BASIC DESIGN STUDY REPORT

ON

THE PROJECT FOR MODERNIZATION OF FISHERIES TRAINING INSTITUTE

IN

MALAYSIA

MAY 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of Malaysia, the Government of Japan has decided to conduct a Basic Design Study on the Project for Modernization of Fisheries Training Institute in Malaysia and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Malaysia a survey team headed by Mr. Tadashi Tsuchiya, Deputy Director, Office for Overseas Fishery Cooperation, Oceanic Fisheries Department, Fisheries Agency, Ministry of Agriculture, Forestry and Fisheries, from November 30 to December 22, 1989.

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

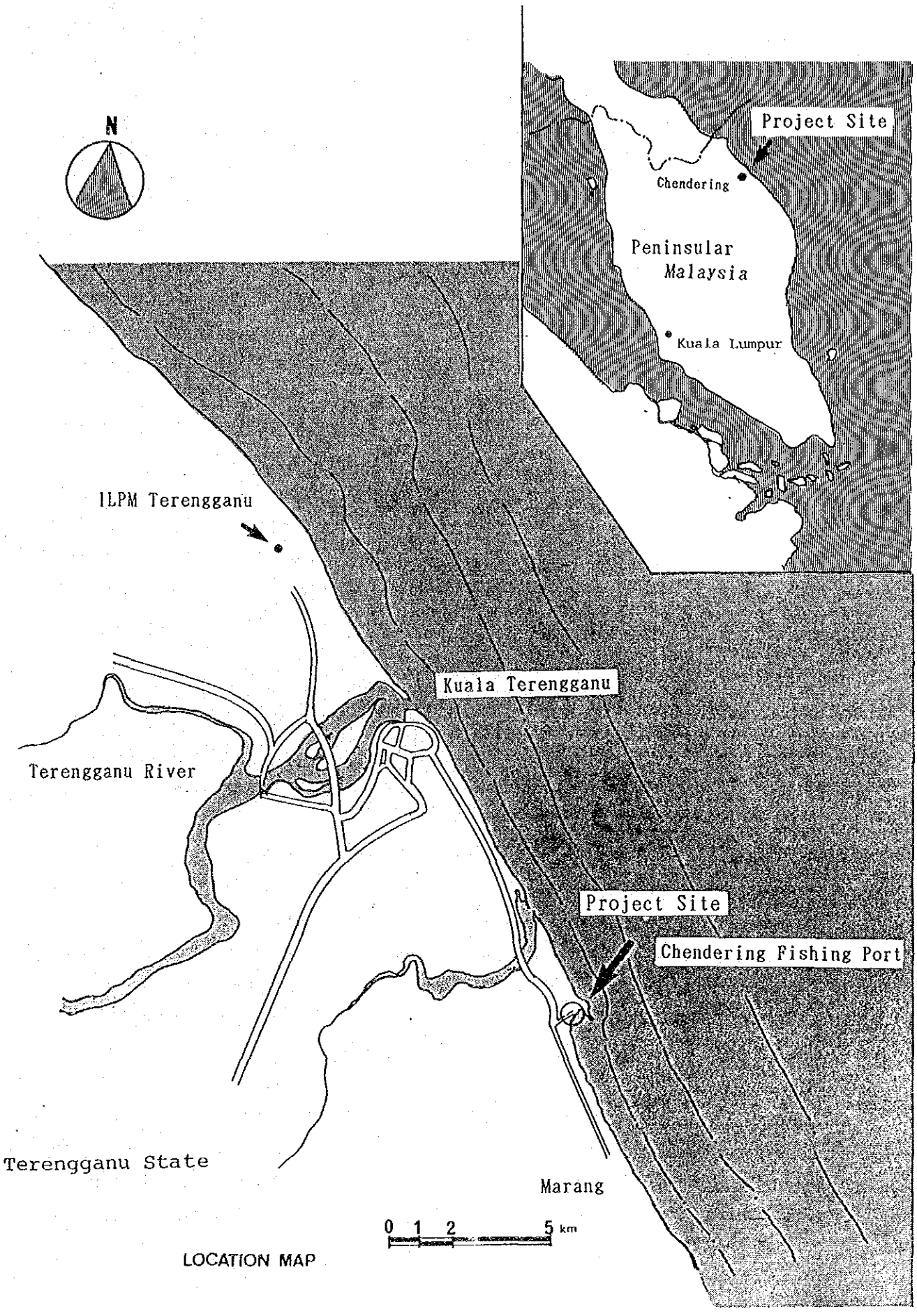
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

May, 1990

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency



LOCATION MAP

SUMMARY

During 1986-87, the Government of Malaysia conducted a series of fishery resource surveys in the country's 200 mile zone and learned thereby that a potential yield of some 420,000 tons of pelagic and demersal fish were available in waters beyond the country's 12 nautical mile mark. A considerable potential yield of 200,000 tons, including skipjack and tuna, was identified in waters off the east coast of Peninsular Malaysia. However, despite the rich fishery resources found in offshore waters, the volume of catches beyond the 30 nautical mile line accounted for no more than 11% of the total marine fish landings of 826,000 tons recorded in 1988, while resource depletion in coastal waters (within 12 miles of shore) has become an increasingly serious problem. As a result of this situation, the Government is attaching major priority, in its fishery development policies, to the development of offshore fisheries and aquaculture and, based on the size of the potential offshore resources, has decided to place primary emphasis on offshore fishery development in east coast waters.

For the Malaysian fishing industry, though, which has hitherto relied on rich coastal resources, offshore fishing represents a totally new area of development, and so it has become necessary to improve the technical skills of Malaysian fishermen in order to develop the offshore fishery.

In light of the above facts, the Malaysian Government, with a view to strengthening the fishery training system geared to raising technical levels among the country's fishermen, has drawn up a long-term plan for a project to modernize its Fisheries Training Institute presently located at Penang and Terengganu (hereafter called "the Project"), based on the establishment of a new institute on the east coast at Chendering, in Terengganu State, and converting its existing training facilities to Fishery Extension Centers. Chendering was selected because practical training could be offered in actual offshore fishing grounds and because of the large number of prospective trainees in the area. The Malaysian Government has submitted a Request to the Government of Japan for grant-aid for implementation of this Project.

Pursuant to this request, the Government of Japan, in August 1989, decided to dispatch through the Japan International Cooperation Agency (JICA) a Preliminary Survey Team, headed by Mr. Soichiro Shirahata, Fisheries Specialist with the Overseas Fisheries Cooperation Foundation, to conduct a preliminary survey in Malaysia. This team validated the background and purpose of the Project, conducted a field survey of the fishing industry, and held discussions with officials of the Malaysian Government. Based on this preliminary survey, it was decided to conduct a Basic Design Study on the Project. Accordingly, JICA dispatched a Basic Design Study Team to Malaysia from November 30 to December 22, 1989, headed by Mr. Tadashi Tsuchiya, Deputy Director, Office for Overseas Fishery Cooperation, Oceanic Fisheries Department, Fisheries Agency. This Team discussed with Malaysian officials the contents of the request and the implementation system for the Project and conducted a field survey which included topographic surveys and soil tests in the vicinity of the Project site. Based on the survey, the following points have been confirmed.

(1) The Department of Fisheries of the Ministry of Agriculture, which is the implementing organization for this Project, currently operates the Fisheries Training Institute (Institute Latihan Perikanan Malaysia =ILPM) in Penang, on the west coast of Peninsular Malaysia, and at Terengganu, on the east coast. The main Penang center offers primarily long-term courses, while the branch center at Terengganu conducts short-term courses.

The objectives of the ILPM programs are two-fold: 1) to provide training for fishermen designed to upgrade their technical skills in various areas; and 2) to offer technical training to officials of the Department of Fisheries to enable them to improve and broaden their administrative services to fishermen. Courses for fishermen have been established in the fields of navigation, engineering (engines), and offshore fishing operations and last for periods ranging from 3 weeks to 5 months. Those courses targeted at government staff comprise a 5-month Induction Course and a 4-month Fishing Gear Technology Course. The ILPM is the only facility offering fishery training in Malaysia and has already trained a large number of fishermen.

(2) The Project site is adjacent to the fishing port of Chendering, about 10 km south of Terengganu in Terengganu State and is a flat site of some 25,000 m^2. Power, water, telephone, access road, and other infrastructure are in place and, based on the results of the core boring tests, the foundation conditions were confirmed to pose no problems in relation to the construction of the Project facilities. Oceanographic conditions at Chendering, particularly during the northeast monsoon season from November through March, are inferior to those on the west coast, and so some constraints are inevitable on the sea training program during this season. It will be necessary, accordingly, to develop suitable countermeasures for onboard training programs during these months, such as the use of a large vessel from the existing training fleet.

(3) The development of the offshore fishery in Malaysia is significant in terms of both raising the incomes of coastal fishermen, whose livelihood has been deteriorating owing to the depletion of coastal resources, and maintaining the supply of animal proteins for the country's expanding population. The target Project, therefore, will consolidate the existing Fishery Training Institute, which is presently split between Penang and Terengganu, and will establish a new training institute at Chendering, which is the largest fishing port on the east coast. In consideration of the large potential resources in east coast waters as well as the fact that the majority of prospective trainees will be east coast fishermen, the Project is expected to strengthen the fishery training system in Malaysia by enhancing the effectiveness of the training programs. Also, in light of the excellent operating record at the existing training institute, no problems are anticipated in connection with the operating structure at the new facility.

Based on further analysis of the survey findings, the team developed a design of the most suitable types and scale of facilities and other items, as outlined below, which will be required to implement the Project.

(1) Building Facilities:

The building facilities will comprised the following structures, with the functions and size indicated and a combined area of about 5,650m^2.

1) Admi./Training Building:

(RC construction; 2-story (3-story in certain parts); 1,683m^2)

---to include an Administrative Block (offices, instructor's room, conference room, etc.) and a Training Block (consisting primarily of general-purpose classrooms.) This is to be the core facility of the Project.

2) Engine Workshop:

(RC construction, single-story, 180 m^2)

---for training in engine operation, assembly, dismantling, and adjustment, based on the use of actual models.

3) Net Loft:

(RC construction, single-story, 510m^2)

---for practical training on the techniques of assembly, fabrication, and repair of fishing nets and gear.

4) Processing Building:

(RC construction, single-story, 160m^2)

---to offer practical instruction in canning and the production of surimi products and in the methods of handling catches.

5) Gymnasium:

(RC construction, single-story, 490m^2)

---In addition to physical workouts, this facility will also be used for various events and sports.

6) Maintenance Shop:

(RC construction, single-story, 90m^2)

---to function as a maintenance shop for training vessels as well as for the whole facility.

7) Hostel:

(RC construction, 2-story, 2,129m^2)

---to accommodate a total of 152 persons in:

6-person bedrooms for short-term trainees

4-person bedrooms for long-term trainees

double rooms for government trainees

single rooms for visiting instructors

8) Dining Hall:

(RC construction, single-story, 392m^2)

---for meal service to resident trainees; to incorporate a dining room/kitchen, pantry, and a staff room.

