No. 4

BASIC DESIGN STUDY REPORT
ON
THE IMPROVEMENT OF FACILITIES OF NIGERIAN INSTITUTE FOR OCEANOGRAPHY AND MARINE RESEARCH
IN
THE FEDERAL REPUBLIC OF NIGERIA

AUGUST, 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Federal Republic of Nigeria, the Government of Japan has decided to conduct a basic design study on the Improvement of Facilities of Nigerian Institute for Oceanography and Marine Research and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Nigeria a study team headed by Mr. Takeo KOYAMA, Director of Fishing Geer and Methods Department, National Research Institute of Fisheries Engineering, Fisheries Agency from April 6 to May 2, 1986.

The team had discussions on the Project with the officials concerned of the Government of Nigeria and conducted a field survey in Lagos area. After the team returned to Japan, further studies were made, a draft report was prepared and a mission to explain and discuss it was dispatched to Nigeria. As a result, the present report has been prepared.

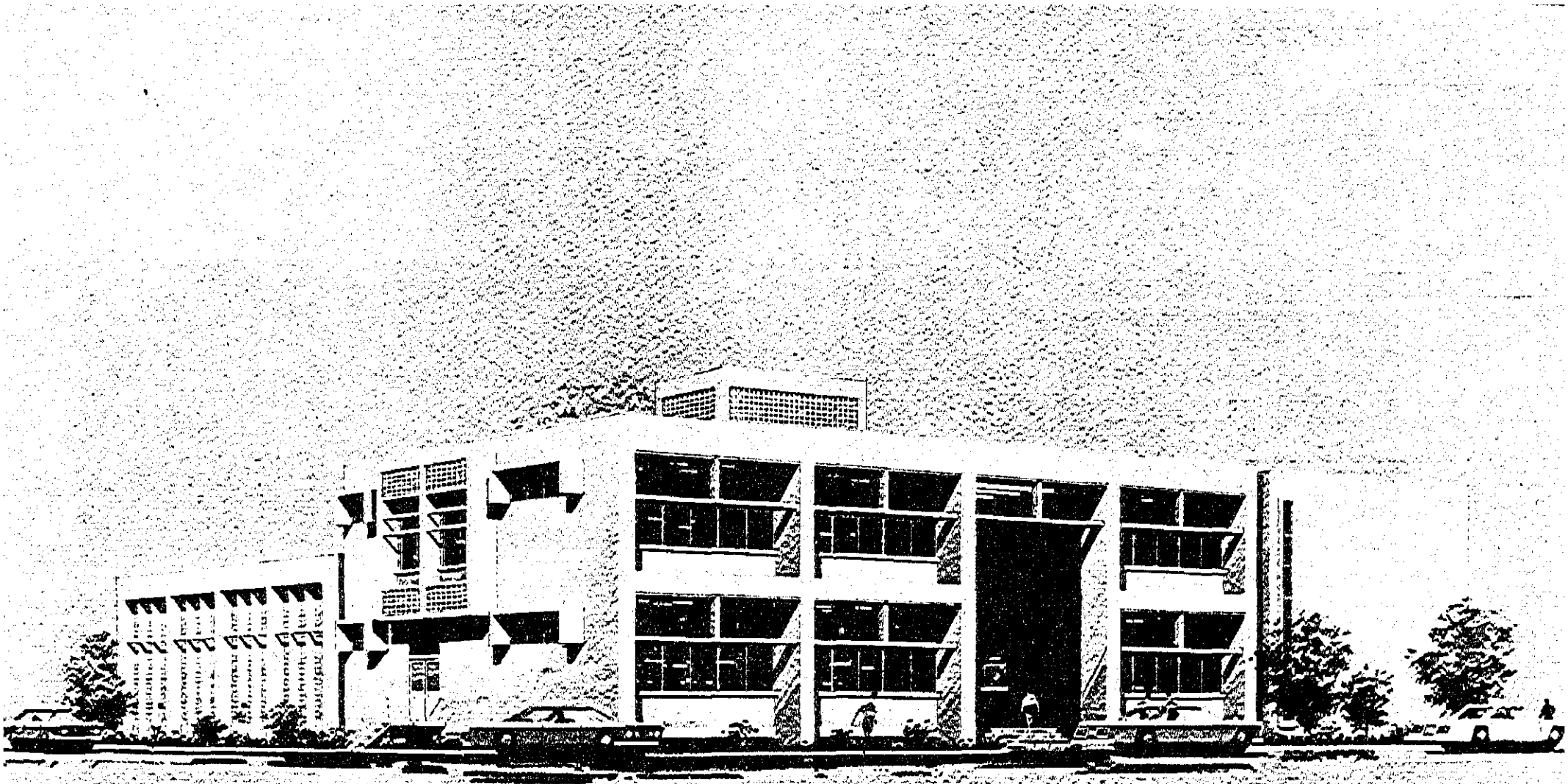
I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Federal Republic of Nigeria for their close cooperation extended to the team.

August, 1986

Keisuke Arita

Keisuke ARITA
President
Japan International Cooperation Agency



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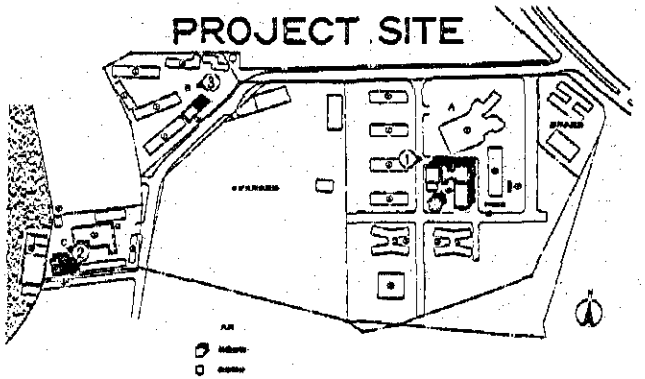
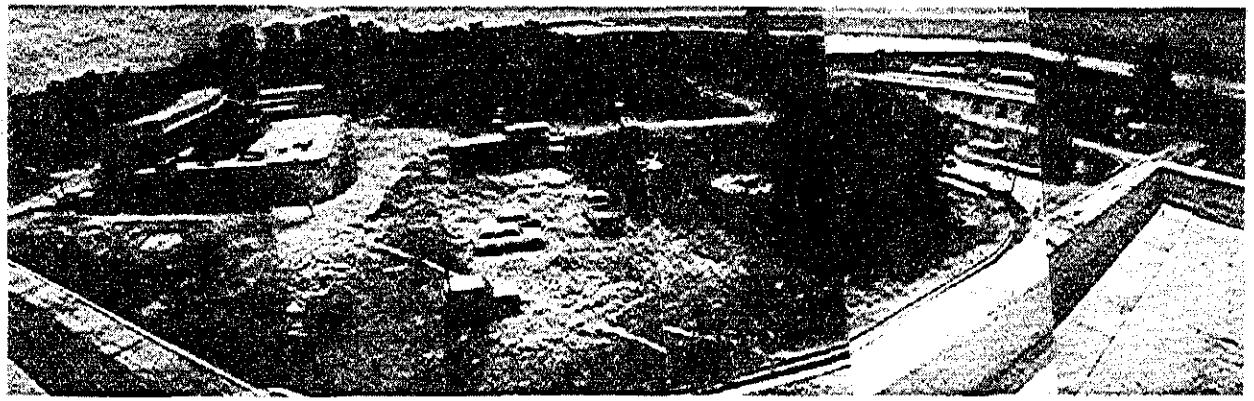
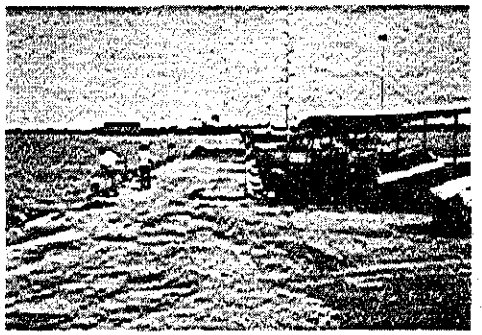
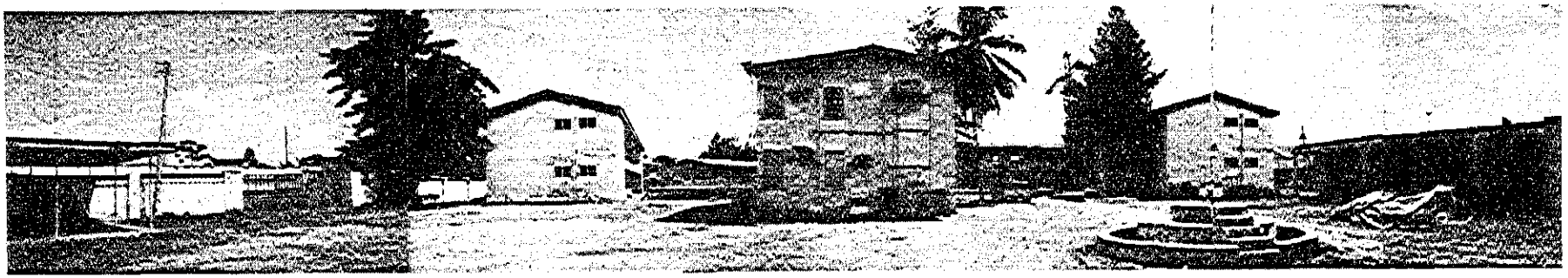




