisheries as a sub-sector of the agricultural sector.

- *Development of inland water fishery consisting of fish culture and Lake Volta

- *Rehabilitation of fishing port facilities for promotion of tuna fishing

2.3 General Situation of Fisheries in the Republic of Ghana

2.3.1 Outline of Fishery Development Plan

The Ministry of Agriculture of the Republic of Ghana established a medium-term plan from 1991 to 1995 development.

(1) Outline of Medium Term-Plan

At present, total population of the Republic of Ghana is about 14,000,000, of which 70% is engaged in the field of Agriculture Sector. The Agricultural field accounts for 50% of GDP. Index of employee's average monthly earnings per capita per year is shown in Table 2-5.

Table 2-5 Index of Employees' Average of Monthly Earning by Year
('80 = 100)

	1980	1981	1982	1983	1984	1985
Nationwide Average	100	129	139	241	496	726
Agriculture, Forestry and Fishery	100	152	170	269	698	859

The above table shows average of monthly earnings of employees in the fields of agriculture, forestry and fishery are relatively higher than the nationwide average.

In the medium-term plan, requirements for promotion of development of fishery industry are noted as follows.

- (i) to increase the domestic product so as to meet the volume of consumption of marine products required by the increase of population.
- (ii) to make efforts to secure more employments in fishery industry, aiming at the average of employment rate of 60%.

- (iii) as 35,000 -46,000 mt of fish catches are brought from Lake Volta, in the inland water, the circumstantial improvement is necessary.
- (iv) to make improvement of aqua-cultural technology and to promote its education widely.
- (v) to improve the hatchery facilities for increasing the production of fingerlings for the aquaculture.
- (vi) too improve Tema Fishing Harbour and the dry dock to promote the development of tuna fishery.
- (vii) to make improvement of technology regarding the management of resources in the water area of EEZ and calculation method of optimum fish catch.
- (viii) to strengthen the system of controlling the fishing activities.
- (ix) to improve the unstable factor of fish prices drop such as the shortage of refrigeration facilities caused by the seasonal fluctuation of fish catch, for example fish catch of sardine concentrates in June and September.

(2) Budget

Agricultural budgets by sector are shown in the following Table 2-6 (as of 1989).

Table 2-6 Agricultural Budgets by Sector

Sector	('000,000 Cedi)	%
Ministry of Agriculture (Central)	280.9	1.0
Policy Planning, Monitoring and Evaluation Department	367.5	1.3
Crops Services	618.9	2.2
Fisheries	137.9	0.5
Animal Health and Production	736.9	2.6
Extension	1,055.3	3.8
Agricultural Engineering	134.4	0.4
Subventions	1,197.7	4.3
Sub-total MOA	4,529.5	16.1
Agricultural Research (CSIR)*	711.0	2.5
Ghana Coco Marketing Board (CoCoBOD)	21,950.0	77.9
Forestry	987.6	3.5
TOTAL	28,178.1	100.0

*CSIR : Council for Scientific and Industrial Research

The expenditures by several organizations under the supervision of Ministry of Agriculture from 1991 to 1995 are shown in Table 2-7.

Table 2-7 MTADP Expenditure 1991-1995

Programme	1991	1992	1993	1994	1995	Total	USD M
1. Agricultural Technology	6735.0	7683.0	9544.0	8219.0	7667.0	39848.0 (28.5%)	132.8
2. Livestock	492.6	1417.9	2674.6	1222.3	655.0	6462.4 (4.6%)	21.5
3. Fisheries	2616.0	2704.0	1272.0	769.0	2251.0	9612.0 (6.9%)	32.0
4. Irrigation & Water Resources	3398.0	4187.0	4993.0	7315.0	9865.0	26378.0 (18.9%)	87.9
5. Feeder Roads	5872.0	8752.0	8563.0	8860.0	8880.0	40937.0 (29.3%)	136.5
6. Marketing & Agro-processing	3539.5	4334.0	2419.0	2645.0	2245.0	15173.5 (10.9%)	50.6
7. Implementation & Monitoring of MTADP	460.0	273.0	257.0	195.0	166.0	1351.0 (0.9%)	4.5
Total	19813.1	29360.3	29722.6	29229.5	31729.0	139761.0	465.8
US\$ (mill)	66.0	97.8	99.4	97.3	105.7	465.8	

US\$ 1.00 = 3000 cedis

MTADP : Medium Term Agricultural Development Programme

In addition, the expenditures required for the programme, related to fisheries sector are shown in Table 2-8.

Major contents of Fisheries Programme are as follows:

- i) Training for the purpose of improvement of technology of employees engaged in fishery business.
- ii) Development of technology for aquaculture as well as improvement of required facilities.
- iii) Improvement of circumstantial facilities for the inland fishery.
- (iv) Control of the marine resources and improvement of required facilities.
- (v) Research, experiment and survey

Table 2-8 Fishery Development Programme

Programme	1991	1992	1993	1994	1995
Institutional Strengthening	232	332	215	138	138
Aquaculture/Culture Based Fisheries	354	256	74	55	55
Inland Fisheries	685	720	544	260	95
Marine Fish Control and Development	1,035	1,035	50	50	50
Studies/Research	197	322	216	106	1,893

2.3.2 Present Situation of Fisheries

(1) General Aspect

Ghana has about 560 km long coastal line facing to the Gulf of Guinea. Continental shelf is situated ranging from 24 to 80 km away from the shore side. Within its 20,000 km² sea region, its depth of sea is ranging from 10 to 200 m.

The upwelling current from the deep layer current usually tends to occur after the rainy season from May to September. The phenomenon normally induces breeding of planktons. In that season, sardine and other species of fish regularly migrate to this region to search for planktons as their baits. It is needless to say that the large size of fish also migrate following those small fish for their food.

The oceanographical structure in the region constitutes such favorable and rich marine resources of fishing grounds.

As a result, so far afore-mentioned, Ghana is ranked as one of fisheries nation in West Africa as well as Senegal.

Fisheries operated in this region are generally divided into four types as follows:

* Canoe Fishery

- Fishing Methods : Grill net, purse seine, pole and line
beach seine net, fixed shore net, etc.
- No. of Vessels : About 8,000 (as of 1991) including 4,600
with outboard engine.
- Annual Fish Catch: About 215,000 mt

* Inshore Fishery

- Fishing Methods : Purse seine, trawl
- No. of Vessels : About 150 (as of 1991)
- Annual Fish Catch: About 7,300 mt

* Deep-sea Fishery

- Fishing Methods : Large scale trawl
- No. of Vessels : 32 (as of 1991)
- Annual Fish Catch: About 28,700 mt

* Tuna Fishery

- Fishing Methods : Pole and line, purse seine
- No. of Vessels : 36 (as of 1991)
- Annual Fish Catch: About 38,000 mt

The fish catch amounted to 290,000 mt as of the year 1991. The following paragraph described the past information with regard to the quantity of production by means of traditional marine fishery in the Republic of Ghana in the past years.

In of the 1950's, the Government made encouragement on the modernization in fisheries as whole in order to promote productivity. In the 1960's, the first fishing operations were commenced in the deep-sea fishery sector. As a result, the fish catch in the year of 1970 amounted to 220,400 mt. This catch growth indicated 3 times comparatively larger than that of in the past 7 years.

With regard to the catch growth during the past 20 years, from 1971 to 1991, however, it considerably stagnated and showed as only 30% of increase.

The present annual intake per-capita consumption of fish was said to be about 21 kg.

In earning foreign currency, tuna fishery is one of the most important and indispensable industries in Ghana. The output from fisheries production amounted to about US\$ 16 million (about 430 US\$/mt).

(2) Oceanographic Conditions

Due to the seasonal fluctuation of the sea conditions, fish schools periodically migrate and relocate their habits to the other place. On the other hand, therefore, this causes much changes in the formation of fishing grounds as well as fishing season for fishermen.

Sea currents which are flowing into the Gulf of Guinea consist of cold and warm currents as mentioned below:

Warm Current

Cold Current

- | | |
|-----------------------|---------------------|
| 1. Guinea Current | 4. Southern Central |
| 2. Benguela Current | Atlantic Water |
| 3. Equatorial Current | 5. Canary Current |

These currents normally mitigated each other and flow into the Gulf of Guinea.

In the Ghanaian sea region, annual sea water temperature is over 24°C which is relatively high. But water mass with low salinity of 33 - 35‰ is stagnated around that sea region.

In the season from June to October, sea water temperature around Ghana becomes low with the lowest-temperature season from July to September it, while it becomes high temperature during the season from March to June. High water-surface temperature of 27 - 29°C before the lowest-temperature season sharply drops to 21 - 23°C in the season from June to October. Such phenomenon is caused by the upwelling of the cold Southern Central Atlantic Water, which occurs by blowing of the South-west trade wind from the Atlantic Ocean. The same phenomenon is also observed at the same time in territorial waters in Ivory Coast, Togo and Benin.

In the said season, sardines and large bade fish gather in the Ghanian off-shore waters. When those fishes are approaching to the shoreside waters in Ghana, pelagic fish schools such as skipjack and tuna tend to migrate and come to the coastal zone.

Monthly changes of water temperature and salinity in offshore of the Tema Finishing Harbour is shown in Table 2-9 as indexes expressing the condition of water mass in this waters.

Table 2-9 Monthly Mean Surface Water Temperature and Salinity
Content in offshore of Tema Fishing Harbour (1981-1991)

Month	Water Temperature (°C)	Salinity Content (%)
January	23.7 - 28.1	33.814 - 35.512
February	25.8 - 28.0	34.775 - 35.833
March	25.8 - 28.8	35.154 - 35.367
April	26.9 - 28.3	34.891 - 35.532
May	26.8 - 28.9	34.717 - 35.117
June	26.4 - 27.5	34.507 - 35.440
July	20.9 - 25.3	34.562 - 35.118
August	20.1 - 23.2	34.629 - 36.223
September	20.1 - 24.4	34.446 - 35.779
October	25.3 - 27.8	34.802 - 35.554
November	27.0 - 29.1	32.592 - 35.261
December	26.4 - 28.1	34.540 - 35.485

Source : Fisheries Department

(3) Resources and Fish Catch

As many different species of fish inhabit around the continental shelf in the offshore of Ghana, assessments of potential in the Ghanaian waters have been made several times. They were made mainly for bottom fish and are considered to have contributed upon the trawl fishery in Ghana.