9) Guard House and other incidental facilities:

(RC construction, single-story, total area of 19m^2)

---incorporating a guard room and a machine room.

(2) Fisheries Training Vessel:

This vessel is to provide practical training in purse-seine fishing operations and should be large enough to accommodate 10 trainees. The main specifications are as follows:

Vessel Class:	NK, NS* (Fisheries Training), MNS*	
Hull Material:	Steel	
Principal Dimensions (approximate):		
	Length, overall	28.0m
	Length, p.p.	24.0m
	Breadth, mld.	7.2m
	Depth, mld.	3.15m
	Draft, full loaded	2.65m
Gross Tonnage (international):		165 tons
Service Speed:		10.0 knots
Capacities (approximate):		
	Fish hold	20m^3
	Fuel tank	25m^3
	Freshwater tank	8m^3
	B.W.T. (F.P.T)	3m^3
	(Aft B.W.T)	8m^3
Complement:	21 including ten trainees	

(3) Training Equipment:

The following training materials will be provided as required for the various courses on navigation, engines, deep-sea fishing, and fishing gear technology:

Radar with image playback capability:	2 units
30ps diesel engines for training in assembly and dismantling:	5
Mini-power block	1
Cutter boat	1
Surimi equipment	1 set
Canning equipment	1 set
Printing equipment	1 set

The implementing organization for the Project is the Department of Fisheries, Ministry of Agriculture, which can transfer the operational structure at the existing training facilities to the new Training Institute. In addition, since we can anticipate greater efficiency from the consolidation of the existing facilities, there can be no doubt as to the Department's capability to operate the new institute envisaged under the Project. It is estimated that about M$2.1 million per year will be required for operation and maintenance, a figure which is virtually identical to the combined operating budgets of the existing institute at two locations. Thus, assuming that the present appropriation can be secured, no problems are foreseen in this connection.

The initial objectives of the Fishery Training Institute will be to modernize the fishing industry by upgrading the technical skills of fishermen and to expand administrative services to the fishery sector by raising technical capabilities among officials of the Department of Fisheries.

In Malaysia, where opportunities for specialized fishery education are extremely limited, the Project facilities will serve as the only source of technical training open to ordinary fishermen. And, through the technical training of both fishermen and officials of the Department of Fisheries, we may expect the facilities to contribute to the modernization of the country's fisheries and thereby to improvements in

the social status and incomes of Malaysian fishermen. Based on these benefits, the Basic Design Survey Team has concluded that there is considerable significance in implementing the Project with grant-aid from the Government of Japan.

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APPENDIX

CHAPTER ONE: INTRODUCTION

The Government of Malaysia, based on its National Agricultural Policy promulgated in 1984, in order to accurately establish the size of the fishery resources lying within the country's 200 mile zone, from 1985 to 1987, conducted fishery resource surveys, applying acoustic method based on a scientific echo sounder as well as sample hauls by bottom trawling on predetermined stations.

As a result of these surveys, it was learned that the potential yield of pelagic and demersal species was approximately 37,000 tons in the waters to the west of the Peninsular Malaysia, 149,000 tons in East Coast waters; and some 235,000 tons in waters off Sabah and Sarawak States.

In order to promote the change-over from coastal fisheries, where resources are in danger of depletion, and maintain a supply of marine products for the people of Malaysia, the Government decided to focus its future fishery development efforts on the development of offshore fisheries and aquaculture, and, as one of the measures intended to promote the offshore fisheries, it was deemed essential to strengthen the training system so as to improve technical skills among fishermen.

Fisheries training in Malaysia is presently being conducted at the Fisheries Training Institute (ILPM), located in Penang, in the northwest part of the Peninsular Malaysia, and at a branch facility of this institute at Kuala Terengganu, on the east side. However, from the standpoint of favorable fishing ground conditions (less than 70 m water depth with a sandy bottom) and the size of the potential yield, the future development of offshore fisheries in Malaysia is expected to take place primarily in waters off the east coast of Peninsular Malaysia.

To this end, the Government has drafted a "Project for Modernization of Fisheries Training Institute (hereafter called the "Plan"), the essence of which is to establish a new facility for offshore fishery training at Chendering, in Terengganu State, and utilize the existing training facilities as Fisheries Extension Centers. This Chendering site was chosen because: (1) training can be carried out in waters that already serve as actual fishing grounds; (2) the bulk of the anticipated trainee

population lives on the East Coast; and (3) it is planned to relocate other fishery-related government offices to this area. In order to bring this Plan to fruition, the Government of Malaysia has requested a grant-in-aid from the Government of Japan.

Upon receipt of this request from the Government of Malaysia, the Government of Japan, in August, 1989, decided to dispatch a Preliminary Survey Team to Malaysia to conduct a preliminary survey. This team was headed by Mr. Soichiro Shirahata, Fisheries Specialist with the Overseas Fisheries Cooperation Foundation. Based on the results of this preliminary survey, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team to Malaysia from November 30, to December 22, 1989, headed by Mr. Tadashi Tsuchiya, Deputy Director, Office for Overseas Fisheries Cooperation, Oceanic Fisheries Department, Fisheries Agency to validate the contents of the request, assess the appropriateness of the Plan and the conditions at the existing Fishery Training Institute, and evaluate the future plan for using the existing facilities as well as Plan implementation structure. It also carried out topographical and geological surveys in the vicinity of the Plan site.

During this field survey, a basic agreement was reached regarding implementation of the subject Plan on the basis of discussions between representatives of the Government of Malaysia and the Basic Design Study Team, and a Minutes of Discussions was signed by both parties.

After returning to Japan, the Team analyzed and reviewed survey findings, evaluated the benefits that would accrue from the Plan in terms of modernizing and enhancing the effectiveness of the country's fishery training programs, and prepared a basic design for a facilities and other items of optimum scale and character. These findings are presented in the Draft Final Report.

In order to explain the contents of the report, another team led by Mr. Junichi Fujita, Deputy Director, Office for Overseas Fisheries Cooperation, Oceanic Fisheries Department, Fisheries Agency, was sent to Malaysia from March 22 to 29, 1990. The team reviewed and discussed with the concerned officials of the Malaysian Government on the basic design study included in the draft final report.

This report incorporates the above results and contains the most appropriate basic design for the facilities, training vessel and equipment for the Plan, the implementation plan, project evaluation, etc.

The name of the study team member, the itinerary, the names of the discussants along with the Minutes of Discussions are shown in Appendix following the body of the main report.

CHAPTER TWO: BACKGROUND OF THE PROJECT

2.1 The National Development Plan and the Economic Structure

Malaysia comprises Peninsular Malaysia, occupying the bulk of the Malay Peninsula, and the states of Sabah and Sarawak in the northern part of the island of Borneo. It is located between 1-7° N. latitude and between 100-119°E longitude. The country's population in 1989 was 17.3 million, with a density of 51 persons/km^2, lower than that of the Philippines (152), Thailand (116), and Indonesia (91). About 83% of the total population lives in Peninsular Malaysia, 8% in Sabah, and 9% in Sarawak. Educational levels are high, with 99% attendance at elementary schools, as of 1988, and an 83% attendance rate for junior high schools.

Since the country faces both the Indian Ocean and the South China Sea, it is influenced by Asian seasonal winds and, while the timing of these winds differs by area, the nation is blessed with an annual rainfall of 2,000-3,000mm. About 70% of the land area is covered by tropical rain forests, and so animals and vegetation are abundant and a wide variety of plants and vegetables are grown. In terms of geological structure, the country sits astride a stable crust called the Indochina Platform and is endowed with such minerals as tin, oil, and natural gas.

Malaysia's 200 mile exclusive economic zone is estimated to cover 590,000 km^2, of which the most important waters extend from the east coast of Peninsular Malaysia to the waters off Sabah and Sarawak states. Depths range from 40-100m over the Sunda continental shelf. These waters are known for the occurrence of upwelling currents resulting from surface current and eddy caused by periodic winds. As a consequence, primary production is high in surface waters, with production of phytoplankton exceeding 500 mg/m^2/day in all areas except the very deep waters off Sabah and Sarawak.

Endowed with abundant natural resources, Malaysia has long been orienting its development primarily to tin and rubber. Prior to the early 1960s, the share of these products in total exports had never fallen below 60%. However, since the First Malaysia Plan, inaugurated in 1966, the Malaysian Government has consistently set its sights on diversifying

production and exports and expanding the country's industrial sector. As a result, in the latter 1960s, timber was added to the country's two traditional export commodities of tin and rubber, followed by palm oil and petroleum in the 1970s. At the same time, Malaysian industries, which started at the level of import substitution in the early 1970s, have steadily boosted their export competitiveness, with textiles and electronics production oriented to the export market. Since 1986, electronics have overtaken oil to become the nation's leading export commodity. Based on the implementation of the 4th Malaysian Plan, which ran through 1985, Malaysia has attained an economic growth rate exceeding that of other ASEAN countries and has succeeded in further developing and diversifying its industrial base.

The Government of Malaysia is presently completing the final year of the 5th Malaysian Plan (1985-90). This Plan was launched at a time of adverse economic conditions, reflecting the collapse of primary product prices starting in 1985 and a rapid increase in fiscal deficits and foreign debt. Thus, the Plan emphasized production growth and the use of domestic resources. During the Plan period, the Government has taken steps to attract private capital and privatize government corporations. As a result of these policies, and bolstered by a recovery in primary products beginning in 1986, the Malaysian economy has shown a rapid recovery, with the GDP growth rate at 5.2% in 1987, 8.7% in 1988, and 7.6% in 1989.

For the Malaysian economy, which is expected to show continued brisk growth along the above lines, the main problems, for the time being, are seen to lie in the twin areas of inflation and unemployment. The rate of increase in consumer prices was 0.6% in 1986, 0.8% in 1987, and 2.5% in 1988-- an average of less than 1.3% per annum over these three recovery years. However, while inflationary pressures have been controlled up to now, the producer price index, which leads the consumer price index, rose a full 7.4% in 1988 from the previous year, reflecting in part a rise in import prices resulting from a fall in the value of the ringgit, while in 1989 this upward trend continued at a rate of 8.0%. As a result, it is believed that consumer prices also rose some 4% during 1989, and there is concern over further inflationary pressures in the future.

On the other hand, despite the booming pace of economic activity, unemployment remains at high levels: 8.2% in 1987, 8.1% in 1988, and 7.9% in 1989. This high rate is, essentially, as acknowledged by the Malaysian Government, a function of the inability of technical education and training to keep pace with economic diversification and the rapid development of the industrial structure. That is to say, a gap has developed between the quantity and quality of human resources in relation to supply and demand. In 1989, 69% of the unemployed were aged 15-24, while 95% had completed only 9 years of schooling. Thus, as the figures show, there has been an increase in the demand for labor with some degree of technical experience but no such growth in the demand for unskilled and inexperienced workers. The shortage of skilled technicians has led to investment in automated, labor-saving facilities in the manufacturing sector, which has expanded as a result of the domestic business recovery, while the expected expansion of employment opportunities for unskilled workers has failed to materialize. In the agricultural sector, on the other hand, despite the high unemployment, a shortage of labor persists, mostly on plantations. The direct cause of this shortage has been a deterioration of employment conditions in these sectors but, indirectly, one cannot overlook the constant influx of young workers from the countryside to the cities.