1 - Site for Fishing Technology Laboratory



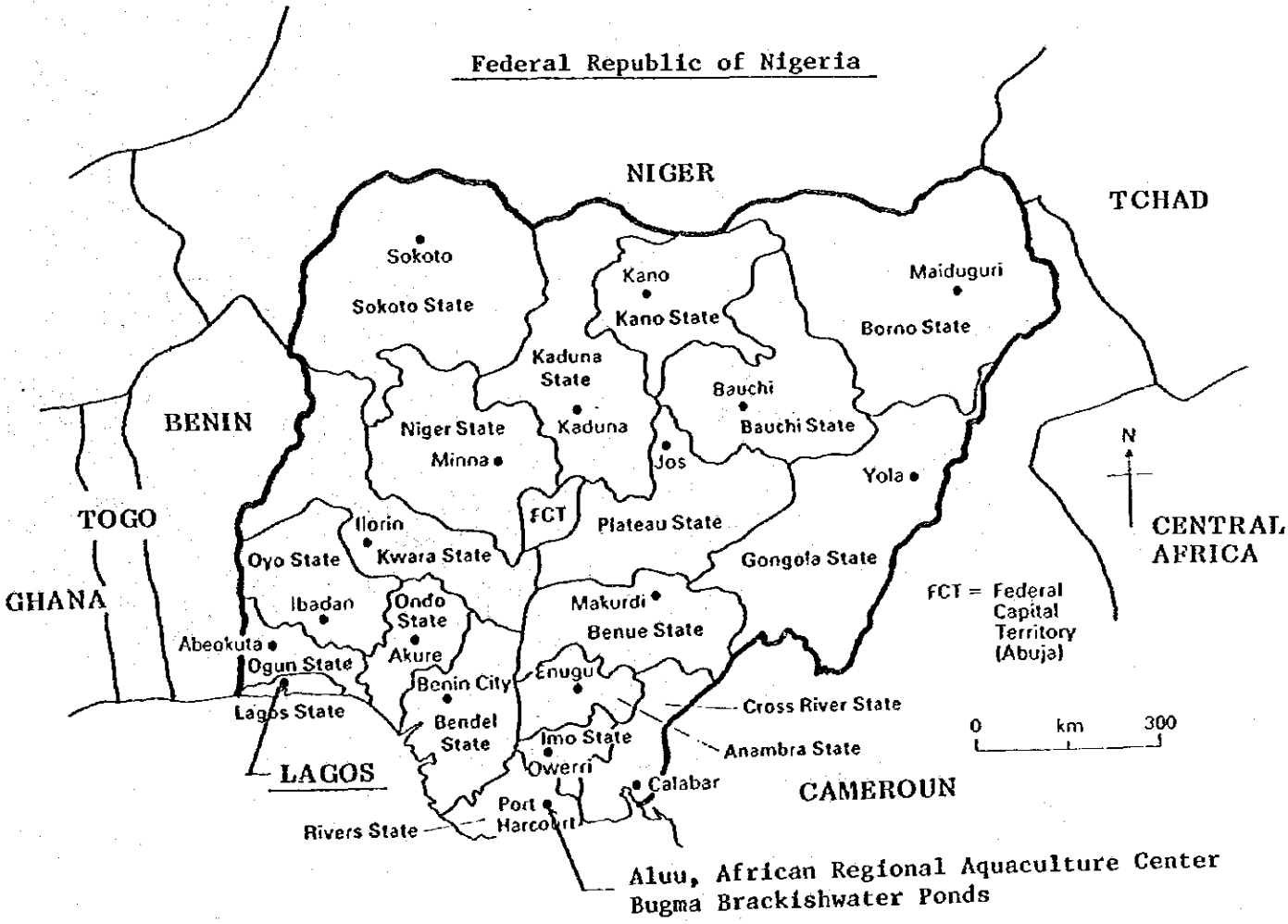
2 - Site for Improvement of Jetty



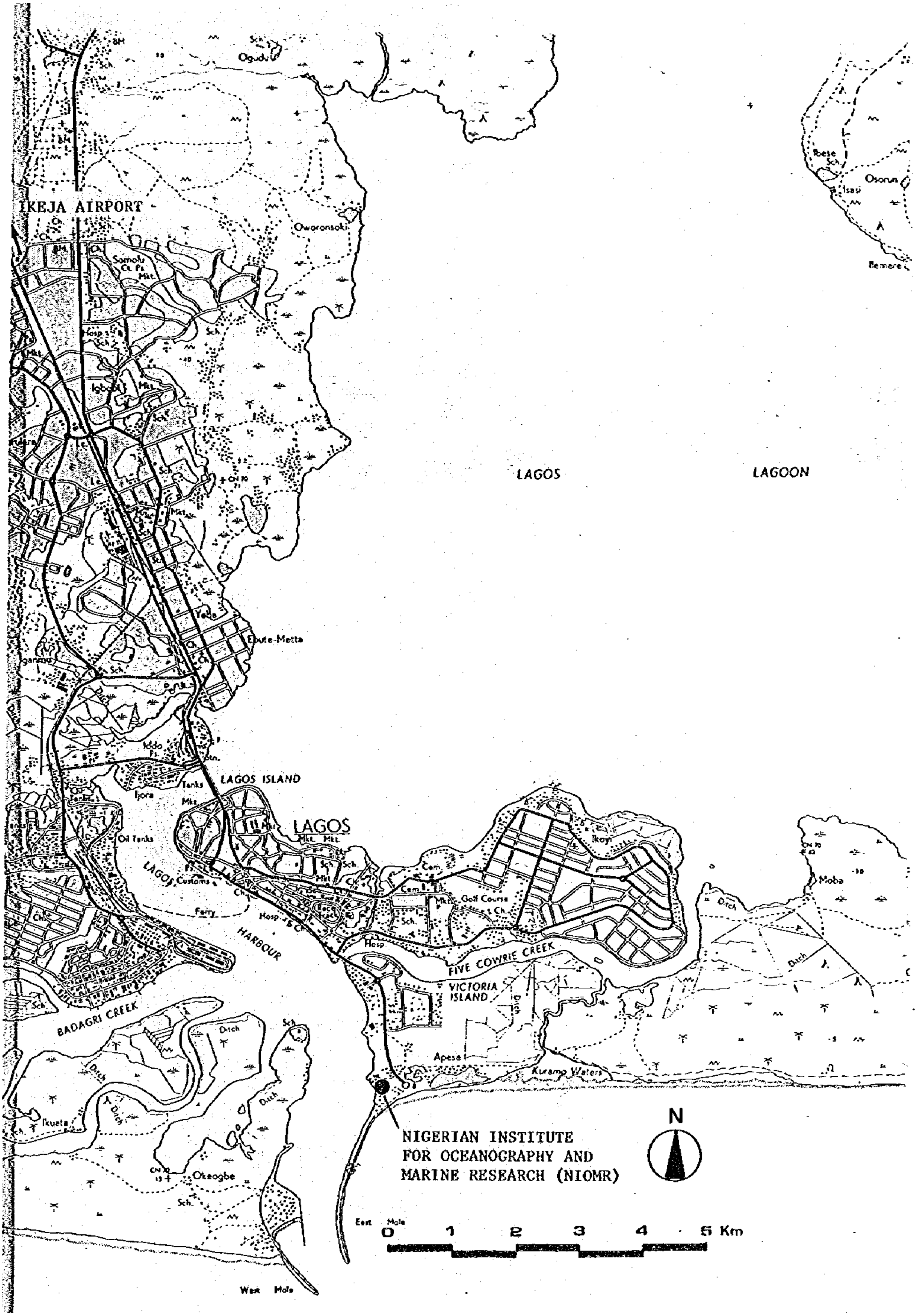
3 - Site for Federal Fisheries School

The Continent of Africa

Federal Republic of Nigeria



Aluu, African Regional Aquaculture Center
Bugma Brackishwater Ponds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BADAGRI CREEK
Ikueta
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NIGERIAN INSTITUTE
FOR OCEANOGRAPHY AND
MARINE RESEARCH (NIOMR)
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SUMMARY

The Federal Republic of Nigeria had enjoyed economic growth during the 1970s by developing its abundant oil resources. It was during this period that its economy came to be dependent on oil. The subsequent declining trend in the price of oil, however, is giving a serious impact on the country's economy. Nigeria which today is particularly lagging in the development of its primary industries such as agriculture and fisheries and in the establishment of a system of self-sufficiency in food cannot be said to be supplying adequate food to its population of some 90 million.

In view of the circumstances, the Government of Nigeria, in an attempt to remedy its oil dependent economic structure and to become self-sufficient in food, has established increased food production and the promotion of education as the major objectives of its Third Five-Year National Development Plan (1977 - 1981) and its Fourth National Development Plan (1982 - 1986). Both plans particularly emphasize the development of the fisheries industry which is the source of protein rich food as their urgent task. The Government, therefore, is aggressively engaged in fisheries development through its Federal Department of Fisheries, organizations relevant to fisheries of each State Government and the Nigerian Institute for Oceanography and Marine Research (NIOMR).

NIOMR is conducting research, development, survey and training relevant to fisheries development, and is aiming at expanding its research and development setup and intensifying its training activities, both of which are indispensable for increased fisheries production. In order to reinforce NIOMR's activities, Japan has extended its cooperation both economically and technically, including grant aid of research and training vessels twice in the past, equipment provision of navigation instruments, and dispatching of experts.

As a result, NIOMR has been achieving, although gradually, tangible results in the development of unutilized domestic fisheries resources and the development of manpower resources. However, with the deterioration of the country's economic condition since 1983, NIOMR is unable to maintain its momentum and improvement of services adequately which is hindering its effectiveness.

In view of the circumstances, the Government of the Federal Republic of Nigeria has formulated the project of improvement of facilities of Nigerian Institute for Oceanography and Marine Research covering the improvement of facilities and equipment necessary for reinforcing the activities of NIOMR and requested the Government of Japan for its grant aid cooperation. In compliance with this request, the Government of Japan through the Japan International Cooperation Agency, dispatched a basic design study team to Nigeria for the period between April 6 to May 2, 1986. to confirm the contents requested and to investigate the appropriateness of implementing it as a grant aid cooperation project and to determine the scope of necessary cooperation. Upon returning to Japan, the reasonableness of said project, the proper scale and the grade of facilities and equipment, the system for operation and management, project evaluation, etc. were carefully studied, as a result of which the following areas, facilities and equipment were included as the objects of Japan's cooperation.

(1) Expansion of Fisheries Production

1) Development of fishing gears and fishing methods

Construction of a fishing technology laboratory building (1,204 m^2)

2) Development of unutilized domestic fisheries resources

Small boats to be used exclusively for research on live baits necessary for skipjack fisheries development

Laboratory equipment and supplies necessary for aquaculture (fish farming) development

3) Development of fish processing methods

Cannery of an experimental scale for canning skipjack and sardine

(2) Intensification of Training Activities

1) Intensification of activities of the Federal Fisheries School

Construction of a classroom building including a mock-up bridge for accommodating the navigation instruments granted by Japan in 1981 (336 m^2)

(3) Provision and/or Improvement of Infrastructure Facilities

1) Modification and improvement of the jetty

Modification and improvement of the jetty for mooring NIOMR's two training and research vessels

2) Expansion and improvement of a maintenance system for equipment

Construction of a maintenance shop for maintenance and repair of the research and training vessels

This project has taken NIOMR's current budgetary situation into full consideration, and it is considered to be of a scale and contents sufficiently operable with NIOMR's present staff. In order to successfully execute the project, 19,510 Naira will have to be born by Nigerian side.

The period required for the manufacture, procurement, construction and delivery of the necessary facilities and equipment is 17 months after signing of Exchanging of Notes. The executing agency on the Nigerian side is the Nigerian Institute for Oceanography and Marine Research, whose prompt response in implementing this project is looked forward to as said Institute will also act, for the sake of conveni-

ence, as the consignee of the equipment and construction materials that will be shipped from Japan under this project. Judging from the past activities of said Institute and its way of utilizing the two research and training vessels granted under the past grant aid co-operation projects, there is no doubt that the facilities and equipment contained in this project will be utilized effectively and efficiently.

The smooth operation of this project is anticipated to bring about the following effects: NIOMR's research and development, training and extension functions will be reinforced by the construction of the fishing technology laboratory building and extension of the Federal Fisheries School; the efficiency of skipjack fisheries will be improved by the granting of boats for research on live baits for skipjack; canned products will be manufactured with the use of domestically produced raw materials, which will result in the improvement of aquatic product distribution and in the reduction in outflow of foreign currency by the elimination of the use of imported fishes. Also, improvement of infrastructure facilities will allow protective and stable mooring of the research and training vessels and improvement in the maintenance setup for equipment and materials, and thereby contribute to the smooth operation of NIOMR's various activities.

This project which will reinforce the functions of the Nigerian Institute for Oceanography and Marine Research, as stated above, is closely relevant to the two most important development strategies of Nigeria's National Development Plan, namely, increasing the food production and encouraging education. In this sense, it is judged to be most significant and opportune that the grant aid cooperation of Japan will be extended to the implementation of this project.

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CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

The Federal Republic of Nigeria had made great strides in developing itself during the 1970s supported by its abundant oil resources. However, the decrease in oil prices due to changes in the global supply and demand situation since then has seriously affected its economy. The Government, according to the policy line of its Third National Development Plan, thus places priority on promoting its primary industry, increasing food production and promoting education in an attempt to reform an economic system that has been too heavily dependent upon oil. With a large population (reported to be as high as 90 million) for whom the supply of food has been insufficient, the most urgent problem of the nation is the establishment of self-sufficiency in food production. Since 1983, however, the country's economic problem which had already assumed serious proportions by then, have been further aggravated by the enforcement of extremely severe import controls which in effect have even restricted the import of producers' raw materials, with the result that domestic production today is beginning to show signs of stagnation.

Increasing the production of food is a vital task for the nation, but particularly important and urgent is the development of its fisheries industry to provide its people with protein-rich food. The Nigerian Institute for Oceanography and Marine Research (NIOMR) which is under the jurisdiction of the Federal Ministry of Science and Technology is the organization in charge of research and development for the fishing industry. The Institute, with a staff of more than 300, is engaged in survey, research, development and training activities. It also owns two research and training ships, which were donated in 1980 and 1984 respectively under the grant aid programmes by the Government of Japan. Both ships have operated successfully. However, ever since 1983, as the economy took another turn for the worse with the result that the budget of NIOMR was drastically reduced, the Institute's research programmes have begun to be seriously affected.