The outline of fish potential is summarized as follows:

(i) Resources of Bottom Fish

In the Continental shelf offshore of Ghana, the sea water zone of water depth of 15 -75 m is approximately 17,300 km². Researches conducted in 1979 and 1980 indicates that the potential of bottom fish inhabiting thereof is estimated at 160,000- 170,000 mt, or 9.3

- 9.4 mt/km².

If the present annual catch of about 30,000 mt is maintained, the resources will be stable in their amount. Rocky seabed preferable fishing ground for securing the conservation of resources for trawl fishery operations.

Productivity of Ghana is reported to be 15-35% higher than that of Continental shelf of Ivory Coast.

(ii) Surface Layer Fish (Pelagic Fish)

Few researches are available on estimates of potential of surface layer fish in offshore region of Ghana. Tuna fish in the Atlantic Ocean has been internationally controlled by the international organization, ICCAT, to make those resources stable, estimating the optimum limit of catch for each species.

The fishing vessels operating in eastern part of the Atlantic Ocean which is a main tuna fishing ground have been moving to other fishing grounds since 1985. The fishing efforts with long lines and pole-and-lines have been decreasing. Under these circumstances, it is expected that the resource controlling will render a favourable influences upon the conservation of biomass.

(iii) Fish Catch in Ghana (from 1981 to 1991)

The fish landings in Ghana classified by the fishing methods are shown in Table 2-10.

The annual total fish landing has been gradually increasing since 1981, and it has been amounting to approx. 300,000 mt since 1987.

The annual fish catch in the tuna fishery sector has been almost constant in 30,000's mt.

According to the Fishery Law modified in 1991, it is defined that all the fish catch by fishing vessels registered in Ghana has to be unloaded at the designated fishing ports within Ghana.

Table 2-10 Statistics of Ghana Fish Landing (1981-1991, unit :m/t)

		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1	Canoe Fishing	149,823	140,890	137,028	171,233	159,899	190,196	261,451	244,451	220,042	242,020	215,847
2	Coastal Fishery											
	1)Purse Seine	6,695	7,922	11,126	6,260	9,956	10,117	5,003	1,880	8,622	6,470	5,557
	2)Trawl	10,039	8,434	8,559	8,443	8,032	11,776	9,928	5,533	4,034	2,779	1,798
	3)Long Line	2	-	-	-	-	-	-	-	-	-	-
	4)Fixed Net	0.8	-	-	-	-	-	-	-	-	-	-
	(Sub-total	16,857	16,357	19,686	14,703	17,979	21,893	14,931	7,414	12,656	9,249	7,356
3	Offshore Fishery											
	1)Vessel	15,380	12,985	16,811	16,249	21,932	22,344	20,171	16,042	23,073	26,588	27,892
	2)Shrimp Vessel	-	-	-	-	-	-	-	-	380	725	784
4	Tuna Fishery											
	1)Ghana Flag	18,365	28,886	31,656	29,143	34,406	34,719	33,465	35,433	32,294	40,802	37,794
	2)Foreign Flag	26,807	17,360	8,372	2,122	-	-	-	-	-	-	-
	(Sub-total)	45,172	46,247	40,028	31,266	34,406	34,719	33,465	35,433	32,294	40,802	37,794
5	TOTAL	200,425	199,120	205,183	231,511	234,218	269,154	330,019	302,931	289,282	319,387	289,675
6	Tuna Transhipped	32,498	31,031	26,263	25,133	24,337	24,568	26,290	29,571	21,543	28,253	24,938
7	Tuna Sold Locally	9,011	10,500	7,431	5,815	10,069	10,151	7,175	5,861	10,751	1,549	12,855
8	Fish Imported (frozen)	1,455	877	3,000	-	1,000	496	-	-	-	22,698	26,576
9	Fish Imported (salted, dried)	-	-	1,000	-	-	-	-	-	-	-	-
10	1)Fish Exported (frozen)	-	-	-	1,811	1,818	1,910	-	-	3,710	4,960	5,227
	2)Fish Exported (shrimp)	-	-	-	-	-	-	-	-	-	186	147
11	Domestic Consumption	192,528	181,581	184,957	206,369	209,062	233,171	303,729	273,359	264,027	308,683	285,936

Data Source: Fisheries Bureau

Note : (1) Item 5 = Items 1+2+3(1)+3(2)+4(1)

(2) Item 11 = Items {(1+2+3+7+8+9)}-{10(1)+10(2)}

Catches per unit of effort (CPUE) from 1972 to 1986 are shown below.

- | | |
|----------------------------|-------------|
| 1) Beach seine fishery | 0.28 - 0.95 |
| 2) Fixed shore net fishery | 0.03 - 0.21 |
| 3) Long line fishery | 0.05 - 0.11 |
| 4) Coastal trawl fishery | |

(Vessel size)

- | | |
|------------------|-------------|
| (i) 27 - 39 ft | 0.34 - 0.88 |
| (ii) 40 - 120 ft | 2.52 - 7.11 |

- 5) Purse Seine fishery

(Vessel size)

- | | |
|------------------|-------------|
| (i) 27 - 39 ft | 0.58 - 2.21 |
| (ii) 40 - 120 ft | 0.46 - 2.65 |

- | | |
|---------------------|--------------|
| 6) Offshore fishery | 2.88 - 11.00 |
|---------------------|--------------|

(4) Fishing Vessels

Table 2-11 shows the classification of fishing vessels operating in Ghana.

Table 2-11 Statistics of Fishing Vessels in 1991

Type of Vessel	No. of Vessel
<hr/>	
Motor Fishing Vessels Operating Overall	
Overall length	
Less than 9.9 m	82 (59)*
10.1 - 21.0 m	58 (103)*
21.3 - 30.5 m	13 (15)*
over 30.5 m	32 (24)*
Ghanaian Tuna Vessels	27 (9)*
<hr/>	
Total No. of Vessels (operating	212
(non operating	(210)*
(in Ghana	422
<hr/>	
Canoes (1) Non motorized	3421
(2) Motorized	4631
<hr/>	
Total	8052
<hr/>	

Source: Fisheries Department

Note : ()* indicates non operational vessels

There are about 8,000 canoes in the fishing region of Ghana and about half of those canoes have been motorized with out-board en-

gines of 20 to 40 horse power (HP) and most of them have the length ranging from 5 - 18 m. Crews are usually from 1 to 10 persons. Most of the canoes are used for the purpose of drift-gill net fishing. Other canoes are normally engaged in purse seine, beach seine and fixed shore net fishing.

Although about 300 vessels are engaged in coastal fishery, about half of them are not in operation because of the improper conditions engines and shortage of spare parts or superannuation of the vessels. Fishing vessels with the length less than 10 m are made of wood and are usually engaged in purse seine fishing, having size of net for float line from 300 - 400 m. They normally operate at the shallow sea area of less than 30 m deep. Number of such vessels are about 140 with non-operational ones of about 40% of the all.

Fishing vessels with the length from 10 to 20 m are mostly made of wood. Number of such vessels are about 160, about 100 of which are not in operation. Fishing vessels in operation are mostly engaged in both trawl and purse seine fishing. They normally operate in the sea area less than 50 m deep.

Vessels engaged in inshore fishery is less than 30 m in length and most of them are wooden vessels. A trip of such a type of vessels require between 5 and 10 days. These vessels operate within the EEZ region utilizing Tema Fishing Harbour as their base port, some of which are engaged in both trawl and purse seine fishing. Annual total time of their trips is from 20 to 25. Their annual fish catch amounts to 7,000 - 12,000 mt from the year of 1988 to 1991 and about 50 - 60% of the catch are unloaded at the Tema Fishing Harbour.

The vessels engaged in offshore fishery are medium and large sized trawl fishing vessels, all of which are utilizing Tema Fishing Harbour as their fishing base. Their main fishing grounds are around EEZ water zones. Those vessel have cold storage system equipped, and stern-trawl-type vessels of about 1,000 GRT operate for 50 to 90 days per trip. Number of such vessels are about 31 in 1991 and their landing amounted to 27,000 mt.

In the tuna fishery sector, 27 vessels for pole-and-line fishing and

9 vessels for purse-seine fishing(as of 1991) are in operation with using Tema Fishing Harbour as the fishing base. Their annual fish landed is amounted to approx. 38,000 mt, and its annual fluctuation is small. The details of tuna fishery are mentioned later in the sub-section 2.3.3.

2.3.3 Present Conditions of Tuna Fishery

In the Fishery industry of Ghana, the tuna fishery is one of the most important industry, which is earning about 16 million US\$ annually by its exportation.

Fishing vessels engaged in tuna fishery are utilizing Tema Fishing Harbour as their fishing base . Although these vessels are normally made of steel, most of them are 10 year or more old.

The following Table 2-12 shows annual numbers of fishing vessels by fishing companies.

Table 2-12 Number of Fishing Vessels by Fishing Company

	1987	1988	1989	1990	1991
1. GHANA TUNA	6	6	6	6	6
2. PIONEER TUNA	4	4	4	4	3
3. AFKO FISHERIES	10	9	9	9	8
4. GHAKO FISHERIES	1	1	1	1	1
5. COAST LINE FISHERIES	1	1	1		
6. GOSHEN FISHERIES	1	3	4	3	2
7. OSBREY	1	1	-	-	-
8. IFITCO	3	3	4	4	3
9. STATE FISHING CORP.	2	-	-	-	-
10. CACTUS	-	1	1	1	-
11. CENTRAL FISHERIES	-	-	2	3	3
12. NOVA COMPLEX	-	-	1	1	1
13. WORLD MARINE	-	-	-	1	-
14. MANKOADZE	-	-	-	-	-
TOTAL	29	29	33	33	27

(1) Operation Form of Tuna Fishery

1) Frequency of Fishing Operation

Operation of tuna fishing vessels utilizing Tema Fishing Harbour are summarized as below:

(a) Preparation of Sardine for Bait Fish

Purse seiners normally need to catch sardines as bait fish around the coastal water zone for tuna fishing. In order to catch sardines with the size of about 5 cm long, the float lines with the length about 250 m and nets about 25 m deep are used. And this fishing is conducted during the night time using attraction lamps of under-

water types. 2 catamaran boats (25 HP) are used for such operation with the fishing gears.