The Malaysian Government is developing programs to revise curricula in schools and training institutes to enable them to provide training in a wide variety of technical fields, while placing increasing priorities on practical vocational training at public training centers. Efforts are also being made to increase the number of trainees; the number of graduates of public training centers is believed to have risen from 17,868 in 1988 to 25,648 in 1989. As a means of coping with the country's high unemployment levels, the Government is attaching great importance to raising technical skills through retraining existing workers and expanding employment opportunities in local areas for young people through regional industrial development.

2.2 Fishing Industry and Development of Offshore Fisheries

2.2.1 Fishery Resources:

The Malaysian 200 mile economic zone is estimated to extend over an area of approximately 590,000 km^2 , of which Peninsular Malaysian waters comprise about 224,000 km^2 and those off Sabah and Sarawak states 366,000 km^2. The percentage of total area accounted for by the continental shelf (not over 200 m deep) is about 50% in Sabah and Sarawak, but around Peninsular Malaysia the entire area is comprised of continental shelf with depths of 100 m or less.

Excluding the narrow shelf off the northernmost part of Sabah State, where depths range from 1,000~2,000 m, the Malaysian shelf is comprised of the central, southern, and eastern Sunda shelf, with the most important sections found off the east coast of Peninsular Malaysia. These waters have a depth of not over 80m, with a sea bottom mainly of sand and mud.

To date, catches are being made off Peninsular Malaysia over an area of 44,000 km^2 within 12 nautical miles from shore, equivalent to about 20% of Peninsular Malaysia's exclusive economic zone. Within these waters, the catch effort is believed to be equal to or even in excess of the Maximum Sustainable Yield (MSY). Following is a summary of the catch effort and resource conditions in the waters off Peninsular Malaysia:

(1) West Coast:

The waters off Selangor in the south and Johor in the west already show signs of overfishing, with poor levels of catch efficiency. In the northern sections (Kedah, Perlis, Pulau Pinang, and Perak States), fishing activity inside the 12 mile line has reached MSY levels. There is room for further development only in a limited area beyond the 30 mile mark off Kedah and Perlis states.

(2) East Coast:

Demersal Resources:

Within 3 miles of shore, catches exceed optimum levels. Between 3-12 miles, it is estimated that catches are just about at the optimum level, with the fishery comprised of both Malaysian and foreign

vessels. There is room for development in waters beyond the 12 mile line.

Pelagic Resources:
Overall, the fishing effort is believed to be below the potential yield.

In order to more accurately establish the size of the marine resources in its 200 mile zone, the Malaysian Government has conducted three resource surveys based on the acoustic sounding method-- the first in July 1980, using the FAO research vessel, DR. FRIDTJOF NANSEN and two others in August 1981 and September 1982 with its own research vessel, K.K. AYA. However, seeing the need for a more sophisticated resource survey directed at offshore fishery development, particularly in waters beyond the 12 mile line up to the border of the country's 200 mile zone, the Government conducted another resource survey within the 200 mile zone between December 1985 and June 1987, using the FAO research vessel, RASTRELLIGER.

This survey was carried out through the technique of experimental trawling, using mid-water and bottom trawl, in order to establish species composition and body length distribution. A scientific echo sounder was installed to operate on two frequencies (38kHz and 120 kHz) on a stern-trawler of 40m LPP (length between perpendiculars) with a gross tonnage of 391 tons and a 1,320 hp main engine. The survey waters, in the case of pelagic species, extended from a point 12 nautical miles from shore to the 200 mile line north of $7^{o}30'$ N. off the coast of Sabah and Sarawak; and, in the case of demersal species, throughout the Malaysian economic zone, excluding only waters with a depth of 183m or more. In the case of pelagic fish, the studies were conducted over two seasons in order to obtain data on changes in resource size between the season of the northeast monsoons (November-March) and other times of the year.

Based on an analysis of the echo traces and biological data collected from experimental catches during the surveys, the following estimates were made on biomass and potential yield for the pelagic and demersal resources:

Table 2.1 Pelagic Resources (in tons)

	Biomass			Potential Yield		
Peninsular Malaysia:	12-30nm	30-200nm	Total	12-30nm	30-200nm	Total
East Coast	24,500	109,200	133,700	12,250	54,600	66,850
West Coast	18,200	33,900	52,100	9,100	16,950	26,050
Sarawak	53,200	163,100	216,300	26,600	81,550	108,150
Sabah	72,600	35,500	108,100	36,300	17,750	54,050

(Source: Deep-Sea Fisheries Resources within the Maslaysian Exclusive Economic Zone, Fisheries Research Institute, 1988)

From the above, the total biomass of pelagic resources in waters between the 12 mile line and the outer limit of the country's 200 mile zone was estimated at 510,200 tons, and the potential yield at 255,100 tons. In addition, with respect to skipjack and tuna species, which were not targeted by the acoustic survey, the potential yield in waters off the east coast of Peninsular Malaysia was estimated at 50,000 tons.

The estimates for demersal resources were as follows:

Table 2.2 Demersal Resources (in tons)

	Biomass	Potential Yield		
		Edible Fish	Trash Fish	Sub-total
Peninsular Malaysia: East Coast (25 nm & beyond)	205,900	55,100	27,100	82,200
West Coast (30 nm & beyond)	32,800	4,300	7,000	11,300
Sarawak (12 nm & beyond)	184,400	33,600	28,700	62,300
Sabah (12 nm & beyond)	31,400	6,500	4,400	10,900
TOTAL	454,500	99,500	67,200	166,700

(Source: Same as preceeding table)

The above surveys revealed that, in west coast waters off Peninsular Malaysia, the undeveloped portion of the pelagic resources is felt to be no more than 26,000 tons, and 11,000 tons for demersal resources, for a

total of 37,000 tons. On the east coast, however, it was confirmed that there is a concentrated potential yield, with a high proportion of edible fish, of 67,000 tons for pelagic species and 82,000 tons for demersal fish, for a total of 149,000 tons.

Among the pelagic species on the east coast, the largest resources are Carangoides malabaricus, Selar crumenopthalmus, S. mate, Decapterus maruadsi, Sphyraena forsteri, Megalaspis cordyla, Decapterus macrosoma, Scomberomous commersoni and S. guttatus. During the northeast monsoon season, Selar crumenopthalmus and Carangoides malabaricus are predominant but, at other times of the year, species distribution is comparatively even. On the west coast are found Lutjanus spp., Decapterus maruadsi, Selar crumenopthalmus, Serrolina rigrofasciata, Formio niger and Scomberomous guttatus but, compared to the east coast, resource size is small, with no predominant species.

Turning to the demersal species, the main species on the east coast are Priacanthus spp., Nemipteridae, Upeneus spp., Parupeaeus spp. and Loligo spp., while, on the west coast, Arius spp., Nemipteridae, and Lutjanus spp. are relatively abundant. The share of trash fish is 32.9% on the east coast but reaches 53.2% on the west coast.

2.2.2 Fishing Ground Conditions:

For purposes of operating restrictions, the Malaysian 200-mile EEZ is divided into four zones by the Department of Fisheries of the Ministry of Agriculture:

Table 2.3 Waters for Fishing Operations

	Waters	Restrictions
Zone A	within 5 nm	Priority given to artisanal fishermen
Zone B	5-12 nm	Trawl vessels not over 40 tons
Zone C	12-30 nm	Vessels owned by Malaysian nationals
Zone D	30 nm & beyond	No restrictions on fishing vessels, but official permit required

Following is a comparison of the zones on the east and west coasts of Peninsular Malaysia:

Table 2.5 Area by Zone (in km^2)

	Zone A	Zone B	Zone C	Zone D	Total
Pen. Malaysia:					
East Coast	13,000	12,000	36,000	84,000	145,000
West Coast	8,000	11,000	56,000	4,000	79,000

(Source: Fisheries Sector Project in Peninsular Malaysia, FAO, 1985)

Table 2.6 Area by Depth (in km^2)

	0 - 30m	30 - 80m	80 -100m	Total
Pen. Malaysia:				
East Coast	17,000	128,000	-	145,000
West Coast	18,000	48,000	13,000	79,000

(Source: Same as preceeding table)

The east coast area is about 1.9 times bigger than the west coast area but, comparing Zones A & B only (i.e., from the shoreline to 12 nautical miles), the difference is not that great. In the case of Zone D (30 nautical miles and beyond), however, there is a tremendous difference: 84,000 km^2 for the east coast area and only 4,000 km^2 for the west. The sea bottom conditions on both coasts are similar, ranging principally from sand to sandy mud. Trawling is possible in 77% of east coast and 72% of west coast waters.

Currents in Malaysian waters evidence area variations in terms of fishing season, grounds, and peak and low fishing periods, reflecting the effects of the winds from the Indian Ocean during the southwest monsoon season and the winds from the South China Sea during the northeast monsoon. The east coast is strongly affected by the northeast monsoons and, between December and February, catches are greatly reduced. On the west coast, although the area is affected by the southwest monsoons from June to

September, their influence is less than on the east coast, and so catch variations over the year are small.

Based on catch data for 1987 and 1988, average monthly catch volume on the east and west coasts of Peninsular Malaysia were as shown below:

	West Coast	East Coast
January	36,390	11,455
February	33,610	16,683
March	38,071	22,372
April	43,485	21,101
May	45,254	16,233
June	42,708	20,007
July	40,103	26,627
August	38,498	27,063
September	34,456	35,814
October	36,658	30,083
November	34,314	17,692
December	34,318	7,374

(in tons)

As is evident from the above table, while catches are stable throughout the year on the west coast, on the east coast they are greatly reduced during the November - January period. In the east coast area, the northeast monsoons are predominant from November to April, particularly in November and December, with wind velocities of 13-22 knots. From May to October, the area is influenced by the southwest monsoons, with winds of 8-13 knots. While typhoons also develop, they rarely reach land, normally passing through to the north.

Changes in ocean currents by season, based on the effects of monsoons, are as shown below:

November - April	to the south	0.2 - 10 knots
May - August	to the north	0.2 - 1.0
September-October	mixed	0.2

Tides are not particularly strong, rarely exceeding 1.5 knots. However, at times they increase to 3.0-3.5 knots under the influence of currents

and winds. During the season of prevailing northeast monsoons, under conditions of strong winds, upwelling currents develop in the east coast area.

In west coast waters, however, the northeast monsoons are prevalent from November to March and strongest in January, with winds of about 5-10 knots. From May to September, the area feels the effects of the southwest monsoons, but winds are weak at 4-8 knots, while typhoons are rarely seen. Ocean currents flow from northwest to south throughout the year, with the exception of August and September, with flow speeds of about 1.0 knot. Waves are tranquil throughout the year, with no large swells.

It may be concluded then that, except for east coast waters during the peak period of the northeast monsoon season, the oceanographic and meteorological conditions on both the west and east coasts of Peninsular Malaysia are eminently suitable for fisheries for all species.