It was against such a backdrop that the Government of the Federal Republic of Nigeria requested of the Government of Japan grant aid assistance for the Facilities Improvement Project of NIOMR in order to expand up its activities.

In response to this request, the Government of Japan agreed to implement a basic design survey to investigate the current state of NIOMR's activities in the Federal Republic of Nigeria, review the appropriateness of the facilities, equipment and supplies specified in the improvement project and determine the scale and scope of Japan's cooperation. Japan International Cooperation Agency dispatched a Basic Design Study Team headed by Takeo Koyama, Director, Fishing Gear and Method Division, National Research Institute of Fisheries Engineering, Fishing Agency of Japan to Nigeria between April 6 and May 2, 1986 for confirmation of the contents requested and to study the fishing situation and the activities of NIOMR. This Basic Design Study report compiles the results of analyses which were carried out in Japan on the basis of the field survey.

CHAPTER 2

PROJECT BACKGROUND

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2.1 Brief Description of the Federal Republic of Nigeria

The Federal Republic of Nigeria is bordered on the east by the Federal Republic of Cameroun, on the west by the Federal Republic of Benin, on the north by the Republic of Niger on the south and faces the Atlantic Ocean and the Gulf of Guinea. It has a land area of about 900 thousand square kilometers (approximately 2.5 times that of Japan). Its industry is centered on mining. In particular, its oil resources, which are said to be the fifth largest in the world in production volume, constitute the foundation of its economy. The recent change in the balance of supply and demand in the world oil market has reduced the quantity and value of its oil exports and added momentum to its economic difficulties. In contrast to its oil production however, the nation's food production by its agriculture and fisheries sectors, is small. The supply of food, particularly the production and supply of protein sources, for its population of around 90 million is far from sufficient.

In order for a cooperation project in Nigeria to be effective under circumstances such as those described above, it is necessary to analyze the present economic conditions as well as forecast their future.

2.1.1 Economic Trends

The incumbent administration has decided to postpone until 1987 the launching of the Fifth National Development Plan which had been scheduled to start from 1986. Instead, the administration has declared 1986 as the year of economic emergency, a year in which to aggressively push forward its policies to revive Nigerias economy which is its biggest headache today. Oil was the source of its satisfactory economic growth in the 1970s, and yet, it was also during these years that its overly oil-dependent economic system was formed. The government is

therefore orienting its policies toward rectifying its excessive dependence on oil for fiscal revenues by promoting the diversification of revenue sources and expansion of tax revenues. The highlights of the government's economic policies are, among others, 1) levying of a 30% surcharge on imports, 2) wages freeze for public servants and 3) cutting back on subsidies for oil products. The government intends to apply the incremental revenue of about 2.4 billion Naira which are anticipated to accrue from these measures as funds for promoting exports by stepping up the production of agricultural produce and for expanding and improving its educational system.

The government has appropriated 15.6 billion Naira for the 1986 budget under a strict austerity financing policy of freezing all new development projects, as a rule. However, oil revenues (with a 1.3 million barrel per day production ceiling set by OPEC) which account for more than 50% of revenue sources for the budget were estimated at $22 per barrel. Considering that the current price of oil has fallen to $10 - $12 a barrel, future economic conditions may be presumed to be extremely severe.

The nation, while it suffers from a serious situation will launch its Fifth National Development Plan in 1987 which in effect will follow in the footsteps of the Fourth National Development Plan which places emphasis on promoting the agriculture, fisheries and cattle raising industries in order to establish a self-supporting system of food production to feed its huge population, and to promote exports. With the recent fall in the price of oil the country's economy which had continued to depend on oil sustained heavy deficits on its trade accounts. As a result its current foreign exchange reserves have dwindled to an equivalent of less than that required to pay for one month of imports. The government has imposed severe import restrictions to cope with this situation, such as expanding the list of embargoed items, increasing the number of items subject to restriction by I/L (import license) (almost all items are subject to this restriction at present), and reducing the ceiling on I/L permits. These strict import restriction measures, however, are precluding the nation from securing manu-

factured goods which in effect, is limiting productivity (in agriculture, fisheries and domestic manufacturing).

2.2 General Fisheries Situation

2.2.1 Fisheries Resources and Fishing Methods

Nigeria has a coastline that extends for approximately 800 km. In 1978 it established the sea area extending 200 sea miles from the coast as its exclusive economic zone. Its marine fishing and resource development potential is therefore large. Almost all fishermen (said to number as many as 500 thousand) are engaged in small scale fishing using wooden canoes with comparatively small sized gears like drift nets, beach seines, fishing hooks and line. Reflecting the recent short supply of fish in Nigeria, commercial trawling in the coastal zone is beginning to flourish. (Table 2.1)

Table 2.1 Number of Registered Trawl Fishing Boats under Enterprise Management

(Number)

	1977	1978	1979	1980	1981	1982	1983	1984
Fish Trawler	43	38	44	35	45	52	81	94
Shrimp Trawler	36	49	48	45	36	34	39	37

(Federal Department of Fisheries)

This fishing method is operated mainly in waters of 40 to 50 m in depth in the range of 8 to 15 miles offshore. The river-mouth area of the Niger River constitutes a fishing ground for fishermen targeting pink shrimp (Penaeus duorarum notialis), and here many shrimp trawlers, spurred on by the nation's export promotion policy, gather in hopes of earning foreign currency. However, due to the fact that too many boats are out to exploit the limited shrimp resources, the number of such fishing boats is decreasing. (Refer to Table 2.1.) The size of each trawler is limited by the Fisheries Act: length of trawlers for catching fish are between 11 and 13 meters in length and that of shrimp trawlers are between 23 and 25 meters. Every type of marine fishing is supported by a huge consumer demand for fish. Their principal targets are croaker, cat-fish, thread fin, sole, and shrimp. However, the

actual situation is that the fishermen are all out to exploit the small portion of marine fisheries resources that have been developed so far along the coastal area. In future fisheries development, therefore, it is necessary to adequately reexamine and control trawler fishing from the viewpoint of conserving fisheries resources (the ratio of trash fish to total fish catch by trawlers is seen to be increasing) and, on the other hand, expand development in terms of both fishing methods and water area by exploiting the resources that still remain unutilized. The following may be enumerated as unutilized fisheries resources to be developed.

(1) Development of skipjack resources (reportedly 250 thousand tons or even one million tons) known to exist in Nigeria's 200 sea mile exclusive economic zone.

(2) Development of surface and mid depth pelagic fish resources such as Ilisha, herring (bonga) and sardines (known to seasonally migrate in masses in the offshore area) by the use of mid depth trawl or drift net.

(3) Deep sea trawling development in waters 200 - 300 m deep where large masses of deep sea drift fish (Ariomma bondi and Ariomma melanum) were confirmed by the research vessel M.V. Okion of NIOMR in March of this year.

Nigeria has an inland water area that extends over as much as one million hectares including the Niger river system, Lake Kainj and Lake Chad and another 750 thousand hectares of brackish water area in the river-mouth area of the Niger and the lagoons in the neighborhood of Lagos. Hence, the potentiality for fresh water fishery development in these areas is quite high. Also, because of the fact that distribution channels including the storage facilities required for supplying ocean fish to the population of Nigeria (scattered throughout its vast territory of nine hundred thousand square kilometers) are limited, fresh

ocean fish have hardly ever been distributed to the inland inhabitants who have historically depended on freshwater fishes as a protein source. Freshwater fishing is carried out only on a small scale as a side business along with farming with the use of 4-6 m long dugout canoes with simple gear such as gill nets, cast nets and traps. The number of fishing boats (canoes) in the possession of small scale fishermen including the small scale ones involved in coastal fishing is 133,728, of which less than 10% or only 12,510 are powered with outboard motors. Among the freshwater fish, cat fish, tilapia, Nile perch and mormyrus are preferred and are generally distributed as fresh fish, smoked fish or dried fish.

At present, the supply of proper fishing gear for inland fishery is difficult, but if the fishing gear is improved and the supply situation remedied by providing appropriate extension services it is a field that promises increased production.

Lately aquaculture is being developed in Nigeria by utilizing its abundant inland water or brackish water areas. Besides some capitalists in the aquaculture business, there are 19 state government-run (particularly such states as JOS, KANO, PANYAM, ONDO, OYO, RIVER and CROSS RIVER) fish farms (hatcheries) today, and the people themselves also manifest a strong desire to participate in this enterprise. Even though their technological level is still low, some of the farms have ponds as large as 100 hectares or even larger, and their potential for future development is quite high.

Fisheries statistics which are necessary to accurately grasp the present condition of fisheries in Nigeria are to be compiled by the Federal Department of Fisheries (regarding marine fishery) with the cooperation of the fishery-related agencies of each state (regarding freshwater fishery). The Federal Department of Statistics is also compiling statistics of its own. As a result, it is difficult to acquire an accurate grasp of the current situation of fisheries. Table 2.2 shows a summary of findings by the Statistics Division of NIOMR.

Table 2.2 Fisheries Statistics of Nigeria

(Unit: ton)

Year	Artisanal Fisheries	Industrial Fisheries (fish)	Industrial Fisheries (shrimp)	Aquaculture	Domestic Production	Imported Frozen Fish	Imported Processed Fish *1	Total Fish Supply
1980	461,364	16,342	1,890	-	479,596	202,502	105,365	787,463
1981	481,783	12,435	2,003	-	496,221	245,000	583,739	1,324,960
1982	497,206	15,052	3,525	-	515,783	244,408	780,248	1,540,439
1983	501,927	13,572	2,375	20,476	538,350	238,854	276,411	1,053,615
1984	320,086	22,255	2,277	22,012	366,630	137,717	47,503	551,850

*1 The figure shows the gross fish weight of raw materials for canning products.

The table shows how fisheries products have been adversely affected by the deterioration of the Nigerian economy. The policy of imposing extremely strict import restrictions to cope with the foreign exchange shortage has not only restricted the import of fish but has restricted even the importation of fishing nets and other producers' goods or spare parts. Particularly the latter is causing a shortage of fishing materials and equipment and affecting even domestic production.

As a consequence, the annual per capital fish availability which was in excess of 10 kgs during 1981-1982 was less than halved in 1984.

2.2.2 Brief Description of Fisheries Development in the Past

Under the oil dependent economic system of Nigeria which had depended on imports even for food, the development of fisheries were given only low priority with the result that there were hardly any projects in which a foreign government had ever cooperated. It has been only since national development goals were changed with the inception of the Third National Development Plan that a modicum of technical cooperation by international bodies (such as development of aquaculture by FAO) has begun to be rendered. Japan's cooperation in the form of grant aid to fisheries which were rendered twice in the past was therefore highly appreciated by the parties concerned with fisheries development in Nigeria. Also, Nigeria launched various fisheries development programmes with its own funds, including the fishing terminal programmes (terminals were constructed at the three locations of Igbokoda in Ondo State, Ebughu in Cross River State and Port Harcourt in River State), the programme for subsidized distribution of trawling boats (45 units of 13 m craft) and fishing boats to promote small scale fisheries (1000 units FRP 8 m fishing boats), cold storages construction programme (15 sets of 20-ton capacity cold storages), etc., but as the economic conditions took a turn for the worse in 1983 these programmes have since been reduced in scale or suspended or even cancelled.

2.3 Fisheries Support System

2.3.1 Brief Description

The Federal Government and each State Government have their respective organizations for fisheries administration. The Federal Government has two organizations, the Federal Department of Fisheries that belongs to the Federal Ministry of Agricultural Water resources and rural development the Nigerian Institute for Oceanography and Marine Research (NIOMR) that belongs to the Federal Ministry of Science and Technology. Fisheries-related administrative organs function under each State Government although they are respectively attached to different organizations.