Fresh sardines as bait fish are caught before the departure of vessels for fishing tuna. They requires volumes of bait fish corresponding to 300 buckets and are kept in a hold with sea water. Such quantity of bait fish enables a trip for 4 or 5 days.

When those baits run short at the fishing grounds, they can be purchased from canoes in operation. The vessels sometimes go back to the coastal water zone to catch the sardines as bait fish, which have a habit of migrating and gathering in the coastal waters with weak tidal currents, and immediately return to their own fishing grounds. Generally, the vessels go back to the coastal water zone about four times to catch bait fish, depending on tuna & skipjack's school conditions.

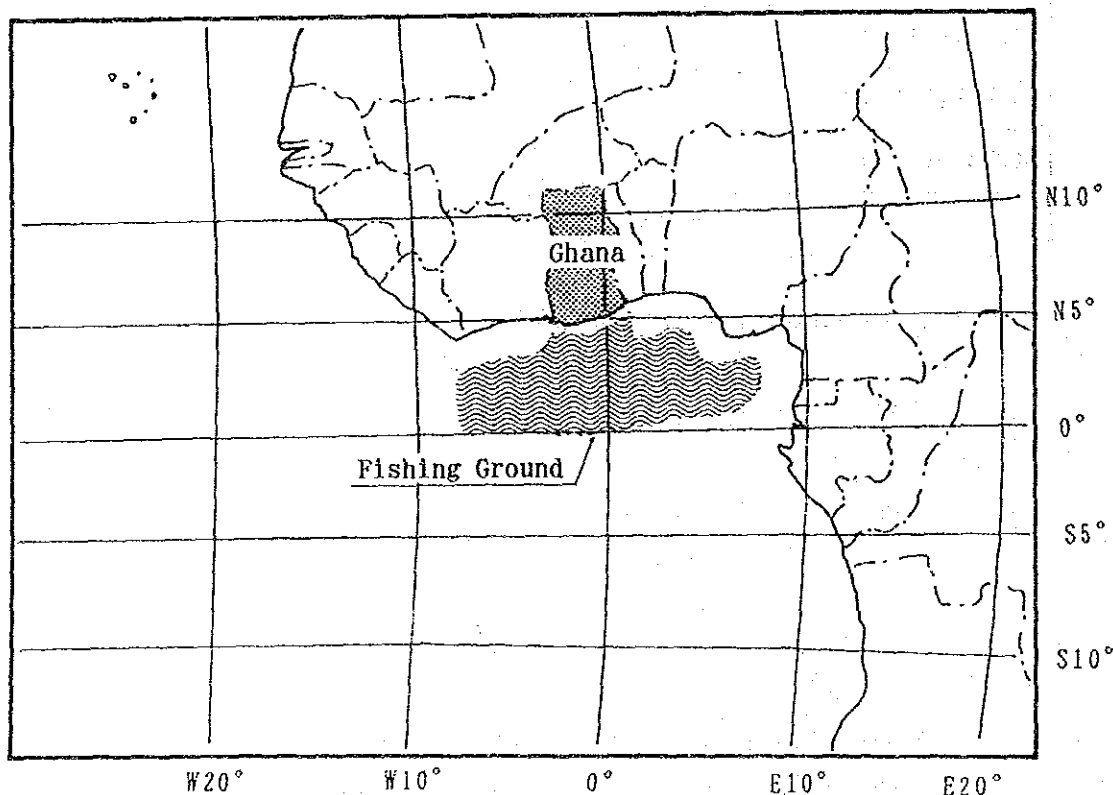


Fig. 2-1 Location of Fishing Ground

(b) Days Required for One Trip

It takes about 25 to 35 days for a trip of the vessels of 300 GRT, 30 to 40 days for 500 GRT, and about 40 days by purse net fishing.

"Brine Freezing System" (temperature of meat about -15°) is usually used for storing fish caught. Vessels using ice water require 3 or 4 days a trip.

(c) Entry of Fishing Vessels to the Port and Unloading of Catch

Fish is discharged immediately on arrival of fishing vessels when berths are available. Fish is usually unloaded for about 9 hours continuously from 8:00 am. to 17:00 pm. Mobil cranes and trailers for transportation are used at the landing wharves. 2 or 3 people on the vessel operate derrick cranes to lift up frozen fish hauled in the bag net from the hold on the deck. Frozen fish put on the deck is sorted to 3-4 classes such as small, middle and large sizes. After the sorting they are put into one ton capacity of fish boxes, which are lifted up on a trailer by a mobile crane. 10 to 14 boxes lined up in parallel on a trailer are transported to cold stores in the Tema City. Since the mouth of the hold is not wide enough, a transferable volume by a bag net is about 300 kg. It will take about 3 to 4 minutes to haul the bag net on the deck by a crane. A crane will lift fish alternatively from 2 holds of a vessel.

In general, fishing vessels of 300 GRT class carry back about 190 mt to the fishing harbour. In case of good conditions for unloading in the harbour, it is possible to handle the volume of fish catch from 80 to 90 tons per day and it normally takes about 2 or 3 days to unload fish catch from a fishing vessel of 300 GRT class. But in case of congestion in the harbour when unloading, it can handle only 40 tons per day. Therefore the improvement of working condition in unloading fish is necessary. Otherwise the sorting work will take time under the sunshine and this will deteriorate quality of fish meat.

Unloading is followed by various preparations for next trips and

berthing for 3 to 5 days in the harbour. Since the vessels hulls have superannuated, most vessels take much time in repairing of engine parts and others.

7 to 9 trips per year will be made for any vessels if lay-by days in the harbour are minimized.

(d) Crews and Wages

About 30 crews on a tuna fishing vessel of 300 GRT class are engaged in the fishing and about 40 crews on a vessel of 500 GRT class.

In case the vessels operated by companies of jointventures with foreign firms, captains and chief engineers come from their firms and the rest crews from Ghana.

Two-wage systems such as a fixed wage and a percentage-basis wage are applied for crews' wages. The average monthly wage is between 80 and 100 US\$, which is more than the other workers who receive only about 50 US\$ per monthly.

(e) General Situation of Fish Catch by Tuna Fishing Vessel (as of 1991)

The following Table 2-13 shows monthly fish catch by tuna fishing vessels and followings are indicated.

a) Frequency of trips differs by each company. It is likely caused by conditions of repairing vessels.

b) The fishing season in a year can not be specified through monthly catch amount.

c) Slight proportional relation between the size of fishing vessels and the fish catches can be proved.

d) Frequency of trips throughout the year is 7 to 9 times.

e) Total amount of annual catch in the year is almost the same as the past average.

Table 2-13 Monthly Fish Catch by Fishing Vessels (1991)

Unit: ton

COMPANY	NO	MONTH												NO of CALL	TOTAL	AVRG
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
GHARA TUNA FISH Co.	1	284.78	125.9	147.6	192.1	—	145.2	140.3	—	83.6	132.0	134.4	—	9	1,233.8	142.6
	2	284.59	204.3	131.8	169.6	200.7	203.8	—	114.6	—	201.7	182.8	223.5	10	1,816.4	181.6
	3	282.94	125.8	154.3	167.8	269.7	—	164.6	115.3	—	—	—	120.1	7	1,129.3	161.3
	4	284.76	36.5	163.1	121.6	—	—	184.0	—	138.8	101.1	—	212.3	7	957.4	136.8
PIONEER TUNA FISH Co.	5	282.99	105.6	156.7	177.4	—	185.9	150.7	154.8	—	228.6	—	152.1	9	1,455.2	166.1
	1	416.00	—	224.1	—	—	251.0	149.0	—	158.8	—	243.7	—	6	1,262.0	210.3
	2	416.90	—	—	186.0	—	240.9	—	—	—	—	—	—	3	623.5	207.8
	3	416.90	—	—	107.0	—	—	—	—	—	—	—	—	1	107.0	—
AFRO FISH Co.	4	416.90	—	—	—	—	276.2	—	171.0	—	—	—	517.6	3	964.8	321.6
	1	284.28	60.0	105.1	88.7	128.4	99.1	135.3	97.7	86.0	—	—	—	9	914.3	101.6
	2	440.41	58.5	—	199.7	252.5	246.1	—	262.8	238.1	87	—	243.5	8	1,569.2	196.2
	3	439.89	139.5	—	161.4	413.0	—	245.4	203.1	—	145.1	209.4	—	7	1,516.9	216.7
INFITCO (CH)	4	440.24	49.7	—	97.3	—	271.0	215.5	265.1	—	146.2	155.3	—	8	1,438.5	179.8
	5	450.27	114.6	—	216.9	239.0	247.1	217.7	209.6	—	227.3	212.1	203.6	9	1,948.4	210.5
	6	454.71	140.0	114.7	—	333.9	—	253.5	198.5	262.2	—	—	—	7	1,553.8	221.9
	7	454.71	134.3	—	162.5	—	—	—	229.9	234.2	164.1	258.1	—	5	1,183.1	197.2
CENTRAL FISH Co.	1	431.23	365.0	115.0	—	—	—	320.0	275.0	350.0	390.0	—	302.0	8	2,217.0	277.1
	2	499.71	454.0	—	380.0	260.0	—	300.0	220.0	380.0	260.0	380.0	91.6	10	3,125.6	312.6
	3	402.96	21.0	—	—	152.0	—	236.0	275.0	220.0	150.0	—	—	6	1,054.0	175.7
	4	426.20	250.0	—	260.0	280.0	260.0	—	—	290.0	175.0	260.0	190.0	9	2,228.0	247.6
GOSHEN FISH.	1	374.38	96.1	—	190.3	210.3	186.0	—	192.5	68.5	181.7	204.4	—	8	1,329.8	166.2
	2	294.66	60.9	—	163.4	155.4	231.7	—	—	—	165.7	—	58.2	7	944.2	134.9
	3	992.00	67.8	—	251.6	—	—	243.8	329.5	—	204.7	—	199.3	6	1,236.7	216.1
	1	298.68	147.5	174.6	—	182.1	202.1	—	185.5	172.0	175.2	215.0	—	9	1,606.2	178.4
G H A K O	2	372.19	136.9	—	201.5	117.2	142.1	—	230.2	214.1	16.0	212.5	—	9	1,723.1	191.4
	1	416.95	110.5	126.00	—	—	—	41.8	236.7	155.3	—	—	151.6	7	1,039.8	148.5
	1	—	—	—	171.6	158.7	190.9	—	—	188.7	—	179.1	185.7	7	1,286.7	183.8
	27	—	22	11	21	16	16	14	20	16	18	13	15	195	—	—
WORLD MARINE	1	—	—	—	212.0	—	—	—	—	—	—	—	—	—	—	—
	27	—	—	—	13	—	—	—	—	—	—	—	—	—	—	—
No of Boats		2,946.4	1,613.0	3,916.4	2,970.3	3,498.1	3,374.2	2,857.3	4,131.4	3,258.7	3,045.3	2,864.0	3,110.1		37,585.2	
G • T		133.9	146.6	186.4	228.4	218.6	210.9	204.1	206.6	203.7	169.2	220.3	207.3			
TOTAL																