2.2.3 Present Status of Fishermen and Fishing Boats

Based on fishery statistics for 1988, the number of fishermen in Malaysia in that year totaled 88,963, representing a decline of 2.6% (2,356) from 1987. This was a result of the government's policy of redirecting coastal fishermen, whose productivity has deteriorated owing to resource depletion, to other industries of higher productivity. The number of fishermen has been on a continuing decline since the mid-1990s, with the rate of decrease particularly evident in Peninsular Malaysia, where urbanization and industrialization have been proceeding at a rapid pace. The number of fishermen in Peninsular Malaysia fell 3.8% in 1988 to a level of 58,283, as compared with 60,569 in the previous year. The composition of the fishing population by ethnic origin shows Malaysians marking up 55.6% of the total, Chinese 36.7%, Thais 6.4%, and others 1.3%. Almost all of the Thai fishermen serve on vessels in the offshore fishery. In terms of regional distribution, 55.5% of the ethnic Malaysian fishermen live on the east coast of the peninsula, whereas 92.0% of the Chinese are concentrated in the west coast states of Penang, Perak, and Selangor.

The number of fishing boats totaled 37,802 units in 1988, which is a 2.6% decrease from the 1987 figure. This decrease correlates with the decline in the number of fishermen, and the number of non-powered boats and outboard motor boats showed a conspicuous decrease in 1988, by 15.5% and 9.3% respectively, compared to the previous year. On the other hand, the number of offshore fishing vessels has increased to 399 units in 1988 from 328 units in 1987. The number of motorized fishing vessels equipped with inboard engines totaled 14,621 boats on the west coast of the peninsula but only 5,971 on the east coast. However, in terms of fishing vessels of 70 grt or over, the east coast has 167 vessels vs. 149 on the west coast, indicating that offshore fishing is further developed in the former area. The number of vessels with outboard motors totals 13,362 for the country as a whole, with 4,993 on the west coast, 839 on the east coast, and 7,530 in Sabah, Sarawak, and Labuan Island combined. Almost all vessels are of wooden construction with steel or FRP boats still quite rare, except for government vessels.

The 1988 catch for marine species in Malaysian waters amounted to 826,000 tons, of which the west coast accounted for 430,000, the east coast for 264,000, Sarawak for 80,000, Sabah for 48,000, and Labuan Island for 4,000 tons.

Whether viewed from the standpoint of area or resources, west coast waters are clearly reaching the limits of development, whereas there is still ample development potential on the east coast. Fishing permits in Malaysia are issued on the basis of both fishing gear and type of fishing vessel. Fishing gear permits in 1988 totaled 31,272, with little variation in recent years. The gear which have shown particularly large permit increases are small purse seine nets (none in 1987, 74 in 1988) and gill nets (1,523 in 1987, 2,448 in 1988) on the east coast. On the other hand, declining trends are evident in trawl nets on the west coast, which fell from 4,442 permits in 1987 to 3,257 in 1988. As to vessel permits, in line with the Government's plan to develop offshore fisheries, a decision has already been made to increase sharply the number of permits for large vessels of 70 grt or over.

2.2.4 Economic Viability of Offshore Fisheries:

In order to promote the development of offshore fisheries off the east coast of Peninsular Malaysia, which have substantial leeway for development, the Malaysian Government wishes to encourage capital investment in these fisheries from three sources: a shift of existing coastal fishermen to the offshore sector, an expansion in fishing ventures by present offshore fishermen, and the induction of new entrants. To this end, the Government is conducting various surveys on the viability of offshore fisheries.

The total number of fishing vessels of 70 grt or more capable of operating in offshore waters increased from 200 vessels in 1985 to 429 vessels in March 1989, reflecting the determined policies that have been taken by the Government since 1986 to expand these fisheries.

The Department of Fisheries of the Malaysian Government conducted a survey, covering a 12 month period (January - December 1988), on the economic viability of the trawl and purse-seine fisheries in east coast waters, and the results were released in July 1989. For survey purposes, 36 vessels each of 70 grt or more in the trawl and purse-seine categories, were divided into 3 size groups, and operating performance was analyzed for all 72 vessels.

Based on the survey findings, it was concluded that both trawl and purse-seine vessels could expect satisfactory earnings from offshore operations in east coast waters. In the case of the trawl vessels, gross receipts per trip were M$2,140 - M$3,549, or M$66,260 - M$87,590 for the full year. After depreciation, annual earnings were M$36,800 - M$58,130 for an internal rate of return (IRR) of 12-20%. Figuring the cost per kg of catch at M$0.82 - M$1.12, income worked out to M$1.00 - M$1.30 per kg.

In the case of the purse-seine vessels, gross receipts per trip were M$1,271 - M$1,821, or M$62,264 - M$141,584 per year. After depreciation, annual earnings came to M$24,464 - M$103,784, with an IRR of 20- 31%, which was a higher earnings rate than among the trawl vessels. On a per kg basis, the catch cost was M$0.86 - M$1.13, leaving net earnings of M$1.06 - M$1.47 per kg.

Based on the above findings, average values have been computed for all size classes of trawl and purse-seine vessels, as shown in Appendix V-1. Although assumptions were made in the study on vessel construction costs as well as profit-sharing between vessel and crew, the analysis was made on the basis of actual operating values, and so the data are felt to constitute a valuable reference for the Government in developing offshore fisheries in east coast waters.

2.3 Fisheries Development Plan

In 1984, the Malaysian Government, with a view to resuscitating agricultural production, announced a National Agricultural Plan (NAP) aimed at improving the effective utilization and productivity of domestic resources. Within the Plan, the developmental targets in the fisheries sector were oriented in two directions:

(1) development of offshore fisheries with a view to achieving more effective utilization of existing resources and an expansion of fishery production; and

(2)the development of aquaculture for purposes of expanding domestic supplies and exports.

Various fishery development programs are being carried out within the framework of this NAP, within the parameters of the current National Development Plan. These programs are divided broadly into education and training, resource conservation and management, facility investment, development of artificial reefs, R&D, and information activities. Total expenditures over the 5-year Plan period are planned at about $69 million. Following is an outline of the plans relating to education and training, with the long-term objective of raising the productivity of fishing and aquaculture operations.

(1) Fisherman Training on a Non-residential Basis:

These programs are intended to provide guidance and demonstrations with respect to the maintenance of marine engines, processing of fishery products, and the introduction of new equipment, with a view mainly to improving the technical capabilities of coastal fishermen. Courses are

targeted at 3,000 coastal fishermen per year; in 1988, there were 8 training programs for 3,050 fishermen.

(2) Fishermen Training on a Residential Basis:

Long-term training is provided in designated fields on a residential basis, with modular courses also offered to fishermen unable to participate in extended courses. In addition to training on a technical level, the courses also cover such subjects as fishery laws and regulations, marine safety, discipline, stamina, and morale. Since 1987, a new residential course has been added on offshore fishing, which has been positioned as a key phase of offshore fishery development.

(3) Aquaculture Training:

This program provides training designed to improve technical skills in aquaculture for persons starting a business in this field. The scope of the program, therefore, is quite broad, including instruction in fresh-water aquaculture and seed production, estuarine pond species, shrimp culture, and pen culture of fish and shellfish.

(4) Expansion of Training Facilities:

This is a program for expanding the facilities of the Fishery Training Institute Penang, providing for investment in staff living quarters, hostel facilities, and office facilities.

2.4 Background and Nature of the Request

The development of offshore fisheries has become a key aspect of the Malaysian Government's fishery development program, from the standpoint of the need to strengthen resource management in coastal waters, in which the specter of resource depletion has already begun to surface.

However, for Malaysian fisheries, the offshore sector represents a brand new developmental area, and so the improvement of fishing skills has become essential to the development of the offshore fishery. The Government, therefore, on the basis of the potential for resource development, has decided to place the major priority for offshore fishery development on east coast waters. Accordingly, in order to strengthen the training system from a long-term perspective by raising technical levels

among the country's fishermen and permit training in actual fishing grounds, and considering the large number of potential trainees in the area, a new Fisheries Training Institute is to be established on the east coast at Chendering,in Terengganu State, while the existing training facilities are to be converted to Fisheries Extension Centers . In connection with the implementation of this comprehensive fishery training and modernization plan, built around the above training facilities, grant-aid has been requested from the Government of Japan.

Based on this request, a preliminary survey was carried out in August, 1989. The contents of the Project, as agreed between officials of the Department of Fisheries, Ministry of Agriculture, of Malaysia and the Preliminary Survey Team were as follows:

(1) Facilities
Main building, training building, net working area, dormitory

(2) Equipment:
Equipment for navigation training
Equipment for engine training
Equipment for fishing gear training
Equipment for radio communications
Machine tools
Others

(3) Training Vessel:
Stern trawler (1)
5-day trip, accommodation for 20 persons

At the time of the Preliminary Survey, the Malaysian authorities requested the dispatch of two Japanese specialists to provide guidance in the preparation and implementation of fishery training programs after completion of the Project facilities.

This Basic Design Study was initiated on the basis of the agreement reached at the time of the Preliminary Survey. On the basis of field work and discussions with the Malaysian authorities, the contents of the request have been included, as shown below, in the Minutes of Discussions.

(1) Objective:

Training programs to improve fishing techniques among fishermen and government officials concerned with fisheries.

(2) Implementing Organization:

Department of Fisheries, Ministry of Agriculture

(3) Project Area:

Chendering, Terengganu State

(4) Required Facilities and Equipment:

The facilities and equipment required for the target training programs are as outlined below:

1) Navigation Course	5 months
2) Engineering Course	5 months
3) Deep Sea Fishing Course	5 months
4) Navigation Modular Course	3 weeks
5) Engine Modular Course	3 weeks
6) Induction Course for Staff	5 months
7) Fishing Gear Technology Course for Staff	5 months

1) Facility:

Classrooms (including training rooms for navigation, radio communications, chart work, fish handling, net-loft, and workshop)
Administration Building
Assembly hall
Trainee Dormitory
Maintenance Workshop

2) Training Vessel:

Stern trawler or purse-seiner
Length of training cruises: 5 days
To accommodate 20 persons, including a minimum of 10 trainees

3) Equipment:

For navigational training
For engine training

For fishing gear training

For training in radio communications

Machine tools

Vehicles

Others

With regard to technical cooperation, as was the case during the Preliminary Survey, a request was made for the dispatch of Japanese specialists to handle the preparation of training programs under this Project. The Basic Design Study Team agreed to convey this request to the Government of Japan.

CHAPTER THREE: CONTENTS OF THE PROJECT

3.1 Objectives

The objective of the Project is to conduct two types of training programs as part of the fisheries development policies of the Malaysian Government: (1) courses directed at fishermen to upgrade fishing skills in various sectors; and (2) courses geared to officials of the Department of Fisheries to improve technical services to fishermen. The basic rationale is to develop curricula that meet the needs of the fishing industry and thereby improve the results of the fishery training programs now being conducted at the Fisheries Training Institute at Penang and Terengganu.