Freshwater fisheries and aquaculture are basically placed under the jurisdiction of each State Government and are administered by the Federal Department of Fisheries on a nationwide basis through the National Fisheries Development Committee (chaired by the Director of the Federal Department of Fisheries). Marine fisheries on the other hand are administered by the Federal Department of Fisheries through fisheries-related organizations of the coastal states. Basically, matters that involve States (such as legislation of the Fisheries Act, etc.) are supervised by the Federal Department of Fisheries while fisheries administration in each State is supervised by the fisheries-related organizations in that State. However, in actual practice the coordination and linkage between them can be improved. Therefore, the Federal Department of Fisheries and fisheries-related organizations of each State Government are, either independently or in cooperation with each other, performing the following duties. 1) Control of fisheries cooperatives through registration and other means, 2) control of fisheries-related business enterprises, 3) compilation of fisheries statistics, 4) extension service activities and 5) operation of various fisheries promotion programmes. The implementation of various fisheries promotion programmes however have either been suspended or reduced in scale due to Nigeria's critical economic situation which has further deteriorated of late.

While the Federal Department of Fisheries administers and controls actual fishing operations and functions as coordinator of the fisheries activities of Nigeria, the other Federal fisheries organization, namely, the Nigerian Institute for Oceanography and Marine Research (NIOMR) is in charge of survey, research, training and development works relevant to fisheries. The institute was separated from the Federal Department of Fisheries in the past and placed under the jurisdiction of the Federal Ministry of Science and Technology, but even now, the sites of both organizations are contiguous to each other and they maintain a close cooperative relationship. On the other hand there are the fisheries cooperatives or fishermen's groups (organized at the village level) which are under the jurisdiction of the Federal Government or State Government (responsible offices differ depending on each State) and which are the recipients of the support of the aforementioned government organizations. These organizations are quite active, functioning as the beneficiary groups of various fisheries promotion programmes and subsidized undertakings.

2.3.2 Current State of the Nigerian Institute for Oceanography and Marine Research (NIOMR)

NIOMR originates from the Marine Research Division which was separated from the Federal Department of Fisheries in 1975 and reorganized as one of the 22 research institutes under the jurisdiction of the Federal Ministry of Science and Technology. Its major duties are survey and research, education and training in the field of fisheries and fisheries development works. Organizationally, it is composed of 9 divisions and 16 sections including the Africa Regional Aquaculture Center, and is placed under the jurisdiction of the Ministry of Science and Technology (Table 2.4). Its total staff numbers 335 including 107 senior personnel. It is the largest scale research institute in the field of fisheries in Nigeria. Besides facilities including the research laboratory building, dormitory, jetty, federal fisheries school, etc. located on a site of 5.3 hectares on Victoria Island in Lagos, NIOMR has a 3 hectares aquaculture test station on Ikoyi Island

in Lagos, an 81 hectares Africa Regional Aquaculture Center and 5.3 hectares of brackish water aquaculture ponds at Aluu and Buguma near Port Harcourt in River State, respectively.

NIOMR also has the following four research and training vessels.

①	M.V. Yemoja	350 ton stern trawler-type research vessel
②	M.V. Argonaut	100 ton American style shrimp trawler research and training vessel
③	M.V. Okion	170 ton stern trawler-type research and training vessel (from Japan's grant aid in 1980)
④	M.V. Sarkim Baka	280 ton skipjack pole and line research and training vessel (by Japan's grant aid in 1984)

Functions and past accomplishments of major divisions of NIOMR are briefly described below.

Table 2.4 Organization Chart and Number of Staff of NIOMR

Organization			Senior Officer	Officer	Technician	Total
Ministry of Technology and Science Director Internal Audit Unit Management Committee	Administration Division	Administrative Section	9	23	6	38
		Planning Section	2	1	0	3
		Account and Audit Section	3	8	0	11
		Store Unit	0	0	2	2
		Security and Clearing Section	0	0	38	38
		Sub-total	14	32	46	92
	Technical Service Division	Engineering and Plant Unit	5	9	0	14
		Workshop and Vehicle Unit	4	11	3	18
		Refrigeration Unit	0	1	0	1
		Driver Mechanics Unit	0	8	10	18
		Sub-total	9	29	13	51
	Fisheries Resources Division	Marine Biology Section	6	4	1	11
		Aquaculture section	6	5	3	14
		Fising Technology Section	3	1	1	5
		Sub-total	15	10	5	30
	Fishing Industry Division	Fish Technology Section	15	3	1	19
	Fish Economics and Statistic Division		5	1	1	7
		Vessel Operation Section	3	15	5	23
	Oceanography Division	Geological and Geo-physic Section	7	1	1	9
		Physical and Chemical Oceanography Section	10	2	1	13
		Sub-total	17	3	2	22
	Training and Extension Division	Federal Fisheries School	13	1	4	18
	Extension Research Liason Division		5	0	1	6
	Library	Librarian	1	4	0	5
		Documentation Unit	0	2	2	4
		Sub-total	1	6	2	9
	African Regional Aquaculture Center		10	26	22	58
Total			107	126	102	335

(1) Fisheries Resource Division

1) Marine Biology Section

This is the section that was in charge of the skipjack pole and line research and training vessel project implemented with the cooperation of the Federal Fisheries School of the Training and Extension Division as Japan's grant aid programme in FY 1984. Its major duties are the development of unexploited resources and management of fisheries resources through the survey and research of fisheries resources in which the Section has achieved steady results by utilizing the aforementioned research vessels that belong to NIOMR. The following are some of its major accomplishments.

① Cooperated with the Federal Department of Fisheries in formulating the Fisheries Act from the viewpoint of resource management.

② Launched the development of commercial shrimp fishing in the estuary of the Niger.

③ Determined the maximum sustainable yield of coastal trawling fisheries resources (15,000 tons of fish and 3,500 tons of shrimp) and cooperated with the Federal Department of Fisheries in controling operational permits for shrimp and fish trawling boats.

④ With the cooperation of the Government of Japan (the granting of M.V. Sarkim Baka), the section launched trial skipjack fishing. Prior to this, the Section was mainly responsible for executing the skipjack resources research project which NIOMR had undertaken by chartering Team based Japanese pole and line fishing boat with its own budget in view of the importance of skipjack fisheries development to Nigeria.

2) Aquaculture Section

The main duties of this section are survey, research and development of aquaculture in the huge inland water areas of Nigeria, particularly in the brackish water areas (750 thousand hectares). For Nigeria, which suffers from a shortage of domestic aquatic products, increasing the production of aquatic products by means of aquaculture is an important task. This section selects species that are suitable for brackish water aquaculture, studies the methods and stocking density conducive to obtaining maximum yields, conducts surveys on usable natural seeds, establishes artificial seed production technology, studies the mortality rate associated with the transport of seeds and the necessary countermeasures and also conducts studies on feeds. The section has a 3 hectares brackish water aquaculture test station on Ikoyi Island in Lagos where it conducts survey and research, seed production and aquaculture. During the 1975-1983 period, five million seeds each of mullet and tilapia and one million seeds each of cat-fish species like Chrysichthys and Clarias were produced here and distributed to private aquaculture farmers.

3) Fishing Technology Section

This section investigates the fishing gear and boats being used in Nigeria in order to develop more advanced fishing gear and methods from the viewpoint of economics and resources and thereby aiming at increased domestic fisheries production. It places particular emphasis on improving small scale fishing gear in view of the fact that 90% or more of current fisheries production is accounted for by small scale fisheries. This section also has the function of providing extension services. It is using this function to distribute its improved nets by aggressively contacting each fisheries cooperative and fishermen's group.

The following are some of the section's major accomplishments.

① Offering direct guidance on the use of improved fishing gear to small scale fishermen.

② Offering guidance on propagation and expansion of the large mesh drift net fishing method.

③ Offering guidance on expanding the use of improved beach seine nets

④ Development of resource-conservation-type coastal trawling fishing nets (using large mesh for sleeve nets)

(2) Fisheries Industry Division

1) Fish Technology Section

Aquatic products must be properly processed in order to maintain their quality while distributing them to various parts of Nigeria's vast territory in the heat and humidity of its natural environment. With traditional processing methods, it is estimated that as much as 40% of the fish catches are being wasted without being utilized. In view of this, the section engages in the research and development of processing methods for aquatic products suitable to the climate of Nigeria through a scientific approach, by mobilizing the disciplines of dietetics, chemical analysis and bacteriology. The following are some of its achievements.

① Development of a method for processing fish into fillets for distribution in urban areas.

② Propagation of this method for processing fish into smoking developed in this section.

③ Distribution of small cooling boxes for improving distribution of raw fish.

④ Development and propagation of a mincing process and other methods for utilizing the meat of small fishes with low commercial value.

Also, as 40% of all catches by industrial trawling method fisheries are so-called trash fish, which are mostly thrown away without being utilized, this section is studying the use of these as raw materials to produce fish meal and feed.

At the time of the aforementioned research on skipjack resources conducted during 1982 and 1983, the section, prior to launching large scale development, had conducted market research on consumer preferences in various parts of Nigeria by processing the skipjack that was caught into frozen fish, smoked fish and vacuum packed minced meat with favorable results.

(3) Technical Service Division

This division was established in 1984 to undertake the development of engineering technology for fisheries development. It designs, fabricates and conducts tests on necessary equipment and materials. It has so far fabricated a fish drier that utilizes solar heat. It is found to be extremely satisfactory and is being introduced now. The division has an engineering and plant unit, a workshop and vehicle unit, a refrigeration unit and a driver mechanics unit, but due to the reduction of NIOMR's capital budget in recent years, the division is equipped only with tools enough for repair work on vehicles, home refrigerators and air conditioning systems.

(4) Federal Fisheries School

The present school was established in 1976 as the only professional school in the fisheries field in Nigeria. The number of graduates is increasing yearly. In the last few years the students graduating from it have numbered about 250 a year and the cumulative total between 1975 and 1985 has been as many as 900. At present, the school offers instruction in the following seven courses.

Table 2.5 Instruction Course of Federal Fisheries School

	Course	Period	No. of Students	Diploma
1	Fisherman	8 weeks	30	Cert. of Proficiency
2	Coxswain	6 months	20	Coxswain Cert. of Competency Plus Schools Cert. of Attendance
	Ordinary National Diploma			
3	General Fisheries	2 years	50	National Diploma
4	Nautical Science and Fishing	2 years	30	National Diploma
5	Marine Engineering	2 years	30	National Diploma
	Higher National Diploma			
6	General Fisheries	2 years	40	Higher National Diploma
7	Officers Orientation	5 weeks	60	Cert. of Attendance

Besides the above listed regular courses, the school offers at irregular intervals a two-week teaching methodology course (subsidized by the government) for fisheries coaches and extension workers of the government, and a three-week onshore fishermen's proficiency course for crew members assigned to fisheries cooperatives.

To enrol in the ordinary national diploma course, WASC (West African School Certificate, certifying completion of 6 years of elementary school and five years of middle school, totalling 11 years of

education) or an equivalent qualification is necessary. In order to advance to the higher national diploma courses, one year of practical experience after completing the ordinary diploma course is obligatory; and after obtaining the higher national diploma, civil service of at least one year is obligatory.

Up to now, students of this school which is the institution for advanced education for personnel in fisheries-related organizations of federal or state governments have mostly been government employees temporarily transferred to the school. However, due to the recent difficult economic situation, the budgets of government organizations have been cut back. As a result, the enrollment of company employees or individuals rather than government employees is on the increase. The special curriculums of each course are listed below.

Table 2.6 Special Curriculums of Federal Fisheries School

Ordinary National Diploma	
General Fisheries	Gear technology, Aquaculture, Fish technology, Fisheries management, Fisheries biology, Statistics, Aquatic ecology, Fisheries cooperatives, Public administration, Extension education, Oceanography, Fisheries economics, Science mathematics, Chemistry, Biology, Physics, etc.
Nautical Science and Fishing	Practical navigation, Principals of navigation, Chartwork, Rules, Seamanship, Gear technology, Ship stability, Ship construction, General ship knowledge, Marine signals, Electronics, Meteorology, Fish technology, English, etc.
Marine Engineering	Mathematics, Marine auxiliary, Naval architecture, Ship engines, Power plants, Applied mechanics, Thermodynamics, Ship stability, Workshop, General management, Electrical technology, Technical drawing, Diesel plant, etc.
Higher National Diploma	
General Fisheries	Fisheries biology, Fish technology, Gear technology, Fisheries management, Aquaculture, Research Technique, Fisheries cooperatives, Extension education, Public administration, Oceanography, Statistics, etc.