Data Source: Fisheries Department

(f) Form of Fishing Ground and Sea Conditions

Tuna fishing are being executed every year in off-shore from Ghana and in the Gulf of Guinea.

Baite fish is caught by the fishing vessels in the coastal water zone where sardine schools likely migrate and they steam to the fishing grounds in Ghanaian territorial seas and high seas in the Gulf of Guinea.

Sea conditions of the Gulf of Guinea are as follows:

25° of water zone moves from the mouth of Zaire River (latitude 6°S, longitude 14°E) near to the Equator in parallel with the latitude line being pushed up by a low temperature of current from Atlantic Ocean.

From the past records, the period of such water zone stagnating near the equator can be seen as follows:

In 1989 : June 23rd - August 24th (63 days), then at August 30th it separated into 2 zones.

In 1990 : June 30th - August 4th (36 days), then at August 11th it separated.

In 1991 : July 18th - July 25th (7 days), then at August 8th it separated.

In 1992 : June 14th - July 18th (34 days), then at July 25th it separated.

It is proved from the interviews of local fishing companies that the movement of 25°C of water zone influences upon the form of the fishing grounds.

(2) Price and Distribution in Market

1) Fish price and distribution

Skipjack weighing over 1.8 kg, yellow-fin and big-eye over 3kg are usually exported to the American canning firm and smaller fish is

distributed to a local market.

Sales prices differ by the classes of fish. Buyers purchase in-shore marine fish for domestic consumption purposes and come to tuna market to intervene business.

Examples of fish price are shown below is for reference.

* Price in Ghana (\$/kg)

Skipjack		Yellow-fin tuna	
3.5 kg.	0.59	40 kg.	1.09
1.8 kg.	0.48	10-40 kg.	0.94
1.5 kg.	0.10	10 kg.	0.66
		5-10 kg.	0.47

* International Price(\$/kg)

i) Dakar

Skipjack		Yellow-fin tuna	
3.5 kg.	0.61	40 kg.	1.00
1.8 kg.	0.34	10-40 kg.	0.82
1.5 kg.	0.12		

ii) Abijian

Yellow-fin tuna	
40 kg.	1.09
10-40 kg.	0.94

For domestic consumption, frozen fish is transported to 116 inland places where the cold stores are available.

But most of medium sized fish as skipjack as well as herring fish is usually processed to smoked fish by Mammy Groups and sent out. Some fish is processed to dried fish or salted fish.

2) Fuel

Fuel prices in Ghana and Ivory Coast are shown as below:

* Ghana : US\$ 215

* Ivory Coast: US\$ 250-260

At present, the fuel price in Ghana is cheap mainly because of the difference of foreign exchange rates. But A-class heavy oil is available in Ghana, while it is possible to purchase various classes of heavy oil such as A, B, C classes in the Abijian Port.

(3) Present Conditions of Cold Storage

17 units of cold storage facilities are utilized in Tema for the purpose of the temporary storage of skipjack or tuna and the other products having usable total capacity of 30,522 mt. The companies owning the cold storage facilities are listed in Table 2-14. Four facilities marked with * on the table, whose total capacity is 11,201 mt, are used for tuna transshipment.

Table 2-14 List of Storage in Tema

(unit: mt)		
Name of Company	Specified Capacity	Usable Capacity
* Afko Fisheries	3,000	3,000
* Mankoadze Fisheries	5,000	5,000
* Pioneer Cooperative	1,000	1,000
*Tema Food Complex	5,000	2,201
State Fishing Corporation	11,500	6,000
Tema Cold Stores	800	800
Castle Cold Stores	25	25
Ocean Fisheries	800	800
Atok Fisheries	800	800
Kiku Co., Ltd.	1,400	1,400
Atlantis Ice Co., Ltd.	170	170
Kaleawe Cold Storage	500	500
Kaas Cold Storage	2,000	2,000
Nova Complex Ltd.	3,000	3,000
Lamas Cold Store	1,000	1,000
Friogha Ltd.	2,000	2,000
Aquona Ltd.	826	826
Total	38,821	30,522

(Source: Fisheries Dept.)

In order to examine the condition of utilizing the said cold stores for transshipment, the relation between the fish landing and the exported fish volume is taken into consideration, which shown in

Table 2-15. (Note: Exported fish volume includes the volume directly transshipped to the vessel for export.)

Table 2-15 Annual Fish Landing and Exported Volume of
Skipjack and Tuna (unit : mt)

	1987	1988	1989	1990	1991
Fish Landing	33,465	35,433	32,294	40,602	37,794
Exported Volume	26,290	29,571	21,543	28,253	24,938
Domestic Consumption	7,175	5,862	10,751	12,349	12,856

(Source : Fisheries Dept.)

Taking an example of 1991 from the table, the condition of utilizing the cold storages are understood to be used as follows:

Since the annual landed fish in 1991 is 37,794 mt and it includes the volume directly transshipped to vessel for export corresponding to 30% of the exported volume, the fish volume stored in the cold storages in Tema is calculated as follows:

$$24,938 \times (1 - 0.3) = 17,457 \text{ mt}$$

Considering that the above calculated volume is stored in the cold storage facilities for transshipment and present capacity of those facilities is 11,201 mt, the turnover rate per year is calculated as follows:

$$17,457 / 11,201 = 1.6 \text{ (turnover/year)}$$

Since an ordinary turnover rate is defined as about 3, the present capacity of the cold stores leaves room to accommodate additional fish. But from the interviews to the fishing companies at the time of field examination, they desire that a new cold store be installed near the landing wharf because of congestion of the fishing harbour and a long distance transport to the cold storage facilities in Tema City.

Consequently, it is understood that the cold stores now in use have enough capacity for storing the landed fish for the purpose of transshipment. However, considering the increase of discharged fish in future, a new cold store adjacent to the wharf is expected to be constructed.

2.4 Fishing Ports in Ghana and their Current Conditions

The Republic of Ghana faces the Guinea Bay with a 560 km coastal line which comprises mostly sandy beaches and occasional cliffs. The topography offers easy access to the sea and canoe and inshore fishing are conducted along the coast line. The fishery activities are being carried on at many fishing communities that range from several household villages to medium sized cities. There are several fishing centres or those with potentials of becoming fishing centres to supply fish to the cities inland.

2.4.1 Summary of Major Fishing Harbours

Major fishing harbours shown in Fig. 2-2 are summarized below.

(1) Ada

Ada is located in the estuary of River Volta and offers an excellent fishing ground for coastal trawling. Improvement as a fishing base is desired. Before completion of Volta Dam, the calm waters within the estuary served as a basin for small crafts. As a sand bar at estuary was formed along the shoreline after the construction of the dam, fishing boats can navigate only during the high tide, thus impeding its functions as a port and decreased the number of boats engaged in fishery gradually decreased.

There is a pond of about 3.6 m depth in the estuary that is being used by ships for landing of the fishes. A small jetty and two slipways used for repair of fishing boats of up to 21 m length comprise the fishing port facilities.