Fishery training in Malaysia is presently being offered at the main center of the Fisheries Training Institute in Penang and at its branch facility in Terengganu. However, these facilities have been in existence now for some time and so may not be entirely suitable for future training programs oriented to offshore fisheries, while the development of these offshore fisheries is to take place mainly off the east coast. Thus, the Malaysian Government plans to consolidate the existing training centers via the establishment of a new Fishery Training Institute at Chendering in Terengganu State.

The purpose of this Project is to permit the upgrading of technical levels among fishermen, which is the bottleneck limiting the future development of the offshore fisheries, by means of fishery training programs while also improving the capability of officials of the Department of Fisheries of the central government and indirectly strengthening assistance to fishermen through broader extension service programs, a function that comes under the jurisdiction of state governments. The ultimate objective is to effectively utilize the fishery resources distributed widely across the nation's economic zone by maintaining a balance between coastal and offshore operations.

3.2 Evaluation of the Request

3.2.1 Project Contents

The Government of Malaysia is promoting the development of offshore fisheries and aquaculture as key programs in the fishery sector. It is anticipated that there will be a rapid future expansion in the offshore fishery, involving operations in waters 30 nautical miles or more from the shoreline by vessels of 70grt or over, particularly in east coast waters off Peninsular Malaysia, where developable resources are known to be considerable. In order also to replace foreign crews in the offshore fishery, on which the fishery presently relies, with Malaysian nationals, training of offshore fishing vessel crews has become a matter of considerable urgency. The need for and appropriateness of the target Project are evaluated below.

3.2.1.1 Nature of Existing Fishery Training Facilities:

The Fisheries Training Institute operated by the Malaysian Government has a long history dating back to the establishment of a Fishermen's Training Institute on the premises of the Marine Research Center that had been built in Penang in 1957. In 1961, a second Fishery Training Center was established in Terengganu to serve fishermen on the east coast of Peninsular Malaysia and Sarawak.

In 1972, with the assistance of FAO, a Fisheries Training Institute was established in Penang, and this marked the start of specialized education in fishery subjects. When first established, the objective was to cultivate fishery specialists keyed to the development of offshore fisheries, particularly the tuna fishery in the Indian Ocean. Subsequently, however, as the 200-mile economic zone era rapidly took root, opportunities for unrestricted operations began to diminish, while the tuna resources in the Indian Ocean also started to deteriorate. For these reasons, among others, the offshore fishery did not develop as originally expected, and so there was no increase in the need to cultivate manpower with specialized fishery knowledge.

Based on these conditions, the government decided to change the function of the Fisheries Training Institute from the implementation of specialized training programs to the general upgrading of technological levels among existing fishermen. Accordingly, in 1983, the two training facilities in Penang and Terengganu were consolidated into the Institute

Latihan Perikanan Malaysia (Fisheries Training Institute Malaysia [ILPM]). Presently, the main Penang school offers principally long-term training courses, while the branch school at Terengganu conducts short-term fishery courses. Since their establishment, a total of about 4,000 trainees have taken these courses.

The present objectives of the ILPM program are divided into two types of courses: (1) courses for the improvement of technical levels, offered directly to fishermen; and (2) courses geared to officials of the Government's Department of Fisheries that are intended to raise the quality of services to fishermen. The former type of training-- directed at fishermen-- is further subdivided into resident and non-resident courses. Resident-type courses require that trainees reside in hostels on the school premises for periods ranging from 3 weeks to 5 months. The courses currently being offered at the Penang and Terengganu facilities are as follows:

At Penang:			
Navigation Course	5 months	15 students	Twice a year
Engineering Course	5 months	15 students	Twice a year
Deep-Sea Fishing Course	5 months*	100 students	4 times a year
At Terengganu:			
Navigation Modular Course	3 weeks	10 students	10 times a year
Engine Modular Course	3 weeks	10 students	10 times a year

* 2 months in residence at ILPM plus 3 months in training aboard a fishing vessel.

Non-resident programs are made up of short-term courses at ILPM of 1-2 days duration and other courses conducted in various parts of the country. For example, in 1988 the Penang facility offered a 2-day fishery management course directed mainly at fishermen in the Penang vicinity. This course was given twice at Penang and 7 times in Sabah, Sarawak and other areas. The Terengganu branch offers mainly equipment demonstrations via movable classrooms transported by vehicle. In 1988, 21 classes on engines were held at 21 locations and navigation courses at 8 locations,

while demonstration courses for fish-finders and other equipment were offered at 24 locations, with close to 800 fishermen participating in these courses.

Courses for officials of the Department of Fisheries are divided between resident and non-resident courses, as shown below:

At Penang:

Induction Course	5 months	20 students	Twice a year
Fishing Gear Technology Course	4 months	10 students	Twice a year

Non-resident courses for government staff cover a wide variety of themes, and students are not necessarily confined to Department of Fisheries personnel. In 1988, the ILPM at Penang offered radio and fire-prevention courses for rescue squads as well as satellite navigation courses for high-level officials. In addition, courses are conducted in various parts of the country, including advanced fishery courses, quality control courses, and scuba diving training for high-level Malaysian officials as well as officials from other ASEAN countries.

Among the above mentioned various training programs, the target and the contents of the training programs being offered at present for each residential course can be summarized as follows.

(1) Navigation Course

This course is intended to provide training to ensure unencumbered and safe navigation in waters at the outer limits of Malaysia's Zone D--i.e., from 30-200 nautical miles. The basic course includes math, celestial bodies, tidal flows, navigational instruments, seamanship, avoidance of collisions at sea, radio, fire-fighting, first-aid, fish processing, and accounting. There are 580 hours of instruction, including 5 weeks (132 hours) of sea training from Monday -Friday during the 5th, 8th, and 11th weeks and, during the 14th and 15th weeks, through the following Friday. Since the trainees are selected from among fishermen by the state Departments of Fisheries, rather than by ILPM, there will be a problem in that basic academic ability and understanding of the course

materials may not be uniform. There is a final examination, but only about half the students are expected to attain a satisfactory score.

(2) Engine Course:

The objective of the engine course is to provide training in the handling of engines up to 500 ps. The curriculum for marine diesel engines covers basic structure, attached instruments, measuring instruments, operating techniques, maintenance, and propulsion (130 hours); auxiliary engines, power, refrigeration, and outboard engines (68 hours); engine dismantling and assembly, measuring, welding, and tool handling (123 hours); sea training (192 hours); and fish handling, fire prevention, and first-aid (102 hours), for a total of 617 hours in all. The same problem of uneven aptitudes can be expected as with the navigation course but, since the engine course places primary emphasis on practical skills, the drop-out rate is expected to be low.

(3) Deep Sea Fishery Course:

This course has been offered since 1987, pursuant to the Government's active encouragement of offshore fishery development, and comprises two months of training at ILPM and three months of on-vessel training on an operating vessel of the offshore fishery. The purpose of this course is to train crew members for service in the offshore fishery pursuant to the official policy of having 2 ILPM graduates serve on each trawler and 3 on each purse-seiner with an offshore fishery permit, and of reducing the size of foreign crews in this fishery by 10% per year.

The curriculum provides 60 hours of physical education, including defensive martial arts; 90 hours on the handling and repair of fishing gear, 26.5 hours on navigation, engines, and fish-handling methods, 2 weeks (80 hours) in on-vessel training, and 28 hours in religion (Islam) and foreign languages (Thai), for a total of 276 hours in all. The training program is completed with a 3-month internship aboard a private fishing vessel.

(4) Induction Course for Staff:

This course is given to new employees of the Department of Fisheries and embraces a wide spectrum of subjects required to provide administrative services to fishermen, including laws and regulations, practical training in fishery operations, and data processing. The instruction is in the form of lectures, practical training, and field trips, covering such subjects as fishery policy, resources, marine organisms, fishing ground management, aquaculture, fishing gear and fishing methods, navigation, engines, hulls, nutrition, post-catch handling and processing, and information (public relations) activities. Training in fishing gear and methods, navigation, and post-catch processing are given on board a vessel over a 2-week period.

(5) Fishing Gear Technology Course:

This course is directed at public officials serving on fishery training and research vessels as well as those who provide fishery guidance. Training is given via lectures and practical instruction on such subjects as nets, net preparation, traps, longlines, driftnets, trawl nets, and seine nets. The course involves 7 weeks of on-vessel training, including one week on a coastal fishing vessel, and emphasizes practical training on net operations as well.

(6) Navigation Modular Course:

This is a 3-week course which is offered at the ILPM in Terengganu and is intended to provide basic training on safe navigation in coastal waters. Subjects include chart-reading, position finding, cruising regulations, and communications. The course covers 82 hours, including 33.5 hours of on-vessel training.

(7) Engine Modular Course:

This course is designed to provide training in the handling and maintenance of small diesel engines. It covers 82 hours, the same length as the navigation modular course, including 20.5 hours of lectures on engines and 44.5 hours of practical instruction, plus certain other subjects.

3.2.1.2 Thrust of Fishery Development:

Production of Malaysia's marine fisheries has been steadily increasing, reaching 826,000 tons in 1988. But the depletion of resources in coastal waters within the 12-mile line has become quite serious, while the fish catch in waters 30 nautical miles or more from shore remains at only about 11% of the total catch. As a result of the resource studies conducted within the 200 mile zone during 1985-87, the bottom fish, pelagic fish, skipjack and tuna resources within waters 12 nautical miles or beyond off the east coast of Peninsular Malaysia were shown to have a sustained production yield of about 200,000 tons, with the current catch at about 125,000 tons, leading to the conclusion that there is a large developmental potential in east coast waters.

On the other hand, in the west coast waters off Peninsular Malaysia, in addition to the small area of the 200 mile zone, catch efforts centering around the trawl fishery have continued for many years. As a consequence, it has been concluded that catches within the 12 nautical mile line on the west coast are already over maximum sustainable yield, and, even with respect to resources beyond this line, the sustainable yield is no more than 37,000 tons.

On the basis of the depletion of resources in coastal waters and the large potential production volume off the east coast, the Malaysian Government has determined that there is a need to develop offshore fisheries in east coast waters and, in this connection, has been planning to sharply increase the number of offshore fishing permits for new entrants and prepare various sorts of investment and financial incentives. As a result, as of March 1989, the number of permits for offshore fishing vessels of 70 grt or more has increased from 429 to 715 at present, with this upward trend expected to continue. Malaysia's fishing industry, which had until now relied on rich resources within the 12 mile line will be called on to make a major structural change toward the development of offshore resources.

Pursuant to the government's fishery development policies, a major restructuring is also necessary for the fishery training system, and the authorities have decided that there is a need to consolidate the

Fisheries Training Institute, which has been divided between Penang and Terengganu, via the establishment of a new center at Chendering, the largest fishing port on the east coast.

3.2.1.3 Project Area:

The planned site for the Project facilities is in Chendering, some 10 km south of Kuala Terengganu. Kuala Terengganu is the capital of Terengganu State and has a population of about 200,000. It is located about 8 hours (400 km) by road from the nation's capital at Kuala Lumpur and about 50 minutes by air (with 2 flights daily).