(5) Africa Regional Aquaculture Center

The Center was established in 1979 as the center for the African region under FAO's conceptual scheme for regional aquaculture centers (there are such centers in seven regions of the world now). Its purpose is to carry out research, education and development on aquaculture methodology and technology (primarily for freshwater aquaulture) in the African region. It has graduated 130 trainees at the postgraduate level (at present from 26 countries in the African region) (Note). Lectures and training are offered in the two languages of English and French. The Center receives the technical cooperation of 6 persons dispatched from FAO, consisting of 4 instructors and 2 researchers, who engage in the education of trainees and research activities with 10 other personnel of NIOMR. The construction of a culture pond of 15 hectares is now nearing completion where the students will pursue one year of study consisting of 80% field practice and 20% theoretical education, and those who have completed this study are awarded with a master's degree in technology from the Science and Technology University of River State. The Center also functions as an information center on aquaculture and also engages in exchange of information and data as well as theses with other regional aquaculture centers.

Note: Of the 130 trainees, 1 is from Burundi, 2 from Cameroun, 1 from Ethiopia, 3 from Gambia, 3 from Ghana, 15 from Kenya, 1 from Liberia, 3 from Malawi, 48 from Nigeria, 3 from Sierra Leone, 2 from Sudan, 5 from Tanzania, 2 from Uganda, 5 from Zambia, 2 from Zimbabwe, 1 from Haiti, 1 from Mauritania, 6 from Central Africa, 7 from Congo, 6 from Gabon, 4 from Guinea, 3 from the Ivory Coast, 2 from Mali, 2 from Rwanda, 1 from Senegal and 1 from Zaire.

(6) Operating status of vessels donated under past grant aid cooperation projects

NIOMR's four research and training vessels are operated under the Vessel Operation Section to which their crew members belong. Although it owns four vessels, the M.V. Yemoja is undergoing repairs and refitting, and the M.V. Argonaut has become obsolete. Consequently, only the two vessels, the M.V. Okion, a 170 ton stern trawler-type research and training vessel and the M.V. Sarkim Baka, a 280 ton skipjack pole and line research and training vessel donated in 1984 are in operation.

The M.V. Okion, for which the following operational plan had been initially established, successfully fulfilled all of its duties until 1983. However, since then, due to the curtailment of NIOMR's budget resulting from the nation's economic crisis, its navigation plan has been cut down to about 70% in 1984 and to about 50% or approximately 80 days of seafaring in 1985.

Table 2.7 Operation Plan of Research and Training Vessel (Okion)

Federal Fisheries School	Nautical Practice for Nautical Science and Fishing Course	10 days x 6 trips = 60 days
	Nautical Practice for Marine Engineering Course	10 days x 1 trip = 10 days
	Nautical Practice for Coxswain Course	5 days x 1 trip = 5 days
NIOMR	Navigation for Fisheries Resource Survey	15 days x 4 trips = 60 days
	Navigation for Oceanography and Geological Survey	5 days x 3 trips = 15 days
		Total 150 days

The M.V. Sarkim Baka, for which yearly operations of 20 days x 11 voyages = 220 days were initially scheduled was likewise affected by the curtailment of NIOMR's budget with the result that its operating

days for the year between May 1985 and April 1986 amounted to only 8 voyages or a total of 103 days.

Table 2.8 Operation Report of Research and Training Vessel (Sarkim Baka)

	Period	No. of days	Result of Operation
1	1985 6/4 - 6/7	4	Bait Fish Resource Survey
2	" 6/15 - 6/19	5	"
3	" 6/26 - 7/1	6	Caught 60 kg *)
4	" 7/23 - 8/4	13	"
5	" 10/15 - 10/29	15	"
6	" 12/3 - 12/22	20	Caught 1 ton
7	1986 1/29 - 2/18	21	Caught 1 ton
8	" 4/3 - 4/3	19	Caught 600 kg
	Total	103	

*) At Port Harcourt, using Tilapia as live bait

The M.V. Sarkim Baka is a vessel exclusively dedicated to the development of skipjack fishery, and for its first operational voyage, NIOMR hired 20 new crew members. Technological transfer to these crew members is steadily in progress with the help of three experts dispatched from Japan under Japan's technical assistance. Currently, this vessel is being utilized primarily for research of live bait for skipjack fishing, and NIOMR's enthusiasm toward skipjack fishery development is quite evident in the effective way this vessel is being used. Although the vessel's initial operating plan will not be achieved due to budgetary constraints, NIOMR should be lauded for its efforts in managing to operate each of its two research and training vessels for about 100 days per year despite the severity of economic environment.

Besides the foregoing, NIOMR has the following divisions and sections, each of which are engaged in the following research activities.

(7) Fish Economics and Statistics Division

Undertakes development of methods and techniques for compiling reliable fisheries statistics and economic analyses of various fisheries development programmes.

(8) Oceanography Division, Geology and Geophysics Section

Undertakes survey of the peripheral area of the continental shelf; also, measurements of geomagnetism, earthquakes and geological era and exploration for mineral resources.

(9) Oceanography Division, Physical and Chemical Oceanography Section

Studies erosion, ocean pollution and other subjects through measurements of various environmental factors.

(10) Extension Research Liaison Division

The division's responsibility is to supply those engaged in fisheries and government agencies with the results of what NIOMR has developed through official media (television, documents) or by directly offering extension services. It also conducts research and development on methods of extension.

NIOMR with a staff of 335 of which more than 100 are high ranking personnel with the experience of having studied abroad, is the only marine fishery research institute in Nigeria. The expectations that are placed on the results of its survey, research, training and development activities are therefore great. However, the research facilities, equipment and materials necessary for these activities have not been expanded or newly purchased in the last three years due to economic difficulties, with the result that it is becoming difficult for NIOMR to maintain its current level of activities let alone strengthen them. Consequently, research equipment and supplies now in the possession of NIOMR are extremely limited; and even that which is available is mostly inadequate due to wear and tear and obsolescence. These conditions are adversely affecting its recent research activities.

2.4 Circumstances and Contents of Request

The Federal Republic of Nigeria is aiming to promote its primary industries and thereby achieve self-sufficiency in food production as the basis of its national development. However, it is being plagued due to economic problems. It is not only wanting in concrete measures to solve both of these problems at once, but the import controls (resulting from the shortage of foreign currency) which it has imposed on producers' goods has had the adverse effect of reducing the producers' will to produce with the result that production is showing signs of declining. Aquatic products are an important protein source for the Nigerian people but the supply is extremely small compared to demand. The Government of Nigeria has been exerting a great deal of effort to expand the activities of the Nigerian Institute for Oceanography and Marine Research (NIOMR), the Federal Department of Fisheries and fisheries-related organizations in each State and in implementing various fisheries development programmes in order to develop its fishing industry. However, the graveness of economic conditions which have further deteriorated since 1983 is compelling it to curtail, defer or even cancel some of the fisheries development programmes. The Nigerian Institute for Oceanography and Marine Research, whose principal duties are survey, research, education and development in the field of fisheries, is obligated to formulate urgent development projects in the field of fisheries, but its activities, too, are being restricted due to curtailment of its budget.

In view of the situation, the Government of the Federal Republic of Nigeria has formulated a facilities improvement project consisting of the following various facilities, equipment and supplies that it lacks to strengthen NIOMR's survey, research, education and development capabilities at this time of economic problems, and has requested the Government of Japan for its cooperation in making them available.

① Establishment of laboratory facilities for research on fishing gear and methods.

② Strengthening of training activities by providing mock bridge, chart room and classrooms, etc.

③ Stepping up research in fish processing technology with major emphasis on the development of canned goods manufacturing technology.

④ Strengthening the activities of the Africa Regional Agriculture Center which is an international research institution.

⑤ Stepping up skipjack fishery development which commenced under one of Japan's previous grant aid projects.

⑥ Establishment of a maintenance system for all equipment including vessels.

⑦ Improvement of jetty facilities for smooth operation of vessels.

The purpose of this project is to make various improvements in fields where the activities of NIOMR must be urgently bolstered and to effectively push forward, by these overall improvements, the development of fisheries in Nigeria, a task with which NIOMR is entrusted.

CHAPTER 3

CONTENTS OF PROJECT

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3.1 Project Objectives

The Government of the Federal Republic of Nigeria, since its Third National Development Plan, has placed priority on the development of primary industries. It has aggressively pushed forward various policy measures to increase production of agricultural and marine products besides promoting education. In implementing its Third National Development Plan it advocated a "green revolution" under which it consolidated a system for supporting the fields of agriculture and fisheries from various aspects in order to become self-sufficient in food production. The incumbent administration also places priority on the development of food-related industries. Domestic production, however, is small compared to its massive population so that in the 1981-1982 period the country was forced to import 800 thousand to one million tons of aquatic products (Table 2.2). During 1982 when imports recorded a peak, 200 million Naira of foreign currency was spent for processsed aquatic products alone. Increased production of aquatic products, therefore, is important not only to meet the needs of the people but also for the good of the national economy.

Nigeria's fishing industry, however, relies on small scale fisheries for more than 90% of its production which in the last decade has hovered at around 400 to 500 thousand tons a year. In 1984 it plunged sharply, reflecting the drastic deterioration of the domestic economy. One of the reasons for poor production is that most of the fishermen still continue to rely heavily on personal and traditional techniques of fishing and lack the will to aggressively increase production through technological innovation. It would be difficult to change such a situation overnight or to hope to accomplish a rapid increase in production in a short time, but for the future development of fisheries in Nigeria it is important to make every effort to promote the development and extension of modern fishing methods suitable to each type of fishery, the pioneering development of unexploited resources and

the development of human resources through survey and research. Hence, this project aims to strengthen the functions of NIOMR which plays an important role in the development of fisheries in Nigeria by cooperating in improving its facilities, equipment and supplies. Therefore, this project aims mainly to extend cooperation to improve the fields which have a direct bearing upon increasing fisheries production which is a top priority task of the National Development Plan and also the fields related to fisheries education including training and extension, and also to cooperate in improving the supporting infrastructure which are urgently required to carry out the foregoing activities smoothly.

3.2 Review of the Contents of the Request

The Fourth National Development Plan states the activities of the Nigerian Institute for Oceanography and Marine Research (NIOMR) as being : A. Expansion and upgrading of research and development necessary for increasing fisheries production, and B. intensification of training. Developmental research necessary for increasing fisheries production includes 1) development of unexploited resources (development of untapped domestic marine fisheries resources centered on development of skipjack resources and aquaculture which promises to have the highest potential for increased production in Nigeria) and 2) development of fish processing (pioneering research and development on processing and distribution of developed fisheries resources). The Plan's objectives, however, still remain unachieved to this day due to Nigeria's weak economy since the latter half of said Plan or since 1983. Accordingly, the Fifth National Development Plan which is scheduled to commence in 1987 will achieve exactly that which the Fourth National Development Plan planned as the goals of NIOMR's activities while including, as a new plan, the development of fishing technology (fishing gear and method).

Also, the delay in the improvement of infrastructure facilities such as jetties and a machinery repair shop is seriously hampering NIOMR's activities.

As a result of reviewing the assistance requested and upon a thorough investigation of the current activities of NIOMR and the foregoing situation, it is considered reasonable to extend cooperation in the following fields which, among the diverse activities of NIOMR, most need to be urgently improved.

(1) Increase of Fisheries Production

1) Development of fishing gear and methods
2) Pioneering development of untapped fisheries resources
3) Development of processing technology for fish catches

(2) Intensification of Training Activities

1) Intensification of training by the Federal Fisheries School

(3) Improvement of Infrastructure Facilities

1) Improvement of jetty

2) Establishment of a maintenance and control system for equipment and machinery

The contents of the request are examined item by item below.