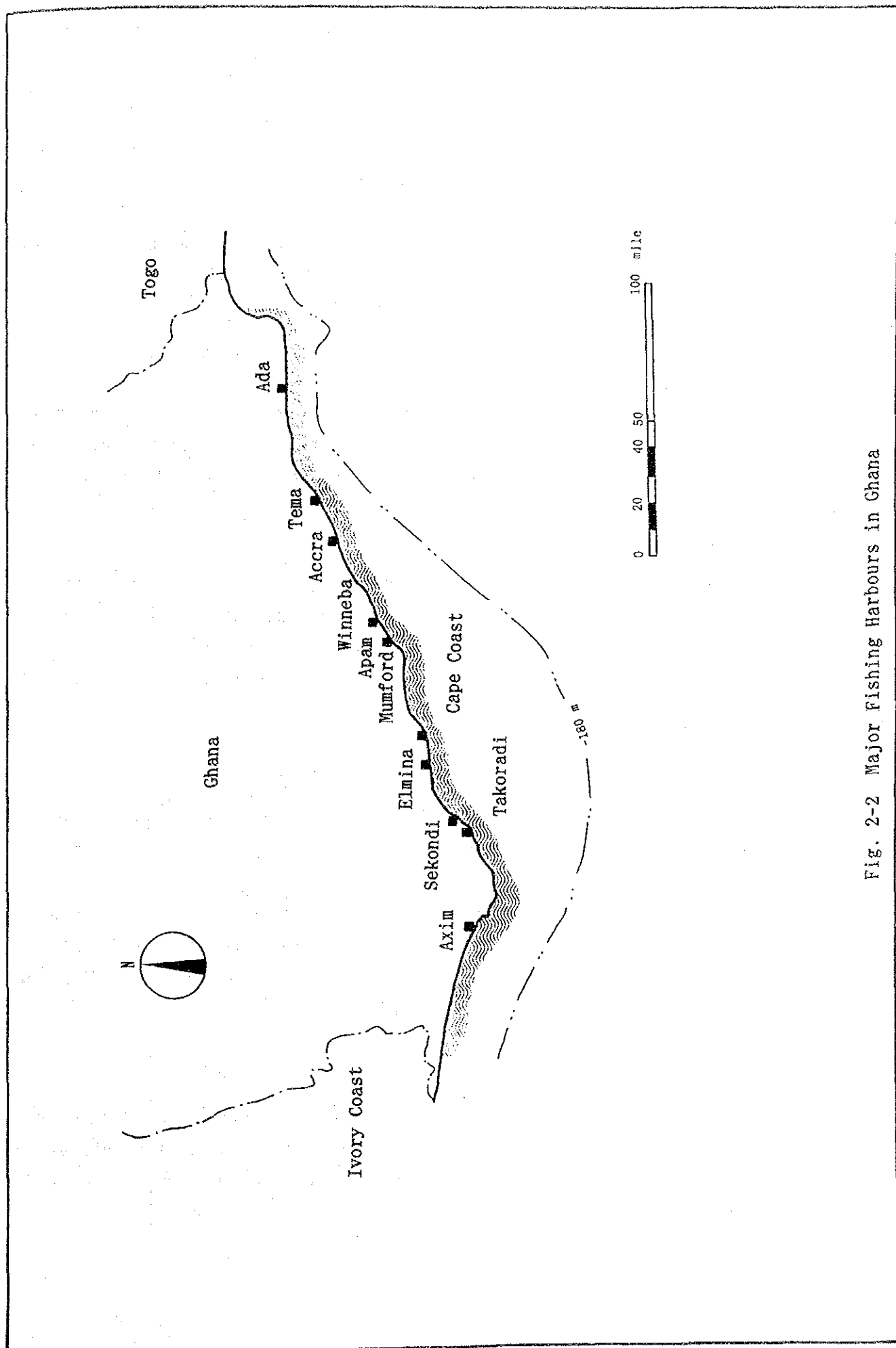


Fig. 2-2 Major Fishing Harbours in Ghana

(2) Accra

Accra is located in James Town District which is about 30 km from Tema. The fishing harbour area protected by an old jetty in the west is congested with many canoes. Canoes are pulled ashore to land fish. The harbour neither has the quay facilities with the calm waters, the repair facilities for fishing vessels nor sufficient areas for berthing inshore fishing vessels.

(3) Winneba

Because there is no calm waters in Winneba which is about 80 km from Tema, inshore fishing vessels cannot berth here except during the calm season. Canoes use the sandy beaches to land their catch.

(4) Apam

Apam is located at about 100 km west of Tema Fishing Harbour and was developed as the landing site for canoe fishery. From 20 to 30 owners of inshore fleet live here, but their vessels operate around Tema or Secondi Fishing Harbours. This is because Apam lacks calm waters and repair facilities.

(5) Mamford

Mamford is located about 5 km west of Apam and serves both canoes and inshore fishing vessels of longer than 10 meters. Predominant swells are prevented by the cape which creates a comparatively calm area behind it. As no vessel can berth there during rough weather, some are based in Tema but most tend to seek their base in Elmina located west of Mamford. There is a slipway, but fishing ships of larger 9 to 10 m cannot be repaired.

(6) Cape Coast

A small fishing village in Cape Coast is for canoes which use the sandy beaches. The State Fishing Corporation has a 250 ton cold store and an ice making machine here, but they sometimes fail to operate properly.

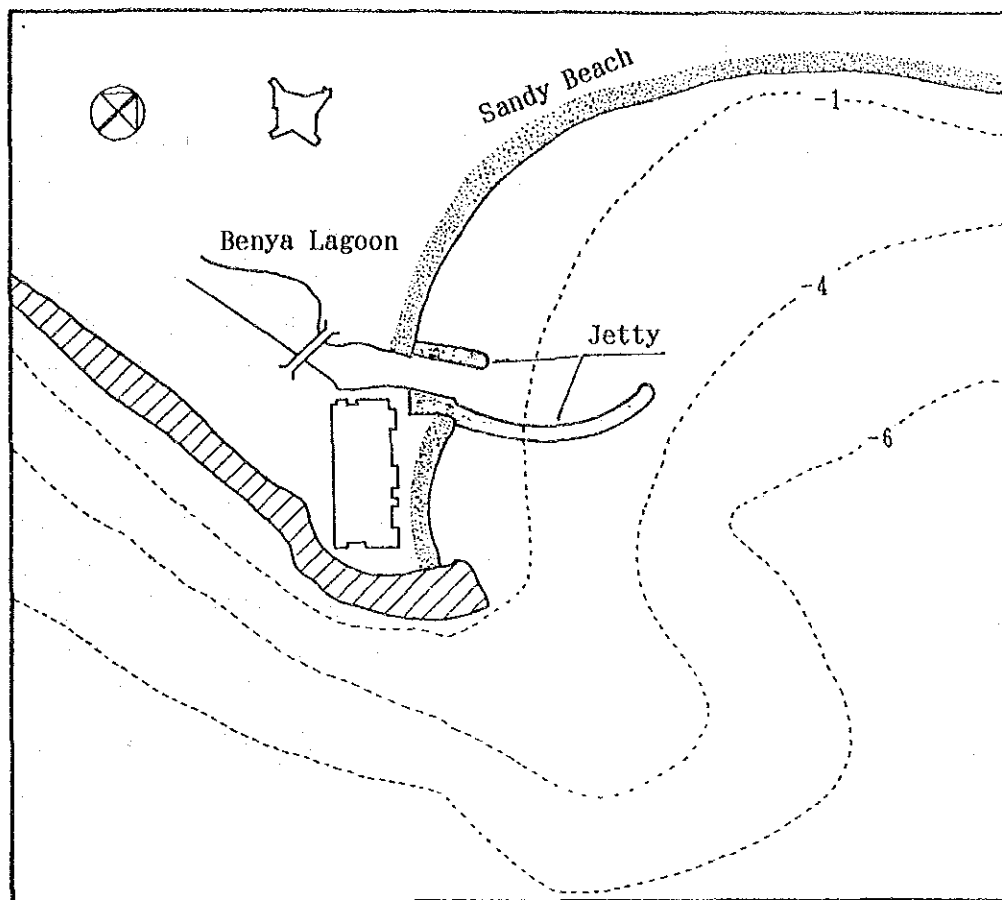


Fig. 2-3 Elmina Fishing Port

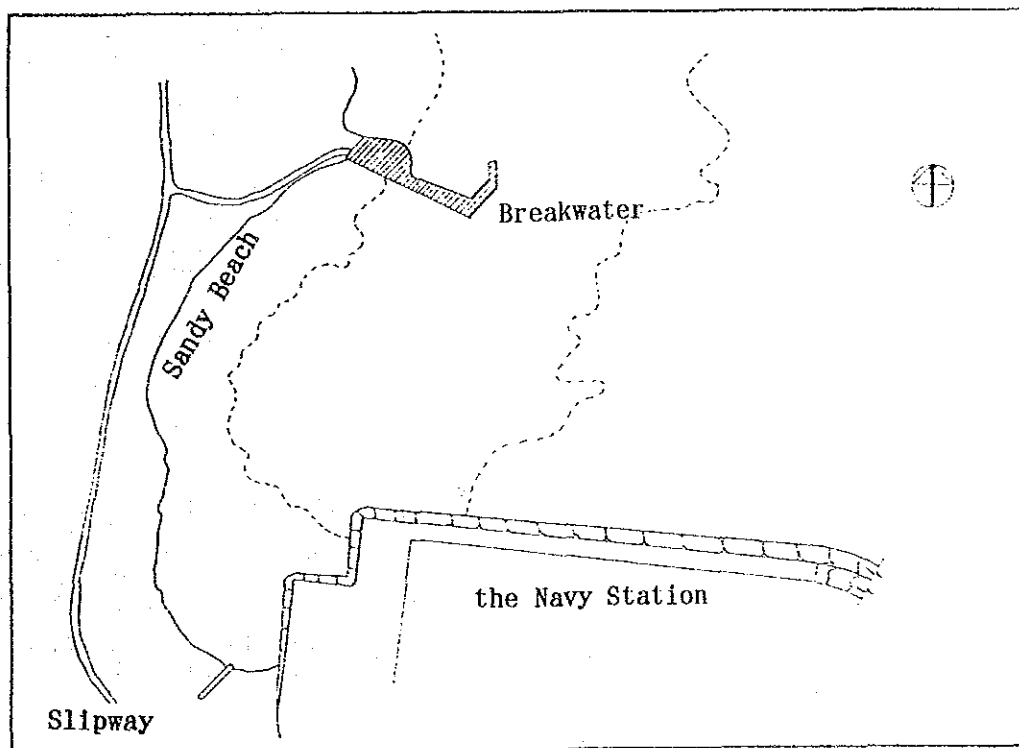


Fig. 2-4 Secondi Fishing Port

(7) Elmina

Elmina Fishing Harbour located 170 km from Tema plays a central role in canoe fishery in the western part of the country. The continental shelf extends toward the south off this area, offering an excellent fishing ground. Elmina is favored by the geographical conditions of its proximity to the fishing ground and a large hinterland as Kumashii.