Chendering is linked to Kuala Terengganu by a 2-lane highway (National Route 3) and is the largest fishing port on the east coast of Peninsular Malaysia. Its extensive fishing port facilities were built between 1980 and 1983 and comprise a landing jetty of 500 m, unloading areas, fuel and water supply facilities, an ice-making plant with a capacity of 200 tons/day, and an 800 m breakwater. Owing to drifting and silting as a result of seasonal winds blowing from opposite directions during the northeast and southwest monsoon seasons, regular dredging operations are required, but this is the only port on the east coast which can safely accommodate offshore fishing vessels of 70 grt or more during the northeast monsoon season, and so its importance is expected to grow along with the future development of the offshore fishery.

The Project site is adjacent to the Chendering fishing port. On the north side of the site are an access road and land under the direct control of the Department of Fisheries, on which a building is presently under construction to serve as a fisheries enforcement office for the department.

On the east boundary to the mid-point of the southern side are found fishing port facilities including a landing wharf and auction hall, all of which are already in operation. Thus, the infrastructure in the area is complete, including power, water mains, telephone lines, and access roads. In addition, on the wharf there is a berth for the exclusive use of the Department of Fisheries, and so there should be no major problems in connection with the berthing of the training vessel. On the remainder

of the south perimeter is a land development project using soil and sand dredged from the Chendering fishing port. Finally, the western side of the site borders on a hill of about 30 m elevation with a steep grade. The site has a somewhat irregular triangular shape, but the land is essentially flat, with no significant change in elevation. If the facilities are positioned with due regard for the noise emanating from the fishing port facilities, the site will provide an excellent environment for the fishery training facilities.

Originally, the site area was limited to about 16,000 m^2, owing to the fact that construction was in progress on a fish processing plant on the southern perimeter for the Fisheries Development Authority. While this area is almost as large as that of the branch center of ILPM at Terengganu, it is only a fifth of the size of the Penang facility. The Department of Fisheries of the Malaysian Government, which is the responsible operating agency for the facilities, recognizing that the site would not be large enough to support a facility of the Project scope, decided, as a result of discussions with the Basic Design Study Team, to discuss the site problem internally with related government agencies. Based on these talks, the Department of Fisheries made the following proposal to the Study Team:

1. They would relocate the fish processing plant presently under construction, thereby permitting use of the entire area on the south side of the Project site.

2. The area on the north side of the access road would also be added to the Project site.

As a result of this proposal, the usable area was expanded on the south side alone to some 25,000 m^2, but, although the area to the north of the access road comprises some 10,000 m^2, it has been excluded from the Project site for the following reasons.

From an environmental standpoint, since the land is separated from the fishing port facilities, it has the merit of being free from noise and the movement of people and goods. But this spot served as a source for soil and sand taken for landfill operations during the building of the

fishing port site and now there is a depression surrounded on 3 sides by steep hills. For this reason, the configuration is such that, during rainy periods, rainwater flows down and accumulates in the middle of the site. And, since the grade surrounding the area on 3 sides is to be left as a collection area for sand and soil, there is a constant danger of falling and shifting rocks, while the surface is highly irregular, with elevation variations exceeding 10 m. Thus, as a site for a facility that is intended to serve a large number of people, there are simply too many problems to overcome, which would, in our view, entail costly improvements.

Based on a topographical survey, boring surveys at 3 locations, and soil quality lab tests, it was confirmed that the soil conditions at the Project site present no problems in terms of constructing the desired facilities. With respect to oceanographic and meteorological conditions at the site, the northeast monsoon season, extending from November to March, produces unfavorable conditions relative to those experienced at Penang, where the main ILPM center is located. December is the worst month of the year for oceanographic conditions along the east coast and, though the existing training program is suspended during December, there will inevitably be some constraints on at-sea training activities during the northeast monsoon season at the new Chendering center. During this period, it will be necessary to adopt countermeasures, such as using a large-sized training vessel of the K.L. KURAU class for the sea training programs.

3.2.1.4 Use Plan for the Existing Facilities:

If, based on implementation of the target Project, the functions of the present ILPM at Penang and Terengganu are transferred to Chendering, it is planned to use the existing facilities as a Fisheries Extension Center, as explained by the Department of Fisheries during the Preliminary Survey. Based on a plan to convert the existing Extension Center at Kuala Besut to one devoted exclusively to training in processing technology, the Terengganu school in 1988 absorbed the functions of the Besut Extension Center along with 9 members of its staff, and so the Terengganu facility has now become the base for extension activities in the area.

Fisheries extension activities in Malaysia are intended to raise technical levels through technical transfer directly to fishermen and also have the important function of providing administrative assistance in improving their social position.

To this end, the Government, in its 5th Malaysia Plan, decided to establish four new Regional Extension Centers in Peninsular Malaysia to coordinate activities in their respective areas. This extension program is under the jurisdiction of the state governments and so is specifically implemented by the state Departments of Fisheries, but the Regional Extension Centers are positioned as bases for providing assistance to extension officers and field workers from 2-3 states within their respective areas of jurisdiction. Following are the areas in the Regional Extension Centers to be established under the 5th Malaysian Plan.

Regional Centers	States to be Serviced
Kuala Terengganu	Kelantan Terengganu Pahang
Kuala Kedah	Perak Kedah P. Pinang
Tg. Sedili	Melaka Johor
Manjung	Perak Selangor

In addition to the above locations, an Extension Center devoted solely to post harvest technology is being built in Kuala Besut and will become a sub-center of the Kuala Terengganu facility. Among the 4 projects, construction is farthest advanced at Tg. Sedili, with completion targeted for March 1990. Construction is also proceeding for the centers at Manjung and Kuala Besut, which are both expected to open by the middle of 1990. In the case of Kuala Terengganu, its functions have already been transferred to the ILPM Terengganu and, when the training activity is eventually moved to Chendering, the intent is to convert this facility in its existing state to an Extension Center.

In Kedah Center, 21 employees have been attached and they are presently operating from a commercial building. However, construction plans for this Regional Center have been stymied owing to budgetary considerations. If the target Project is implemented, it should be possible to utilize the ILPM Penang facilities in their present state as a Regional Extension Center. On this basis, it is planned to amend the plan to build a Regional Center at Kuala Kedah, as contained in the original plan, and use the existing ILPM Penang facilities in their present form for this purpose.

Activities at these Regional Centers will be comprised mainly of: (1) providing short-term training courses to area fishermen; (2) implementing training programs for extension officers from state governments, having direct contact with fisheries, who are assigned to the various fishing districts; and (3) providing assistance in handling inquiries from and advising these officials. At the present time, there is, on average, one extension officer per 1,000 fishermen, but it is planned to increase this ratio to one officer per 500 fishermen. Thus, in the future, the implementation of training programs for these newly assigned extension officers should also become a major function of these Regional Extension Centers.

Based on the above assessment, it has been concluded that implementation of the target Project is required within the context of Malaysian fishery development and that the Project contents are appropriate to this end.

3.2.2 Facility Management Plan:

The implementing agency for the target Project is the Department of Fisheries of the Ministry of Agriculture. The Department of Fisheries has been administering the Fisheries Training Institute at Penang and Terengganu and so, when a new institute is established in Chendering, pursuant to the Project, the existing management structure can be transferred intact to Chendering to administer the new institute.

If the existing management organization is essentially continued, there should be no problems in this connection at the new facilities, but ILPM

plans to develop two new divisions at the Chendering Institute for sea training and audio-visual aids. The sea training division will be organized to smoothly implement the training cruises, using the existing training vessels at Penang and Terengganu, which will be moved to Chendering. This specialized group will be charged with preparing operating plans for the training vessels and conducting supporting shore programs. The audio-visual division will be created to improve training effectiveness by developing superior teaching materials.

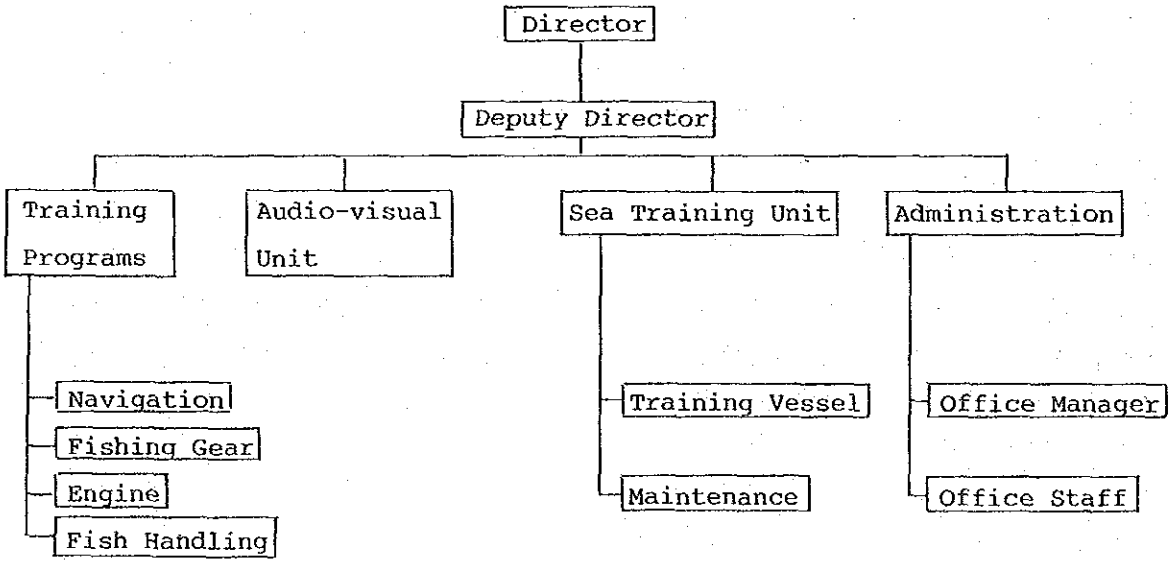
The operating budget for the main and branch centers of ILPM combined has been generally stable at M$1,760,000 in 1987, M$1,740,000 in 1988, and M$1,630,000 in 1989, and operations are running smoothly. Maintenance costs for training vessels are not included in operating budgets for the Training Institute but are covered out of the general budget for vessel maintenance from Department of Fisheries headquarters, which includes research vessels belonging to research organizations as well as fishery inspection and other vessels under the control of the Department. Thus, no budgetary problems have been encountered to date with regard to the maintenance and operation of training vessels.

If the two existing centers are consolidated on the basis of this Project, it is clear that no significant budgetary problems will be encountered with respect to the number of training officers, office personnel, or operations in terms of continuing the present training programs. There are 28 training officers at the existing ILPM Penang and 11 at Terengganu, for a total of 39 in all, but it is planned to reduce the size of the training staff by 4 persons to 35 at the new facility. The existing and planned complement of training instructors is shown below:

Training Area	Projected No. of Instructors	Present No. of Training Officers Penang	Terengganu
Navigation	10	10	
Fishing Gear	10	6	
Engines	10	8	11
Fish Handling	5	4	
Sub-total		28	11
Total	35	39	

The number of trainees at the two existing centers during 1989 totaled about 136; thus, there was one instructor per 3.5 trainees. At the Project facility, however, this ratio will rise to one officer per 4.3 trainees, meaning that the number of instructors per trainee will decline slightly. However, on the basis of a consolidation of functions at the new institute, which have hitherto been split between the Penang and Terengganu facilities, it will be possible to reduce staff redundancies and so the planned complement of training officers is deemed appropriate.