(1) Increase of Fisheries Production

1) Development of fishing gear and fishing methods

More than 90% of Nigeria's fisheries production is accounted for by the small scale fisheries, but the production quantity has hardly increased in the last ten years. This may be attributed, for one thing, to the lack of complete fisheries statistics, but more basically to the fact that almost all of the fishermen resort to traditional methods of fishing which do not even use a fishing net. Therefore, if modern fishing techniques stressing the use of fishing nets are promoted by supplying technology regarding the improvement and development of fishing gear and fishing methods, the impact on increasing fisheries production would be extremely great. Also, if the development of industrial fisheries which has been launched lately were to be furthered in the following fields with due consideration to fisheries resources, the potential for increasing production is considered to be quite high.

When the fisheries, situation in Nigeria is generally reviewed, the areas that need to be improved are as follows.

a) Small scale fisheries

Fishermen engaged in small scale fishery basically use traditional fishing gear (traps, hooks and line, etc.), but lately the introduction of fishing nets is in progress. However, fishing gear of poor quality and low efficiency is being used. For instance, floats and sinkers do not balance well with the net panel but none of the fishermen have any knowledge of the correct form of the net in the water as to be able to improve it. Therefore, small scale fishing gear (gill nets, drift nets, long lines, trolling, pole and line, casting nets, beach seines, small scale purse seines, encircling nets, etc.) must be urgently improved together with the establishment of an effective extension service system.

b) Development of industrial fisheries

Deep sea demersal fishes, bill fish, spanish mackerel and other pelagic fish are in the unexploited state now. Accordingly, if deep sea trawling (for water depth of 200 - 300 m), mid-water trawling, large mesh drift netting and other fishing methods were to be introduced and improved to match the sea conditions and bottom quality of Nigeria, development in this field would have a large effect on increasing fisheries production.

c) Conservation of fisheries resources

About 130 vessels today are engaged in coastal trawling fishery in Nigeria, confining themselves within a relatively small water area (about 20,000 km^2). Accordingly, there is a tendency to overfish with the result that trash fish are reported to account for as much as 40% of the catch. Hence, among the fishing gear and fishing methods to be developed is the development and use of a resource conserving-type trawling net. Simultaneous catching of small fish and young fish cannot be completely prevented by making the mesh size of side nets larger, but such mixed catching of small sized fishes can be reduced to some extent. It may be unreasonable to expect fishing enterprises and fishermen to use resource

conserving-type fishing nets for their fishing activities solely from the standpoint of resource management, but there are fishermen who adopt this type of fishing net as it saves them the trouble of removing trash fish from their catch. In view of this, fishing gear and fishing methods should be developed with adequate consideration to resource conservation.

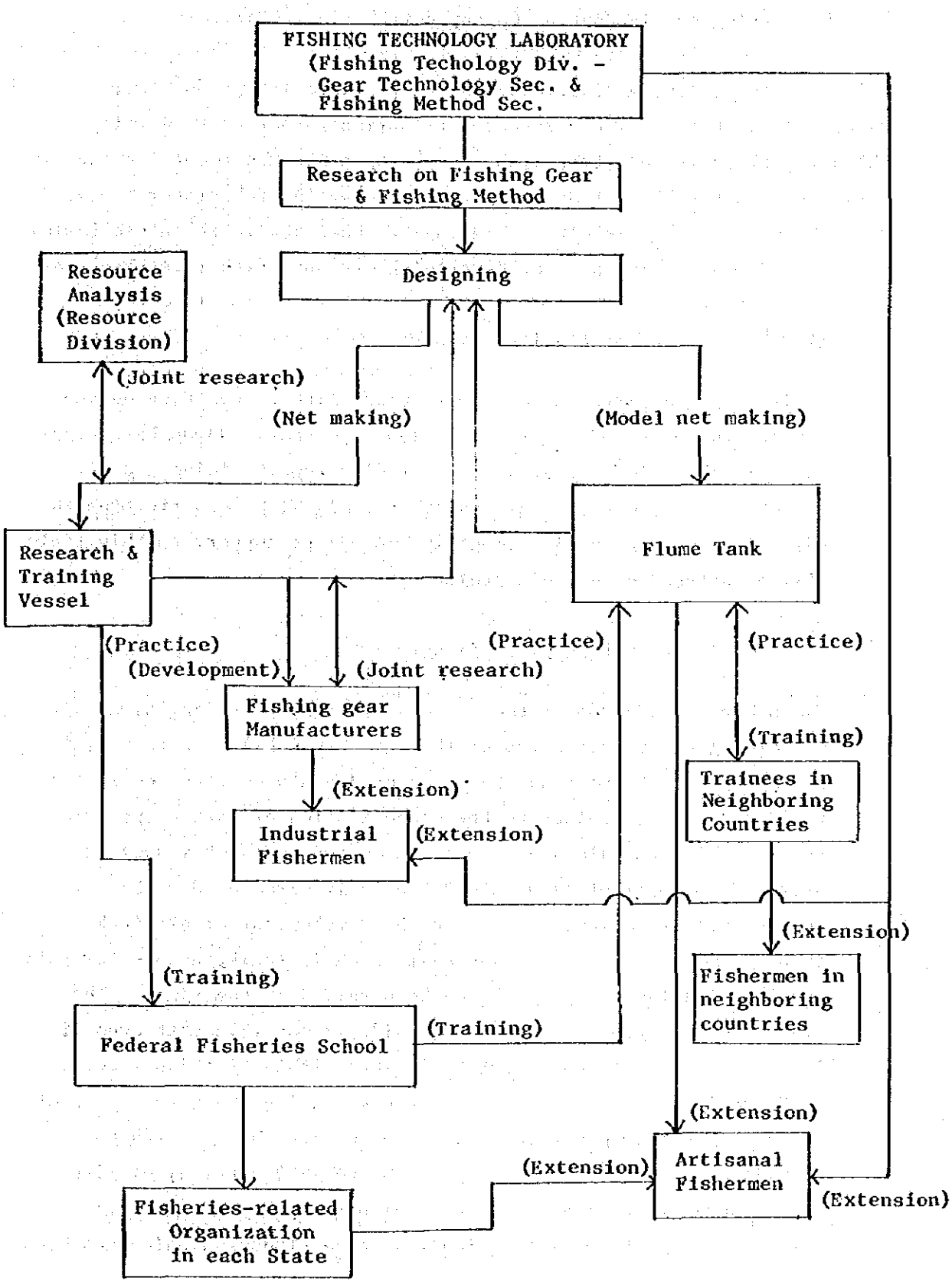
d) Others

Fishing gear other than the aforementioned and fishing methods that must be developed are those such as fish aggregating devices necessary for developing pelagic fish resources, floating cage for stocking live baits to promote skipjack fishery, which will be discussed later, nets for aquaculture (cage culture, pen culture) and other peripheral technologies for increasing fisheries production.

In order to realize increased production through development of the aforestated various fields of fisheries, it is necessary to establish a research system for the development of fishing gear and fishing methods to facilitate their improvement/development as well as establish an effective extension system for propagating the fishing gear and fishing methods developed through research. Fig. 3.1 shows the interconnection between the development of fishing gears and fishing methods and the training and extension activities for same as planned by NIOMR.

Thus, it is considered reasonable to include in this project the installation of new fishing gear and fishing method research laboratory facilities including a flume tank, a fishing net material testing room and classrooms for extension services so as to be able to smoothly implement the aforesaid research, development, training and extension activities.

Fig. 3.1 Functions of Fishing Technology Laboratory



2) Pioneering development of untapped fisheries resources

To achieve a drastic expansion in fisheries production, Nigeria still has available untapped fisheries resources to develop while improving its existing fisheries. Japan has made contributions in this field in the past by donating two training and research vessels, M.V. Okion and M.V. Sarkim Baka. NIOMR has been active in the following three fields for the purpose of developing untapped fisheries resources.

a) Development of trawling fishery

It is making efforts to develop trawling fishery centered on the development of deep sea demersal fish resources. Japan has cooperated in this field by granting a trawler-type training and research vessel and technical assistance. As NIOMR's activities in this field are proceeding smoothly, no direct support to this field will be offered under this project.

b) Development of skipjack fishery

Japan has already cooperated in this field by providing NIOMR with a training and research vessel (M.V. Sarkim Baka). Therefore, it is appropriate to confine the scope of Japan's cooperation in this field under this project to the consolidation of past cooperation. Since a skipjack pole and line training and research vessel was provided in April of 1985, NIOMR has newly hired a 20-member crew and devoted its allout efforts to the development of skipjack fishing. The question of live bait which is indispensable for pole and line fishing of skipjack had been raised at the time of the grant aid. At that time it was considered possible that even if live bait resources could not be located within Nigerian waters, NIOMR could easily gain access to the known live bait resources of Ghana or Cameroun. Consequently, even during the research on skipjack resources conducted from 1982 to 1983 a survey of live bait resources in Nigerian waters was not emphasized. However, Nigeria's current foreign currency reserve situation which has been

seriously affected by the drop in oil revenues is such that gaining access to Ghana's resources is hardly conceivable. Hence, the research vessel entered into service last April without any knowledge whatsoever of the conditions of live bait resources within Nigerian waters. The vessel has made eight voyages during the past year, but all of its time has been spent researching live bait with the result that it has not been able to enter into a full scale fishing test yet. (2.5 tons of skipjack have been caught so far.) So far, the vessel has been able to confirm live bait resources (anchovy, sardine) at a depth of 5m to 8m at 2°50' E.L. in the coastal areas off Badagry near the border with Benin and also at 6°50' E.L. about 50 km west of Lagos during the dry season between September and February. These live bait resources are not decisive yet, however, and for the development of skipjack fishery it is indispensable to confirm the seasonal fluctuations of these live bait resources by conducting year-round research.

However, it is neither effective nor economical to use a large skipjack pole and line research vessel and monopolize almost all of its voyages for year-round research on live bait in view of its original objective.

It was therefore judged appropriate to include in this project a small boat to be exclusively dedicated to research on live bait at Badagry.

c) Aquaculture development

The potentials for aquaculture development in the inland water areas and brackish water areas of Nigeria is large. Because aquaculture basically does not require imported equipment and supplies, production expanded from 20,000 tons in 1983 to 22,000 tons in 1984 as shown in Table 2.2 despite the fact that the country suffered from severe economic conditions. NIOMR places emphasis on this field, and is currently engaged in aquaculture development in Lagos, on Ikoyi Island and at Aluu and Buguma in the

vicinity of Port Harcourt through the Headquarter Aquaculture Section and the Africa Regional Aquaculture Center in Port Harcourt. Aquaculture industry requires various equipment and supplies in its developmental stage, but it is difficult for NIOMR in its present condition to supply itself with the necessary research equipment and apparatus with the result that it is often compelled to substitute classroom lectures in place of practical training for trainees from neighboring countries.

It is therefore judged appropriate to include in this project laboratory equipment and apparatus for the water quality, soil and biological analyses necessary for training in aquaculture and for development of the aquaculture industry, the growth of which is crucial to the course of fisheries development in Nigeria.

3) Development of processing technology for fish catches

Nigeria's strong preference for canned food is unsurpassed by that of any other country. This is because the country's economy had depended on oil and relied on imports for everything, including even food. As shown in Table 2.2, in 1982, about 800 thousand tons of canned products in terms of wet weight were imported in addition to 250 thousand tons of frozen fish imported primarily as raw materials for domestic canning, adding up to a total consumption of about one million tons of canned products in that year. Since 1984, however, imports of canned products and raw materials for canning have been placed under restrictions so that the development of canned products utilizing fish produced in Nigeria has become an extremely important task for the country not only as a means of securing food but also from the economic aspect. However, private packers and dealers cannot be expected to develop new products without NIOMR taking the lead and supplying the technology for new products to the private sector. With full development of skipjack fishery nearly in sight, NIOMR's priority developmental goal today is placed on the processing of skipjack into canned products. The deep sea sardine resources which M.V. Okion has started to develop recently and the small sized pelagic fish (bonga,

Ilisha, etc.) resources which are highly likely to be developed in the future are suitable as raw materials for canning. It is necessary that NIOMR develop canned products using these fish as they are most likely to be accepted by private firms and the consumer market. Heads, bones and the intestines of the fish which are by-products resulting at the time of the test producing of canned products can be used as raw materials for feed which is necessary for the development of aquaculture provided they are properly processed.