Fig. 2-3 shows the layout of Elmina Fishing Harbour. There are two old jetties at the port entrance. Canoes and inshore vessels are moored in lagoon, but their access is hindered by closure and a bridge in the middle of the harbour entrance.

Facilities include a private repair shop for wooden boats and several small government workshops.

(8) Sekondi

Inshore vessels use the northern waters adjacent to a naval port. As it is protected from predominant swells, the water is comparatively calm. Except in emergencies, the navy forbids the use by their call to the Port.

While Sekondi enjoys advantages of proximity to excellent fishing grounds as Elmina, roads in the neighborhood are very narrow and the harbour area along the coast is also very narrow, and fishing activities are not as active as in Elmina.

(9) Takoradi

Takoradi was constructed as the second biggest commercial harbour next to Tema. Similarly to Tema Harbour in the early days, it has no infrastructure for a fishing port. The inshore fleet uses the commercial wharves for landing their catch when it is open. Canoes use the nearby beaches to land fishes.

(10)Axim

Axim is located about 70 km from Takoradi Port and about 100 km from the Ivory Coast. Although canoe fishery is being carried out actively, access to other big cities is poor. The State Fishing has a 20-tonne class cold storage here.

2.4.2 Present Situation of Tema Fishing Harbour

As can be seen from Fig. 2-5, Tema Fishing Harbour is located immediately adjacent to the Commercial Harbour and comprises the Inner Fishing Harbour and the Outer Fishing Harbour. Fig. 2-6 and Fig. 2-7 show details of the fishing harbour facilities, which are outlined as follows:

(1) Basic facilities of the Fishing Harbours

1) Infrastructure

*Inner Fishing Harbour

The Inner Fishing Harbour has a protected water area of 12 hectares and a canoe basin of 5.25 hectares.

The North-South Quay is some 327 m long, on an alignment parallel with the centerline of the main Lee Breakwater of the Commercial Harbour, and used mainly for landing. The depth of at least 5 m is secured in the basin and near the quay wall. The East-West Quay is at right angles to the above mentioned North-South Quay, is about 220 m long, and the quay depth is maintained at about 4 m.

The Finger Jetty is located near the Fish Market buildings and extends some 60 m at right angles of the E-W Quay.

In addition to these facilities, the following facilities were constructed and refurbished from 1989 to 1990 under the Japanese Government's grant aid programme.

- Lay-by wharf (100 m long, 3.5 - 4.0 m water depth): cellular block structure
- Lay-by mooring (155 m long): cellular block structure

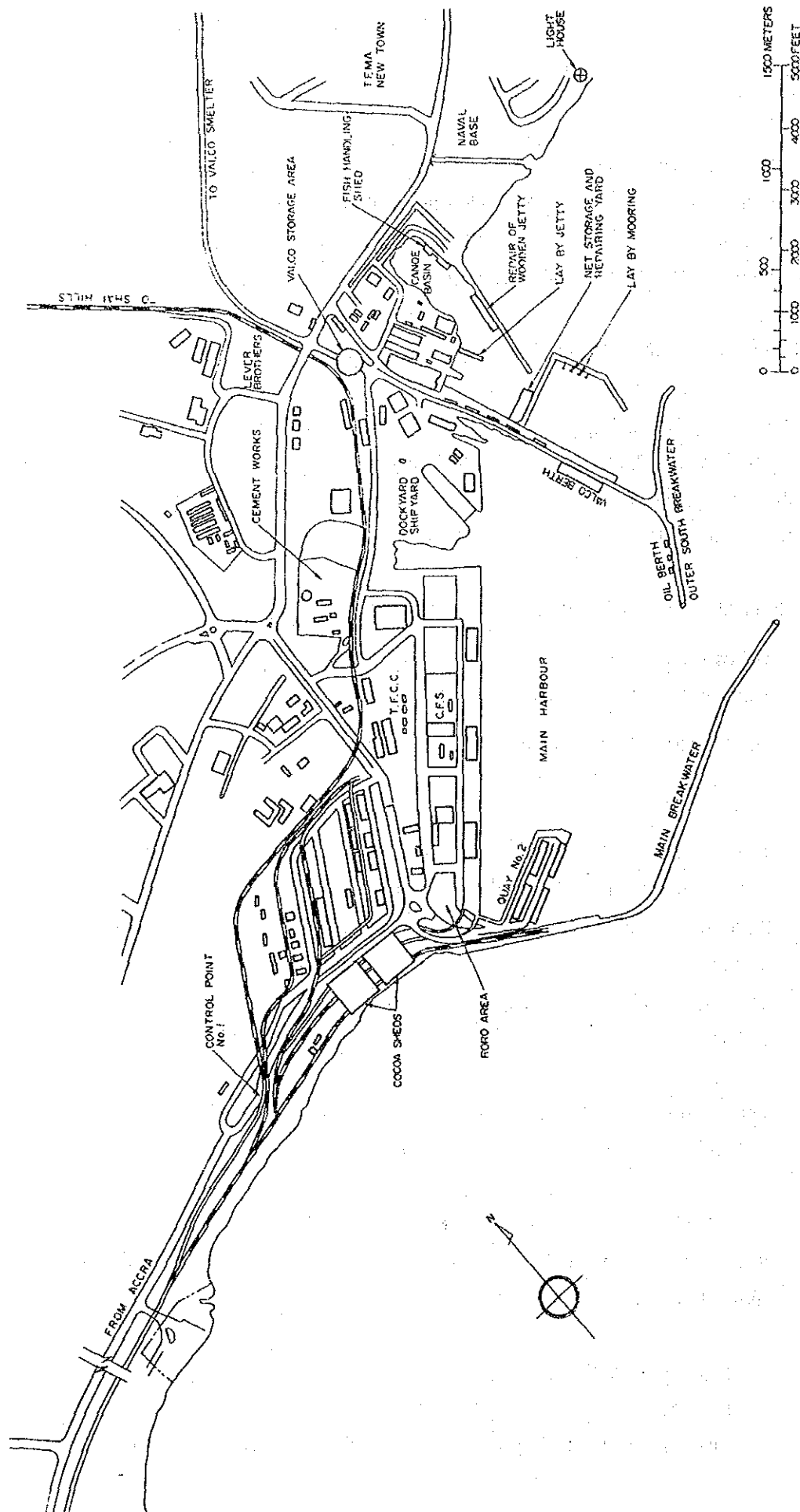
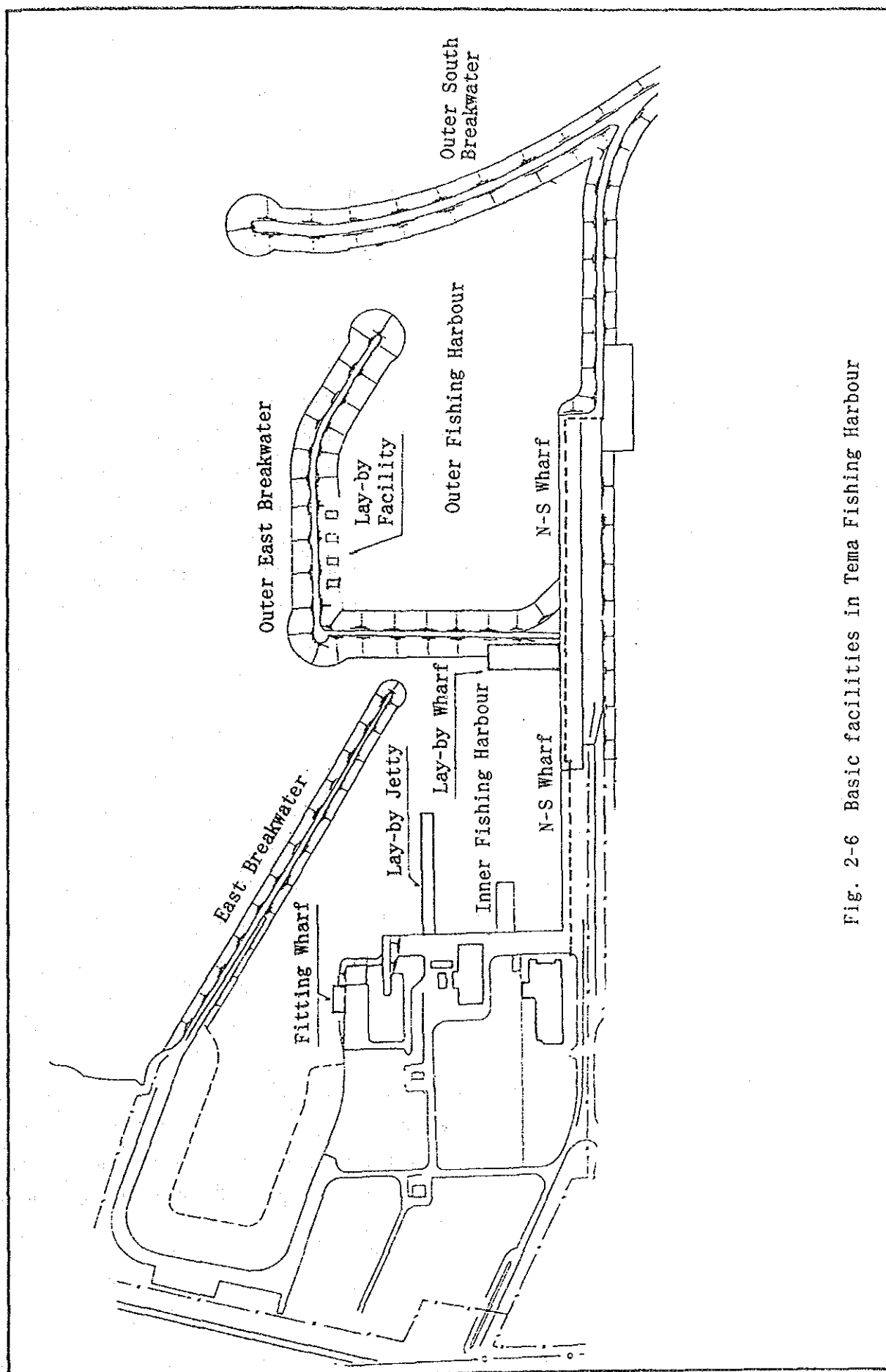


Fig. 2-5 General Plan of Tema Port



- Repair of fish market hall:
repair of roofs and walls, installation of stall facilities
- Installation of water pipes and wiring

These facilities are still in use and highly evaluated by the Ghana Ports and Harbours Authority, the administrator of the Fishing Harbour, and the Government of Ghana.