Other than the training officer, the general office staff will number 15 and the crews on the training vessels 51, the same as present levels. In addition, the operation will require a director, deputy director, secretary, and a few general workers.
Following is an organizational chart for the administration of the Project facilities:



3.2.3 Constituent Elements of the Project

The target Project is divided into three parts: facility construction, construction of fishery training vessel, and the provision of training equipment/ The facilities outlined in the Request included gereral-use classrooms; a separate building for training programs in navigation, radio, charts, processing, fishing nets, and marine engines; an administration building, meeting rooms, a dormitory and other facilities

administration building, meeting rooms, a dormitory and other facilities for trainees; and a workshop for equipment maintenance. All of these facilities are being effectively employed in the existing training facilities and are essential for continuing the fishery training work presently being conducted.

With regard to the training vessel, there was a request for either a trawler or purse-seiner capable of accommodating a minimum of 10 trainees and of providing training at sea for 5 days. Judging from the training conditions to date, while many training programs have already been successfully carried out on trawl vessels, which are specially equipped for this purpose, there are no purse-seine vessels capable of being used exclusively for training purposes, and so no sea training curricula have been devised for purse-seine operations. In any event, however, it is necessary now to replace the existing antiquated training vessel, in which case the choice will definitely be made between a trawler and a purse-seiner.

With regard to training equipment, the Request calls for equipment for navigational, engine, fishing, and radio training as well as machine tools, vehicles, and other necessary items. Some of the equipment being used at the existing facilities has been found to be antiquated and no longer suited to actual conditions. In choosing new equipment, consideration must be given to securing equipment compatible with the existing state of Malaysia's fisheries and the future directions of fishery development.

3.2.4 Evaluation of the Items in the Request:

3.2.4.1 Facilities:

Since the Project facilities are to take over the activities of the existing Fisheries Training Institute, the facilities under the Project should be conditioned for carrying out all training programs offered in the seven residential training courses mentioned in Section 2.1.1. However, with regard to enrollment for the Deep-Sea Fishing Course, judging from the past records, about 70 trainees at one enrollment will be the optimum number. This course was started in 1987 and became fully

operational since 1988, and the future number of applicants for this course could increase. In this case, however, a slight adjustment for the increase could be possible within the total accommodation capacity of the facility.

The courses to be offered, course duration, and the prospective number of students for the training activities at the Project facilities can be summarized as follows:

Course Title	Period	Enrollment	No. per year
1.Navigation Course	5 months	15	2
2.Navigation Modular Course	3 weeks	10	10
3.Engine Course	5 months	15	2
4.Engine Modular Course	3 weeks	10	10
5.Deep-Sea Fishing Course	5 months*	70	4
6.Induction Course for Staff	5 months	20	2
7.Fishing Gear Technology Course	4 months	10	2

* of which 2 months will be spent at ILPM.

The required facilities for the operation of these training courses will be similar to the existing ones: viz.,

1) Administration;
2) Training and exercise;
3) Hostels; and
4) Staff living quarters

The staff living quarters are to be provided by the Malaysian Government.

(1) Administrative Facilities:

The required rooms for the administrative facilities are shown below:

Office of the Director:
This will be a room for the director and will, in principle, be private.

Office for the Deputy Director:
Office for the Office Manager:
These rooms will also be private.

Management office:
This room will handle administrative operations and should be one large room.

Instructors' rooms:
To be divided into four sections.

Printing room:
For the production of teaching materials

AVA room:
A small studio for preparation of audio-visual aids material

Room for training vessel officers:
For use by the officers of the training vessels

Dressing room:
For the use of the female staff, to be fitted with lockers and other furnishings.

Conference room:
For staff conferences

Entrance/exhibit hall:
A small space for public announcements on institute activities

Maintenance shop:
For work on the training vessels and facilities

Storage area:
For the storage of teaching materials and sundries

Rest rooms:

(2) Training Facilities:

The various rooms required for the training facilities are to be composed of classrooms exclusively for particular courses and other classrooms to be used depending on the curriculum but not limited to a particular course. The special classrooms include those for the navigation, chart work, engine, net, and processing courses. Common facilities for use in all courses include a gymnasium for physical training and special activities plus a library.

Summarizing the above, the training rooms at the facilities will include:

Classrooms:	for general instruction
Navigation room:	for training in navigation and communications equipment

Chart room: for training in chart work

Engine training room: for engine assembling, dismantling, and operations

Net training room: training in the repair of nets and gear

Processing room: for training in the techniques of freshness control of catches

Gymnasium: for use both as an athletic facility and a place for assembly

Library: for storage of books and charts.

(3) Hostel Facilities:

We have concluded that the hostel facilities should be comprised of 2 blocks: a residential block and a common-area block.

1) Residential Block:

To accommodate long- and short-term trainees, trainees for government staff, and visiting instructors. The required rooms are as follows:

Individual rooms: to be of four types-- for long-term trainees, short-term trainees, government staff, and visiting instructors

Utility rooms: for washing, drying, and ironing

Lavatory and shower rooms: equipped with showers

Storage rooms: for storage of sundries

2) Common-area Block:

The common areas are intended to support daily life at the institute and will comprise a supervisor's room, a lounge, a dining hall, and a kitchen. Details are as follows:

Hostel supervisor's room: to serve also as living quarters for the resident manager

Lounge: for rest and relaxation

Dining hall & kitchen: to provide meal service for resident trainees,

	with operations to be contracted out to a catering service
Cooks' room:	a private room for use by the cooks, who will be on duty in the early morning or late at night.
Food storage area:	for the storage of dry foods

3.2.4.2 The Training Vessel:

The requests with regard to a fishery training vessel, to be attached to the Training Institute, were as follows:

- either a stern trawler or purse-seiner (1 vessel);
- for training cruises of 5 days;
- to accommodate 20 persons, including a minimum of 10 trainees

With respect to the type of training vessel, agreement was reached, during the Preliminary Survey, on a stern trawler to board 20 persons. However, as a result of the field survey, it was decided that a purse-seiner would also be considered, with the conclusion as to the optimum vessel type to be given in this report.

There were two reasons leading to the decision to consider both vessel types:

(1) When considering the future course of offshore fishery development in Malaysia, since the purse-seine fishery accounts for 23% of the total Malaysian catch, this type of vessel cannot be eliminated from consideration.

(2) The Government has made a decision to reduce the size of foreign crews on fishing vessels of 40 grt or over by 10% a year, starting in 1990, and use only Malaysian crews on offshore vessels by the year 2000. Honoring this condition has already been made a condition of fishing permits. At present, the bulk of the foreign crews on Malaysian fishing vessels are composed of Thai nationals serving on purse-seiners. It is, therefore, vital that Malaysian crews for purse-seine vessels be trained from the standpoint of implementing government policy.

Consideration of whether the vessel should be a stern trawler or a purse-seiner was to be based on an evaluation of the activity patterns of the existing training vessels, conditions of the fishing vessels actually engaged in offshore operations, as well as the future course of fishery development in waters off the east coast of Peninsular Malaysia.

(1) Existing Training Vessels and Repair Facilities:

The usage conditions of the present training vessels are as shown in Appendix V-2. As is clear from this data, a multi-purpose vessel will sometimes, depending on the fishing method, be unable to fulfill the training objectives. Particularly in the case of small vessels equipped with a variety of equipment, not only are such vessels inconvenient in normal use but maintenance entails unnecessarily high costs. Thus, in the case of a small vessel, it is particularly necessary to consider linking the rigging to specific training purposes. Accordingly, we have concluded that, as shown in the Request, the vessel should be either a trawler or purse-seiner but that it would not be proper to select a vessel type that combines both fishing methods.

As to the hull material, based on the anticipated size of the vessel, either steel or FRP can be considered but, from the standpoint of vessel repair facilities in Malaysia and hull stability, we feel that a steel hull would be most advantageous. There are four shipyards in the country equipped with dry docks or slipways and capable of making repairs to steel vessels or building new ones. One of these is in Terengganu and has 2 slipways 100 m long fitted with a 25-ton crane, a 100m fitting wharf, as well as the welding and woodworking facilities required for a general yard for the repair and construction of vessels of the Lloyd and ABS classes. While this yard is also equipped with facilities for building small FRP craft, its capability in this respect is limited to vessels of not over 10m in length. Judging by the yard's present facilities, personnel, and construction record, there should be no problem with respect to its repair capabilities for steel vessels of the 30-35m length class.

The Department of Fisheries maintains its own repair yard for training and research vessels, which is located in Port Klang, some 30 km

southwest of Kuala Lumpur, and has performed repairs on the training vessel, K.L. KURAU. In Lumut, Prerak State, there is a dry dock capable of making repairs on Malaysian naval vessels up to the 2,000 ton displacement class, and this yard has performed regular checks under NK (Nippon Kaiji Kyokai--Japan Classification Society).

In Johor Bahru is located Malaysia' largest shipyard equipped with large docks for use by 500,000 and 150,000 dwt vessels. It builds and repairs large vessels but is not economically geared to building or repairing fishing vessels.

(2) Condition of Existing Offshore Fishing Vessels:

The offshore fishery in Malaysia is defined as one operating in waters 30 nautical miles or more from the coast with fishing vessels of 70 grt or over, based on Malaysian measurement rules. According to fishery statistics for 1988, there were 460 vessels of 70 grt or more, of which 167 were registered on the west coast, 149 on the east coast, and 144 in Sabah and Sarawak.

Most of the offshore trawl vessels based in Terengganu and Kuantan on the east coast are large in size, with a main engine horsepower of about 275 ps. However, in recent years the main engine output has been stepped up and, among the 200 ton trawlers based at Kuantan, a few vessels are now equipped with main engines of 1,000 ps. The hulls are wooden and characterized by a broad width, low-release sterns, shallow draft, and living quarters built in 2 or 3 layers on the upper deck. The vessels have 6-man crews and cast their trawl nets 3-4 times a day for 3 hours per operation. Freshness of catch is maintained by the use of either crushed or block ice or the refrigerated seawater method. The vessels operate 7-10 days a month during normal seasons. About 50% of the catch is comprised of trash fish, which is used as fish meal. During the northeast monsoon season, operations are curtailed to about 3 days, while, in many cases, fishing is moved closer to shore.

The purse-seine fishery, at present, is broadly divided into two branches, depending on the catch being targeted. One comprises seiners with nets 500m long and 110-120m deep, with operations directed at such

pelagic species as Caranx, Scad, and Rastrelliger. The other branch operates mainly at night, using nets 1500-1800 m long and 80-110m deep, and is directed at skipjack and tunas, such as long-tail tuna, little tuna, and frigate mackerel.