In view of the foregoing, it is judged appropriate to include in this project the provision of small scale experimental cannery equipment capable of trial production of canned products using skipjack and other Nigerian raw materials available to NIOMR and equipment for the processing of fish residue which will be discharged during canning process.

(2) Intensification of Training Activities

1) Intensification of Training by the Federal Fisheries School

The role played by the Federal Fisheries School is extremely important when fisheries development in Nigeria is viewed from a long-term perspective. For practical training as part of the School's nautical science and fishing course and the marine engineering course, Japan has supplied a complete set of navigational instruments. At present these instruments are being used individually for their respective purposes in the training of students. However, if these instruments were to be installed in a room to simulate the bridge of a research vessel, and if the operation of these instruments, particularly their interlinking operation were to be incorporated into the training programme it would supplement the limited practical training that trainees receive aboard ship and thus make the training programme more effective. In view of the foregoing, it is necessary that Japan provide a mock bridge and a chart room in order to supplement practical on-board training and intensify training in nautical science as a way of

following up on its past efforts and of contributing to the schools carrying out of more effective training activities.

At present the school offers seven regular courses and two ad hoc courses in which altogether 260 students are enrolled. Besides these, nearly 200 students are on the school register but these are on industrial training to engage in fishing practice at fishery establishments in order to acquire shipboard experience which is a prerequisite for obtaining a certificate of competency in seamanship. For all these students, however, the Federal Fisheries School has available only the following seven classrooms.

Ordinary classroom (for 40 students)	3 rooms
Ordinary classroom (for 50 students)	3 rooms
Multi-purpose classroom (accommodates 60 - 70 students)	1 room

Meanwhile, the Government of the Federal Republic of Nigeria has decided to open the higher certificate courses on "nautical science and fishing" and on "marine engineering" (duration of the courses is two years, the size of the class 30 students each) as one of its educational promotion programmes emphasized in the National Development Plan and the establishment of which had been long awaited. The graduates of these courses will be eligible to take the state examinations for a higher license. As a consequence, the said school which has been managing to offer nine courses of classwork with only 7 classrooms including one multi-purpose classroom will be confronted with a shortage of classrooms more acute than ever.

In view of the foregoing, it is reasonable to include in this project the provision of two classrooms to accomodate the two additional courses that will be established this year. It is therefore judged appropriate to include in this project the construction of a classroom building to house these two classes, a mock bridge and a chart room.

(3) Improvement of Infrastructure Facilities

1) Improvement of jetty

At present NIOMR has four research and training vessels but two of them, namely M.V. Yemoja and M.V. Argonaut are in the dry dock to rectify malfunctioning caused by aging. The following two research and training vessels which were donated by Japan in the past are being utilized at sea for about 100 days a year each for training and research purposes.

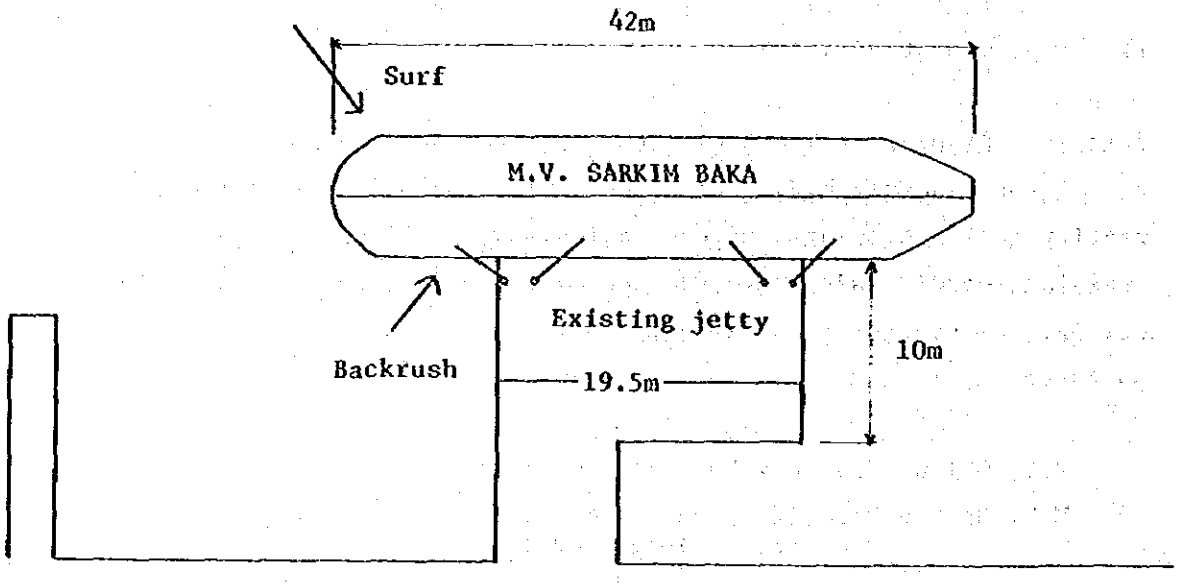
M.V. Okion (Trawler, 204 G/T, total length 32m)
M.V. Sarkin Baka (Skipjack pole and line fishing boat, 272 G/T, total length 42m)

At present NIOMR has an L-shaped jetty about 20m long and projecting about 50m into the sea. It is now being used only for the loading and unloading of M.V. Okion. It is, however, unsuitable for mooring of the abovementioned two vessels which are 10 to 20m longer than the jetty. The following are some of the problems that are being encountered.

a) The jetty being too short, mooring is unstable. Also, the lower part of the jetty, above which is located the superstructure, is of steel pile structure to allow the waves to break. Consequently, the incoming waves and the returning wages which continually pass through this substructure move the vessels to make mooring even more difficult.

b) Because of the unstable mooring condition the vessels keep bumping against the jetty. Also, because the jetty is not protected with fenders as protection against the ship's bumping, the vessel's shell plates become damaged. Portable fenders (provided on M.V. Sarkin Baka) also do not function properly due to the unstable mooring condition. As a consequence, M.V. Sarkin Baka which is a new vessel seldom uses this jetty in order to avoid damage to her shell.

Fig. 3.2 Existing Jetty



It is therefore judged appropriate to include in this project the modification and improvement of the jetty so that the two donated vessels now in operation can be moored stably to load and unload, to be repaired and to receive other services without being affected by the waves while in port. In this way NIOMR will be able to carry out its important task to smoothly and effectively operate the vessels necessary for training and research and development of untapped fisheries resources.

2) Establishment of a maintenance and control system for equipment and machinery

The Technical Service Division of NIOMR which employs a considerable number of engineers (nine senior personnel who have studied engineering abroad, 29 ordinary personnel and 13 minor rank employees) is adequately equipped with the technical competence to perform repair work on ships' piping, deck riggings, machinery in the engine room and on the deck, simple repairs of electric appliances, woodwork repair, painting and other maintenance and repair work on small sized vessels. However, although the Technical Service Division which is NIOMR's repair facility has a small repair shop, it is hardly equipped with the neces-

sary machinery and tools for repair-work (only electrically driven woodworking saws, planes, small electrically driven drills, welders and some other simple tools are available), and because of the shortage of materials and supplies it is unable to set up its own system for ship-repair. Also, because of a lack of proper storage facilities the spare parts and other supplies which had been provided with M.V. Okion and M.V. Sarkim Baka are still stored onboard these vessels.

It is therefore judged appropriate to include in this project the construction of a small repair shop and storage facility for spare parts near the jetty large enough for small scale maintenance and repair of vessels so that the research and training vessels which have been donated can be properly maintained and kept in good condition. This small scale repair shop is important in terms of the smooth operation of this project as it will also undertake repair work on mainly mechanical parts of other equipment and apparatus covered by this project as well as provide space for the storage of spare parts.

3.3 Brief Description of the Project

3.3.1 Brief Description of the Project

As a result of investigating economic and fisheries conditions in Nigeria, NIOMR's activities and their relevance to fisheries development there, and upon closely reviewing the contents of the request regarding this project made by the Government of the Federal Republic of Nigeria, it is judged appropriate to include the following items in the Facilities Improvement Project of the Nigerian Institute for Oceanography and Marine Research.

(1) Increase of Fisheries Production

1) Development of fishing gear and fishing methods

Research laboratory building for research and development of fishing gear and fishing methods and required laboratory equipment and apparatuses

2) Pioneering development of untapped fisheries resources:

A. Skipjack fisheries development:

Small boat for research on live bait for skipjack and required equipment

B. Aquaculture development:

Laboratory equipment and supplies for aquaculture development

3) Development of processing technology of fish catches
Experimental cannery

(2) Intensification of Training Activities

Classroom building consisting of a mock bridge, chart room and classrooms

(3) Improvement of Infrastructure Facilities

1) Improvement of jetty:

Modification and improvement work on the existing jetty

2) Establishment of a maintenance and control system for equipment and machinery

Maintenance shop for vessel and required equipment and supplies

3.3.2 Executing Agency

The executing agency of this project is the Nigerian Institute for Oceanography and Marine Research (NIOMR) under the jurisdiction of the Ministry of Science and Technology of the Government of the Federal Republic of Nigeria. In implementing this project, NIOMR has conferred with the Ministry of Science and Technology, Ministry of National Planning, and Ministry of Justice while still in the stage of studying its basic design in an attempt to effect smooth liaison among the various ministries in the event that the project should materialize. NIOMR has also appointed the incumbent manager of the Fishing Technology Section as the responsible officer for implementing this project and has assigned as aide the principal of the Federal Fisheries School who had been in charge of the past two grant aid cooperation projects (on research and training vessels) and who is fully conversant with Japan's grant aid cooperation project so that the project can be implemented with perfect harmony and by the best of hands.

3.3.3 Budgeting plan

The operating budget apportioned to NIOMR is declining yearly, reflecting Nigeria's deteriorating economy. Particularly in keeping with the basic posture of freezing or reducing the scale of new projects as delineated in the National Development Plan, NIOMR's capital invest-

ment budget has been cut by a large margin. Its new project is therefore without financial endorsement despite the fact that it is shouldered with the important responsibility of developing fisheries resources in Nigeria in line with the development strategy of the national government.

Table 3.1 Budget of NIOMR

(₦)

Year	Running Expense	Facilities Expense	Revenue	Total Budget
1985	2,671,489	138,545	347,405	3,157,439
1986	2,270,000	27,000	- *	(2,297,000) *

* The revenue figure is not included because this chart only covers the period up to the middle of the year 1986.

Compared to 1985, the 1986 budget was cut by 15% on operating expenses and by as much as 80% on capital expenditures. On the other hand, NIOMR is permitted to turn any revenue earned by the Institute into its operating fund. In 1985, there was a revenue of 374,405 Naira, the breakdown of which is as shown below.

	₦
Tuition from Federal Fisheries Schhol	110,779
Sales of Fish	32,458
Charge for use of pier	10,791
Consulting fee of NIOMR staffs	151,626
Repair fee for general vehicles	1,142
Charge for use of library	2,777
Charge for use of office	1,412
Sales of disused fittings	14,466
Charge for use of NIOMR guest house	240
Telephone charge (public telephone)	300
Sales of NIOMR's reports	1,500
Restoration of insurance fee	16,350
Sales of feed (aquaculture use)	3,564
	347,405

NIOMR budgets N1.85 million for her special project for the Fifth National Development Plan period. To implement this project NIOMR will meet her obligation from her annual capital subvention means for special project. In view of the severe economic conditions that prevail and the stringent budgetary measures imposed on NIOMR, it is hoped that NIOMR will fully utilize the institutional advantage of being able to transfer whatever revenue it has earned into its operating fund and use such revenue to increase its sales of fish, canned products, feed and seeds for aquaculture by effectively operating the plant and equipment supplied, and apply the proceeds from such sales to more intensive research.