* Outer Fishing Harbour

The Outer Fishing Harbour basin is surrounded by the Outer East Breakwater and the Outer South Breakwater, and its use began in 1985. Facilities in the harbour consist of the existing N-S Quay extending for 210 m and the lay-by facility built under Japan's grant aid. The former is of concrete blocks similar to the N-S Quay of the Inner Harbour, and the latter is of an H-steel piled jetty. The water depth is not uniform, but 6 - 7 m depth is secured.

2) Functional Facilities in the Fishing Harbour

* Water supply

Faucets are provided at 10 points along the existing quay of the Inner Harbour, with the pipe extending along the existing quay wall of the Outer Fishing Harbour. If the pipe is further extended, the water supply system can easily be installed for the planned quay in the Outer Harbour.

* Oil supply

Ghana Bunkering Service Ltd. (GBL) has an 800 tone storage tank inside the Outer Fishing Harbour. The tank has oil supply lines along the quay walls in the Inner and the Outer Harbours to supply fuel to fishing vessels. Thus, the supply of fuel as well as of water is quite easy for the Outer Harbour.

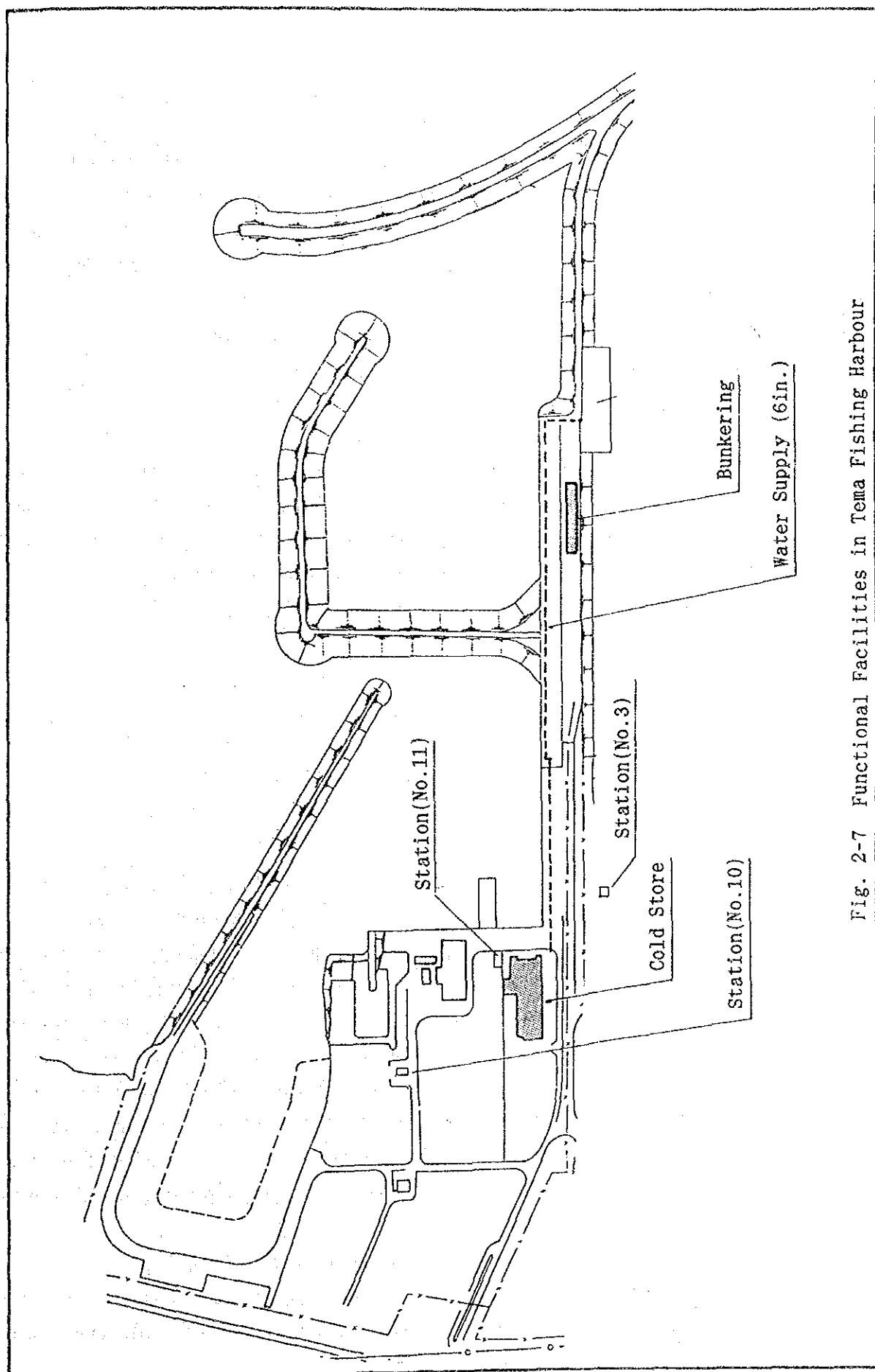


Fig. 2-7 Functional Facilities in Tema Fishing Harbour

* Electricity

There is No. 3 Station to supply electricity to existing facilities. 500 KVA, three phase, 11,000 V power is converted to three phase, 415 V, 50 Hz. A new substation may become necessary if an ice storage is to be built in the future. Service is obtainable by using the existing power line.

* Ship repair shop

Ghana Industrial Holding Corp. (GIHC) operates a ship repair shop which includes a slipway in the Inner Fishing Harbour at Tema. Annually an average of six wooden ships having length of between 8 and 21 meters is built here. Without the facility to hold a fishing boat on the slipway, there is a considerable lag of boats waiting for repair.

(2) Current Status of Tema Fishing Harbour

1) Use of Quay Wall

i) Inner Fishing Harbour

This harbour is presently used by the inshore fleet and some of the pole-and-line tuna vessels. About 150 inshore vessels as well as some of the 36 tuna vessels have been based in the Inner Fishing Harbour, since landing by the ships under the Ghanaian flag was obliged to land fish only in Ghana in 1991. Many of these vessels are beyond their economic lives, and some are not operating because of the difficulties in obtaining essential spare parts. According to 1991 statistics, non-operational vessels account for about 170, which is larger than a number of operating vessels. Currently, three or four vessels are constantly moored alongside vessels each other.

They often wait open berths for landing there because no exclusive quays are available under congestion by inshore vessels and all of

them are allowed to use the wharves in main port for landing when berths are available.

ii) Outer Fishing Harbour

This harbour is presently used by the offshore fleet, mainly by 32 trawlers. Most of the tuna fleet seem to use either the Commercial Harbour or the Inner Harbour, but occasionally use the Outer Harbour when these harbours are congested. The Harbour has three berths servicing large trawling vessels but one of these is constantly occupied by six or seven fishing vessels moored alongside them each other. Therefore, there are only two berths that can be used in this harbour. Non-operational and worn-out fishing boats are berthing with long idling at these wharves and play a role as suppliers of engine spare parts to operational boats. Fishing boats mooring at the lay-by wharf along the Outer East Breakwater play the same role as above.

The number of the berths in the Outer Harbour is clearly inadequate to accommodate the existing fishing vessels. In order to make up for this shortage, three to six vessels are moored alongside, and they are moved as follows to make room for a vessel entering the harbour for landing the catch.

A tug boat moves several moored vessels from the wharf, berths the vessel that has entered the port, and then moors those vessels that have been moved to the newly berthed boat sideways. Tuna vessels entering the Inner Harbour for landing are berthed similarly.

2) Fishing Handling

Fish catch is landed with multi-purpose mobile cranes which are sometimes used for construction etc. No machine solely for landing fish is available and fishing firms rented them from private lessors. Such situation sometimes results in shortage of mobile cranes for landing fish and delaying the landing fish with long waiting in the harbour.

3) Security in the Fishing Harbour

Vehicles entering to the fishing harbour is strictly checked for security while access to the fishing harbour is almost free for people who sell and buy fish around the wharves. The pilferage of the landed fish is so often in the fishing harbour. Pilferage of skipjacks and tunas costing more than other fish is serious problems for fishing firms.

4) Traffic in the Fishing Harbour

There are many obstacles such as protection for electric lines to fishing vessels being moored in the Outer and Inner fishing harbours. In addition, private cars and trailer trucks engaged in fish handling cause traffic congestion in the fishing harbours. The road around the exit and entrance of the fishing harbour area has insufficient width and one way traffic control system is applied there.

The approach to the exit near the canoe basin is also congested with pedestrian traffic. The problem of traffic congestion will be more serious with the increase of traffic for transporting fish when the new wharf is provided in the Outer Fishing Harbour.

5) Fishing Harbour Management Facilities

Tema Port and Tema Fishing Harbour are operated and maintained by the Ghana Ports and Harbours Authority. The Authority is organized with Headquarter, Tema Port and Takoradi Port and the directors of the ports are also involved in the Executive Directors of the Board.

Fishing Harbour Office is established under the GPHA and Fishing Harbour Manager is responsible for the management of the fishing harbours. The office's activity is for collecting port dues and landing charges and selling fresh water to fishing vessels. The manager's office which is located adjacent to the Fish Market does not have enough area to accommodate the other staff.

There is a branch office of Fisheries Department in the Fishing

Harbour and is responsible for fishing vessel's registration and repair, fishery statistics, and collection of duties on fish landed.

2.5 Background and Details of the Request

2.5.1 Background

The only fishing harbour serving as a base for these vessels in Ghana is the Tema Fishing Harbour. Both its Inner and Outer Fishing Harbours are extremely congested because of insufficient number of berths. Due to congestion coupled by the restricted use of quays at the Commercial Harbour, the tuna fleet moved to the Abidjan Port for landing, a well equipped fishing port in Ivory Coast.

The feasibility on the requirements for improving fishing harbours in the Republic of Ghana was studied between 1986 and 1987 with the cooperation from the World Bank in order to facilitate the fishing harbour and to obviate such a situation. The assessment results are discussed below.

- (1) For full development of bottom fish on the continental shelf, fishing vessels larger than the inshore vessels of less than 12 meters are required.
- (2) Increase of tuna catch is considered possible because of the enormous tuna resource still remaining under exploited. The resource commands high prices and their export will earn foreign exchange.
- (3) Operational efficiency of large sized trawling vessels is poor. Medium and small sized ones may enable efficient operation in EEZ or on open seas.
- (4) Elmina and Secondi may have the greatest potential for improving infrastructure besides Tema. The construction cost for Secondi is estimated at US \$19 million with Internal Rate of Return at about 20%, and that for Elmina is US \$26 million with IRR of about 14%.

- (5) Following facilities are required to accommodate inshore fishing vessels based at Tema Inner Fishing Harbour and the fishing vessels entering the Harbour during sardine season.

- * Lay-by wharf
- * Repair of motorboat wharf
- * Outfitting quay

The construction costs for the above items are estimated to be US \$3 million and IRR at 20%.

- (6) By improving Tema Outer Fishing Harbour as a tuna fishing base, the landing operation by fishing boats under Ghanaian flag can be moved from Abidjan to Tema. Following infrastructure is envisaged.

- * Landing wharf : 230 m
- * Lay-by wharf : 200 m (total 400 m)
- * Mooring area : depth 7 m, length 300 m

The construction cost is estimated to be US \$12 million and IRR as 59%.

Based on the study results, the Government of Ghana established the Inner Fishing Harbour Rehabilitation Project for inshore vessels in 1988 and requested the Japanese Government to implement the Project. The Project was completed within two years, in 1990.

Following revision of "Fisheries Law" in 1991, fishing vessels under the Ghanaian flag have been urged to land fish catch in Ghana and the Tema Port and Fishing Harbour has been the tuna fishing base. However, both the Inner and the Outer Fishing Harbours in Tema do not have sufficient landing quays, these ships have been experiencing difficulties not to enable free landing when necessary.

Against such a background as above discussed, the Government of the Republic of Ghana requested the Japanese Government to implement the rehabilitation of the Outer Fishing Harbour, particularly construction of the landing wharf, based on the result of the study report under the World Bank.

2.5.2 Details of the Request by the Government of Ghana

(1) Request by the Government of Ghana

The Government of Ghana made the following requests for implementation of Tema Outer Fishing Harbour Rehabilitation Project under a Japanese grant aid scheme.

* Tuna landing wharf

A 230 meter landing wharf as an extension of the existing wharf to accommodate five berths at one time. The hinterland will be reclaimed as the site for fishing harbour.

* Reclamation of about 23,000 m²

A landing wharf connected to the existing wharf and reclamation of the hinterland to build a cold storage facility, an administrative building and support facilities for tuna fishery.

* Administration building

An administration building of 600 m² in the total floor area to house GPHA office, customs and port health services, fishery company offices, cafeteria, toilets, etc.

* Security fencing and security check-house

Security fencing to be installed along the boundary of the reclaimed area to separate this tuna base and prevent theft of fishes landed.

* Tuna Unloading Service Equipment

- Ten units of movable conveyor to unload the vessel-frozen tuna to a container, with two units of trailer

- Ten units of 2.5 tone forklift to carry tuna to/from the storage
- 3,300 units of 1 tone container

* Support Facilities

Fuel and water supplies

Lighting

Sewage and drainage

Fire fighting, etc.

(2) Confirmation of Request

The following items were finally requested by the Government of Ghana after discussions with the both parties.

- 1) Tuna Landing Wharf
- 2) Land Reclamation for Necessary Functional Facilities
- 3) Administration Building
- 4) Security Fencing with a Security-guard House
- 5) Support Facilities

CHAPTER 3

CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3.1 Objectives of the Project

Tuna fishery in the Republic of Ghana not only serves as a source of animal protein supply but also earns precious foreign currency by transshipment of tuna for export. After the Fisheries Law was revised in 1991 to prevent drain of foreign currency and to increase domestic fish consumption, fishing vessels under Ghanaian flag that used to land in Abidjan began to land their catch at the Main Port and Fishing Harbours in Tema. This resulted in congestion of the Fishing Harbour and restriction in use of quays in the Commercial Harbour, thus hampering the landing operation of tuna fleet.

The project aims at establishing a fishery base comprising wharves for tuna vessels in order to secure stable supplies of animal protein by improving the landing efficiency of tuna vessels and the management of fishing firms.

3.2 Evaluation of the Request

3.2.1 Validity and Necessity of the Project

Marine fishery in Ghana centers around Tema as the inshore fleet and the deepsea trawlers and tuna fishing vessels concentrate at Tema Fishing Harbours. They have a large hinterland in Accra and Tema which render a large consuming area, and the Tema Port and the Fishing Harbours provide better port services than other fishing harbours.

Inshore vessels using the Inner Fishing Harbour mainly land the catch at the wharves in front of fish market buildings, but also use a part of the lay-by berth when the former is congested. Large deepsea trawlers mainly use the Outer Fishing Harbour for landing and laying. Before 1991, fishing vessels under Ghanaian flag used to land their catch in a much better equipped fishing port of Abidjan in Ivory Coast. This meant drain of foreign currency, inability to secure adequate catch for Ghanaian people and management problems arising from extra voyage costs between Tema and Abidjan. Fishery companies had been, however, obliged to continue the operation because there was no

facility in Tema Fishing Harbour for landing tuna at any time they wanted.

On the other hand, the World Bank's 1985 Report on Tema and Takoradi Harbours recommended improvement of the operational efficiency of these commercial harbours to make up for the shortage of berths and cargo handling capacity. For promotion of the above, accommodating the tuna fleet in the Fishing Harbours was proposed. But the Fishing Harbours was then already severely congested and the need for a new fishing harbour was keenly felt. The Government of Ghana investigated improvement of fishing harbours, planned a lay-by mooring in Tema Inner Fishing Harbour to serve the inshore fleet and a new wharf in the Outer Fishing Harbour to serve as a base for tuna fleet.

In 1991, the Ghanaian Government revised its "Fisheries Law" and required fishing vessels under Ghanaian flag to land the catch only in Ghana. This forced the tuna vessels under Ghanaian flag to conduct their operations based at Tema Fishing Harbour, the only harbour with adequate operating conditions. This in turn required the Harbour to further improve its conditions as the base for tuna fishing.

As the Inner Fishing Harbour is already saturated with inshore vessels and the depth at the wharf is only 5 meters, it cannot accommodate all the vessels of the tuna fleet. While the depth to accommodate the tuna fleet is secured in the Outer Fishing Harbour, there are currently several trawlers always lying alongside the wharf, requiring removal of ships if a ship wished to land its catch at the existing quay. Thus, tuna vessels and offshore trawlers are forced to use the wharves in the Main Port for unloading. This naturally hampers the efficient use of the wharf in the Commercial Harbour, and fishing vessels with low priority of wharf use are compelled to lay.

When considering the significant roles of tuna fishery in supplying animal protein and earning foreign currency, the wharves' shortage to impede promotion of tuna fishery should immediately be rectified. The Outer Fishing Harbour where calm waters are secured is considered optimal as the project site as recommended by the World Bank report. With improved facilities for the Fishing Harbour, the operational efficiency of tuna fleet will be enhanced, and sound management of fishery companies and stable supply of animal proteins to the people of Ghana will be secured.

It is concluded that implementation of this Project to remove bottle-necks in promoting tuna fishery is adequate as a grant aid programme.

3.2.2 Operation and Management Plan

(1) Management of the Fishing Harbour

After completion of the Tema Outer Fishing Harbour Rehabilitation Project under a grant aid from Japan, Ghana Ports and Harbour Authority (GPHA) will be in charge of its operation as was the case of "Tema Fishing Harbour Rehabilitation Project" that was completed in 1990. GPHA is the administrator of entire Tema Harbour and Takoradi Harbour, and is a financially independent body earning income through cargo handling in ports and harbours. GPHA reports to the Ministry of Transport and Communications, and management decisions are made by the Board of Directors including the representatives of the Ministry.

The GPHA's budget is shown in the Appendix A-3.2.2-1; for 1991, total income is about 19.3 billion cedis and total expenditure about 14.3 billion cedis, and the net profit about 5 billion cedis. As for Tema Harbour, the total income was about 13.4 billion cedis and the total expenditure about 4.3 billion cedis, the net profit being about 9.1 billion cedis for the same year. The net profit for Takoradi Harbour is about 2 billion cedi.

Income for both harbours is generated from cargo handling. In Tema, the ratio of cargo handling at the wharf is highest at 45%, followed by stevedoring and ship operation. As for expenditures, personnel expenses account for about 50%, followed by maintenance and administrative expenses at 15% and amortization at 12%.

GPHA's management is thus in good condition, Tema Harbour making particularly excellent contribution.

The annual administrative and maintenance cost at Tema is about 730 million cedis, and the estimate for 1992 is about 1,050 million cedis.

GPHA has performed satisfactorily in management and administration of the facilities after completion of the Inner Harbour Rehabilitation Project.

It is judged that GPHA is fully capable of funding the facility management after completion of the Project.

(2) Administration of Fishing Vessels and Catches

Fisheries Department has a branch office in the Fishing Harbour to oversee vessel registration and repair, preparing fishery statistics and imposing tax on the catch of mainly inshore vessels, and registration and statistics of tuna fishery. However, the Fisheries Department imposes charges on the tuna catch depending on weight.

As Fisheries Department does not participate directly in the management of the Fishing Harbour, the same staff will continue to be responsible after implementation of this Project.