3.3.4 Manning Plan

At present NIOMR has 335 persons on its staff. Of these more than 100 are experts who have either studied or been trained at foreign universities or colleges of fisheries. The technical level of NIOMR therefore is on the whole high.

NIOMR is planning to increase its staff by another 4 or 5 persons. But in view of the current economic situation, its budgeting plan is unlikely to be approved quickly. With due consideration to the fact that in the present budget about 60% of the operating expenses is payroll costs, the scale of this project was determined so as to be of a size that can be undertaken without increasing the number of the current staff, excluding part-time workers for manufacturing canned products. Actually, some saving in manpower is possible by the use of the ship repair yard and the other plant and equipment to be added by this project. In overviewing the situation, it is apparent that the research activities of NIOMR have been restricted by the aging and malfunctioning of its laboratory equipment and apparatuses due to the curtailment of its capital budget during the last three years. With the addition of the equipment and supplies to be granted under this project it is most likely that NIOMR itself will be invigorated and that more effective

utilization of NIOMR's current staff will become possible by personnel reshuffling or otherwise. In implementing this project, NIOMR has decided on making the following organizational changes in view of the added importance of each duty under this project.

① The Fishing Technology Section shall be upgraded into the Fishing Technology Division, under which the Fishing Gear Section and the Fishing Methods Section shall be newly created.

② The Vessel Operation Section shall be upgraded into the Vessel Operation Division for which a competent division manager shall be appointed.

The personnel necessary for operating this project are shown below.

Table 3.2 Manning Plan

Name of Facility	Parent Division	Required Manpower	Present Manpower	Remarks
Fishing Technology Laboratory	Fishing Technology Division	Div. Director 1 Sec. Chief 1 Staff 2 Management Staff 1 Clerk/Secretary 2 Librarian 1 Miscelluneous Workers 5 13	Higher Officer 3 Officer 1 Technician 1 5	2 officers and 6 laborers are required to be transfered to this laboratory.
Experimental Canning Plant	"	Officer 3 - 5 Part-time Worker 10	Higher Officer 15 Officer 3 Technician 1	The operation can be done without the increase of manpower except for part-time workers.
Classrooms	Federal Fisheries School	Same as the present staffing.	Higher Officer 17 Officer 3 Laborer 2	
Maintenance Shop for Vessel	Technical Service Division	Higher Officer 2 Officer 5 Technician 3	Higher Officer 9 Officer 29 Technician 13	Not necessary to increase the present manpower.

3.3.5 Conditions of the Construction Site for Facilities

The project site is the existing site of the Nigerian Institute for Oceanography and Marine Research located at the southwestern tip of Victoria Island in Lagos State. The climate is tropical, high in temperature, high in humidity. Each year is divided into the rainy season (May to October) and the dry season (November to April). The dry season ends with a cold wind storm called Hamataan which carries dirt and dust with it from the north. No earthquake has ever been recorded.

NIOMR's existing facility is comprised of three plots located close to each other. One plot is about 4 hectares (Site A) which accommodates the headquarter building, the Technical Service Division, staff dormitory and bachelors' dormitory, another plot is about 0.8 hectares (Site B) which accommodates the Federal Fisheries School, and the last plot about 0.5 hectares (Site C) which accommodates the Fisheries Industry Division and the jetty. Accordingly, the sites of this project are located at three places.

Site A: A land space of about 50m x 50m located approximately at the center of the site on the south side of the headquarters building is the proposed construction site for the fishing technology laboratory building of this project. The road by which access is possible is a 8 m wide road which branches out from Ahmadu Bello Way High-tension and buried underneath it is the high-tension distribution line of the Nigerian Electric Power Authority (NEPA) and the water service pipe of Logos State are buried underneath and supplied power and water to the site. A water service pipe of the Federal Government is also led in from Ahmadu Bello Way to the site. Another water supply source is the 100m deep well with pump and filter located on the site, complete with a concrete filter tank and a storage tank located next to it. However, because of the water's high density iron content these are not being used.

As for the power supply, a three-phase, four wire 11,000V high voltage power supply is received from NEPA, transformed into 415V by the NIOMR transformer and supplied to each building via the wattmeter and the power distribution board in the headquarters building. However, a power source from another system is used for the staff dormitory. To provide against power failures at peak consumption times, a 310 KVA power generator is connected. This generator is located on the proposed construction site of the fishing technology laboratory building so that when the project enters the implementation stage, it will be relocated by NIOMR.

Rainwater is conducted to the drainage pipe on the street through a side gutters and drain pipes. Sanitary sewage is discharged through a seepage tank after going through a septic tank.

As for the ground, results of a test boring of about 2m at two locations within the site proved GL - 0.8m to be comprised of a sand layer mixed with shells and between GL - 0.8m and 2.0m of stable fine sand. Water level of the same level as the sea was confirmed at GL - 2.0m. According to boring data (standard penetration test) at the time of constructing the four-story staff dormitory on the same site, about 1m of the upper layer is comprised of topsoil, beneath which to the depth of GL - 20m is a sand layer having N values ranging between 10 to 20. According to information on ground conditions at the time of drilling the deep well and the information of a Nigerian construction company (a joint venture with a German company which executed most of the civil engineering works including the superhighway in Lagos), the whole neighborhood of the site, judging from the mode of the formation of the Lagos lagoon, is presumed to be comprised of a uniform sand layer which was deposited over a long period of time as a part of that lagoon. From the foregoing, if GL - 1.5m to 2.0m is used as the supporting layer for direct foundation, a ground bearing strength of about 5 to 7 t/m^2 is considered obtainable.

Site B: For water supply to this site, a water service pipe of the State is connected from the access road. As in Site A, power is also supplied by NEPA. There is a pond for brackish water aquaculture within the site to which sea water is supplied. Rainwater and sanitary sewage are drained by the same systems as in Site A.

As for geological structure, it is inferred to be approximately the same as in Site A.

Site C: Same as Site A and Site B with respect to power and water supply, drainage, geological structure and infrastructure. The roof of the existing fish meal plant building is badly deteriorated and will not withstand further use. Effluent from the processing plant of the Fisheries Industry Division is discharged on the side of the jetty.

Comments on sites

All of the sites, A. B and C may be said to be generally well provided with basic infrastructure. Power and water supply and drainage all seem adequately capable of meeting future requirements of the facilities to be provided under this project. Accordingly, it is judged that there is no need to improve the existing infrastructure and that it will suffice to supplement only that infrastructure that will be required for future facilities expansion. Every site is flat, and relocation of some of the existing structures (septic tanks and a generator) is all that will be required. Roads for construction are already available, and the only precaution required in executing work in all three sites is to adequately safeguard the existing facilities.

3.3.6 Brief Description of Facilities and Equipment

Facilities and equipment included in this project are briefly described below.

Table 3.3 List of Facilities

Objectives	Name of Facilities and Equipment	Location	Q'ty
(1) Increase of Fisheries Production			
1) Development of Fishing Gear and Methods	Fishing Technology Laboratory (2-stories)	Site A	1
	Flume Tank Room		1
	Flume tank and equipment		1
	Flow Control Room		1
	Control panel, etc.		1
	Model Net Fabricating Room		1
	Work table, etc.		1
	Storage for Model Net Material		1
	Model net, net materials, etc.		1
	Fishing Net Material Testing Room		1
	Equipment for rope breaking strength measurement		1
	Fishing Gear Laboratory		1
	Equipment for Test Operation (Tension meter, etc.)		1
	Fishing Method Laboratory		1
	Equipment for fish behavior observation (Tank, etc.)		1
	Net Loft		1
	Hoist, etc.		1
	Tool Room		1
	Tools for net making and repair		1
	Fishing Gear Storage		1
	Management Room		1
	Dark Room		1
	Necessary Equipment		1

Objectives	Name of Facilities and Equipment	Location	Q'ty
	Data Room		1
	Bookshelf, desk, etc.		1
	Extension Room		1
	Desk, etc.		1
	Office, Fishing Gear Design Room		4
	Desk, etc.		1
	Electricity, Water Supply and Drainage		1
2) Pioneering Development of Untapped Fisheries Resources			
a) Skipjack Fishery Development	Small Boat for Bait Fish Survey	Badagry	2
	Fishing net, etc.		1
b) Aquaculture Development	Research Equipment for Aquaculture Development	African Regional Aquaculture Center	1
3) Development of Processing Technology of Fish Catches	Experimental Cannery	Existing Factory of Fisheries Industry Division	1
	Drainage and Sewage Treatment		
(2) Intensification of Training Activities	Classrooms	Site B	1
	Mock-up Bridge		1
	Chart Room		1
	Chart desk, etc.		1
	Lecturer's Room		2
	Desk, etc.		1
	Classroom		1
	Other Necessary Facilities		1

Objectives	Name of Facilities and Equipment	Location	Q'ty
(3) Improvement of Infrastructure Facilities			
1) Improvement of Jetty	Improvement of Existing Jetty	Site C	1
2) Establishment of Maintenance System	Maintenance Shop for Vessel	Site C	1
	Necessary tools for repair		1

CHAPTER 4

BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4.1 Design Principle

The facilities and equipment covered by this project have been selected for the purpose of expanding and reinforcing the existing facilities of NIOMR, which assumes an important role in promoting fisheries in Nigeria, in order that it may engage more effectively in research, development, training and extension activities. Accordingly, in the basic design of this project, the facilities and equipment which most need to be improved and expanded to support the policies of the National Development Plan of Nigeria and those which can be most effectively utilized in view of NIOMR's budgeting and staffing constraints have been designated.

The basic plan will be designed so that all facilities and equipment will harmonize with the characteristics of field conditions such as climate, natural features, the prevalent state of fisheries and circumstances surrounding construction. It will also be designed to effectively utilize existing facilities as well as the trunk lines already installed and to ensure that the activities of the existing facilities are not interfered with during the construction period. Adequate care will also be taken to ensure the safety of the people in the living quarters provided for the staff and for the Federal Fisheries School located on the same site.

Particularly with respect to the facilities plan, adequate consideration will be given to the following.

① To better protect the facilities from strong sunlight, natural light shall be taken in mainly from the south and north sides. Also materials of low thermal conductivity shall be selected for the outer walls.

② Local construction methods shall be adopted as much as possible. Also, an economical design commensurate with local conditions skill and which at the same time provides the necessary functions and

environment shall be adopted in order to reduce costs as much as possible. As locally produced materials are in short supply and their prices have soared due to the current import restrictions in Nigeria, only those which will not negatively affect the plan's intent to reduce costs or those which are absolutely necessary for maintenance and upkeep shall be used.

③ In view of the climate of Nigeria where mean annual humidity exceeds 80%, an air conditioning system will be installed just like in the existing facilities in order that research activities may be carried out smoothly. At the same time of course energy saving and the reduction of operating costs will be given due by consideration by careful planning of the architecture of the facilities.

④ Facilities shall be easy to maintain, and the equipment which is to be installed in the buildings shall be of types and models which can be procured locally for the sake of their ease of maintenance and upkeep. The facilities shall not be overly large but of a scale large enough to permit effective utilization by NIOMR's current manpower level which will not be increased. As for the scope of the work to be undertaken by the Nigerian side, every consideration shall be given to making its burden as light as possible in view of its limited available budget.

When deciding the equipment and apparatuses to be included in this project, the following points will be considered.

① Adequate consideration shall be given to the technical level of NIOMR's staff and its staffing plan (including internal personnel reshuffling).

② Present target fish species, fishing methods and fishing grounds environment (meteorology, oceanography, ocean current conditions, bottom material conditions, etc.) of Nigeria shall be adequately reflected in the review of conditions.

③ Ease of maintenance and upkeep and economy in operating expenses shall be adequately taken into consideration.

④ Basically, equipment and materials not too different in technical level from those currently being used shall be adopted.

⑤ The purpose for which each piece of equipment included in the project is to be used shall be thoroughly reviewed to ensure that the equipment selected shall be suitable for current and future research programs.