The vessels targeting pelagic species operate throughout east coast waters, principally under individual ownership, while those targeting small-sized skipjack and tuna are operated by fishing companies based in Kuantan. Comparative profile data are shown below by referring to the former fleet as "Terengganu type" and the latter as "Kuantan type".

	Terengganu Type	Kuantan Type
Size of vessel	50-115 tons	70-180 tons
Size of crew	30 (normally 100% Malaysians)	36-50
Trip length	3-4 days--maximum one week	maximum 2 weeks
Cooling method	block ice	block ice
Net size	500m(l)x 110-120m(d)	1,500 - 1,800 m(l) x 80 - 110m(d)
No. of operations	7-8/trip, daytime only during period of full moon; around-the-clock at other times.	5-7/trip, during daytime searching for fish schools, operations only at night.
Target species	Caranx, Selar, Rastrelliger	mainly long-tail tuna
Catch volume	5-10 tons/trip	40 tons/trip
Sonar	None	Fully equipped
Fish aggregating device	Used	Not used
Northeast mosoon season	Fishing conducted, depending on the calmness of the sea	Fishing suspended. During this season maintenance done in Thailand

Judging by the condition of the offshore fishing vessels in the area, trawl-type operating patterns are not radically different from those in Japan, but the purse-seiners are characterized by the use of nets of

considerable depth relative to water depth, net hauling operations that involve a large number of hands, and rational operating methods based on the use of simple fish aggregating devices known as "unjang".

3) Future Course of Development in the Offshore Fisheries:

Among the elements that will determine the future course of offshore fishery development off Peninsular Malaysia, the most important will be the size of the resources. The total potential yield in Malaysia's 200 mile zone, on the basis of extensive surveys from 1985-87, was calculated in east coast waters at 82,200 tons for pelagic fish, 66,850 tons for bottom fish, and 50,000 tons for small tunas. On the other hand, based on fishery statistics for 1988, the catch on the east coast by trawlers 40 grt or over came to 71,372 tons, accounting for 86.8% of potential bottom fish production, as against 54,085 tons by purse-seine vessels of 40 grt or more (which included 8,330 tons of small tunas). This amounted to only 46% of the total potential production of pelagic fish and small tunas in these waters. Thus, considering the present catch levels in relation to potential production, it is clear that the latent potential of the purse-seine fishery is quite large.

In the trawl fishery, a trend has already appeared among existing trawl vessels toward boosting main engine horsepower so as to increase catch efficiency, while, generally speaking, it is felt that the recovery of bottom fish resources will take some time. Also, in the Gulf of Thailand, in the northern section of the east coast waters, it is said that bottom fish resources have been depleted as a result of overfishing by trawlers. Considering the above, we may conclude that there are inherent limits to the future development of the trawl fishery in east coast waters.

4) Plan to Reduce Foreign Crews on Fishing Vessels:

The plan to reduce foreign crews on the country's fishing vessels by 10% per year was officially decided by the Malaysian Government in February 1989, and this has now become a condition for receiving fishing permits. Based on this plan, the use of foreign crews is now permitted only on vessels of 40 grt or more. Vessels wishing to employ foreign crew members must obtain permission from the director of the relevant state Department

of Fisheries, indicating the reasons for having to use foreign crew and the names and ages of the foreigners concerned, and must append copies of their work permits, crew ledgers, or passports. Based on this petition, the government, in the absence of special reasons to the contrary, may very likely attach a condition to the fishing permit requiring the vessel to reduce the size of its foreign crew by 10% per year, and this in turn entails an obligation to train Malaysian crews as replacements for the displaced foreigners.

In 1989, the number of foreign crew members applied in Malaysian fishing permits totaled 6,000, and the prime reason for allowing their employment was, with respect to purse-seiners, the lack of experience among Malaysians, requiring that foreign crews be used. The Government, therefore, is fully aware of the fact that the training of purse-seine crews holds the ultimate key to the success or failure of the crew localization policy, and so deems it vital that the training vessel to be provided in this Project provide training in purse-seine fishing methods.

Based on the above evaluation, it has been concluded that:

(1) Among the existing training vessels, the only one capable of purse-seine operations in the offshore fishery is the K.L. KURAU, but this is a combination purse-seine/trawling vessel and is now 19 years old, so that the time has come to build a replacement.

(2) Judging from operating conditions of offshore fishing vessels, whereas trawl operations are the most prevalent type, in the case of the purse-seine fishery, a special type of operation is required to meet conditions in the fishing grounds, and we have concluded that the future growth potential for the purse-seine fishery is quite good.

3) On the basis of the potential production and present catch efforts, there is à greater development potential for the purse-seine fishery than the trawl fishery.

(4) And, from the standpoint of the Government's policy to localize fishing vessel crews, it may be said that there is a relatively greater need to train purse-seine fishermen.

Based on the above, it was determined that the purse-seine type would be most appropriate as the training vessel under this Project.

3.2.4.3 Training Equipment:

In the Request, the following types of training equipment were requested:

Navigation training equipment
Engine training equipment
Fishing gear training equipment
Radio communications training equipment
Machine tools
Vehicles
Others

The specific items must be selected in accordance with the particular course syllabus. The training equipment should be chosen on the basis of a consideration of the following factors:

1) The present Fisheries Training Institute has a long history and has modified its training syllabus over the years in accordance with changing social requirements, and these courses have turned out a large number of students. Since the new Training Institute envisaged under this Project will essentially take over the training programs at the existing centers, it will be appropriate to reappraise the nature and quantity of the training equipment and materials currently being used at the existing facilities and, based on this review, select the required equipment for the new institute.

(2) The selection process should also be based on a consideration of both conditions in the fishery--size of existing fishing vessels, fishing gear, type of fishery, and conditions in the fishing grounds-- and the future course of fishery development, including anticipated resource conditions, demand trends for fishery products, and employment conditions.

(3) There are obvious constraints to the scope of training in fishing technology that can be carried out on shore, but we will select the equipment with a view to maximizing the practical training benefits from these courses.

1) Equipment for Navigational Training:

The principal target courses in this area will be the long 5-month and the short 3-week courses, with projected enrollments of 15 and 10 respectively. Navigation is the sector posing the most constraints for shore-based training, but the areas to be covered in terms of knowledge and technology are quite diverse, embracing improvements in vessel operating techniques and navigational safety, such as vessel control, navigation, and bearing measurements.

With respect to the navigational instruments, it will be necessary to have types and quantities to permit practical instruction, including magnetic compasses for training in physiographical and celestial navigation, bearing measurement gear, and sextants. With respect to radio navigation, the shore phase of the training will concentrate mainly on radar, with other navigational instruments limited to actual models. Radar instruction will be oriented principally to training in radar use and interpretation and judgment based on images. As an image replay device, we shall use the raster scan indicator to permit 6-7 persons to view the monitoring screen at one time. The equipment will include an image playback unit. In the case of steering apparatus, we plan to use actual models.

With regard to depth measurement and fish-finding equipment, through the actual operation of a fish finder and sonar, training can be provided in operating principles and screen indications (both by recording paper and images). As in the case of radar, an image playback device will also be provided. Actual models will be furnished of rescue, fire-fighting, and signaling equipment.

2) Engine Training Equipment:

The main courses in this sector will be of 5 months' and 3 weeks' duration, with projected enrollments of 15 and 10 persons respectively. In the case of engines, good results can be readily obtained through shore-based training, and it is relatively easy to convey the essentials of the related technology. Training will focus on the technology of construction, operation, handling, and maintenance of internal combustion engines of up to 250 ps for fishing vessel use, with equipment to be fitted to these objectives. Consideration is being given primarily to diesel engines, and the training program will cover three types: large (250 ps), medium (100 ps) and small (30ps) class engines, with instruction provided through actual engine operation.

With regard to maintenance, training will be required in the assembly and dismantling of actual engines, with five 30 ps units to be provided for this purpose, yielding a ratio of 3 trainees per engine.

With respect to shafts and propellers, while these are vital components of propulsion engines, for purposes of understanding their construction, it should be sufficient to provide specimens.

Other vessel machinery to be provided will include cut models of plunger pumps, centrifugal pumps, and gear pumps to develop an understanding of three different types of construction along with specimens of actual equipment for assembly and dismantling purposes.

With regard to electrical equipment, since no specialized courses will be given in the electrical field, a power switching board will be provided for the operational training of power source apparatus onboard fishing vessels. In addition, with respect to outboard engines, training will cover construction using cut out models. A suitable assortment of tools and measuring devices will also be provided to eliminate any possible snags in the practical training program.

3) Equipment for Training in Fishing Operations:

The main courses in this area will be on offshore fisheries and fishing gear technology for staff from the Department of Fisheries. Those aspects of fishery training that can be effectively taught on shore include:

classification and composition of fishing gear, basic technology of gear fabrication, use of fishing gear, and processing and storage of catches. For practical training in fishing operations, heavy reliance will have to be placed on the training vessel programs.

Instruction in the composition, fabrication, and maintenance of fishing gear will be offered in the net training area. To convey a proper understanding of the relationship between gear and fishing methods as well as the types and characteristics of gear materials, rope samples, blocks, buoys, sinkers, and training gear will be provided. With respect to gear fabrication and maintenance, the emphasis will be mainly on practical technology, requiring an adequate supply of net-making tools, netting, twine, and tool stands.

With regard to fishing equipment, a small winch, a net hauler, a line hauler and a mini-power block will be provided for training in usage and handling through the operation of actual equipment. Instruction in the processing and storage of catches will be given in the processing room.

Under the existing setup, the courses on fish handling and processing, conducted in the processing area, are given to all trainees, but primary emphasis is placed on the induction courses for staff from the Department of Fisheries. Accordingly, there is not much point in having course materials cover the development of particular processing techniques. The objective is to provide knowledge and technology for reducing losses (i.e., discarded fish) arising from inadequacies in post-catch processing techniques. To reduce these losses requires a comprehensive system of freshness control starting immediately after the catch, and so an awareness of proper processing methods among the fish producers, who are at the head of the freshness chain, is indispensable to improvement of quality standards through the rest of the distribution process. The training equipment will promote a clear understanding of the entire process, from changes in fish quality, starting immediately after the catch, changes in shape, deterioration, poisoning, and preservation of fish quality-- in other words, freshness retention.

The training program will focus on quality control and production. With respect to the former, quality rankings will be made for the handling and

storage of fish through different methods -- in ice, in open air, etc.-- and the use of sensuous tests and research and analysis. For this purpose, K-value measuring equipment and simple analytical devices will be required.

In the production phase of the course, in order to understand the relationship of fish quality to that of processed products, tests will be conducted on kneaded and canned products using applicable raw materials. The equipment needed for this training will be pilot equipment for the test production of surimi and canned fish with a processing capacity of 20 kg of raw fish.

With regard to other processing equipment for salt-drying and smoking, it will be sufficient to furnish actual specimens. Instruction on the principles of freezing operations will be given on the basis of operating models.

4) Equipment for Radio and Communications Training:

The main courses in this field are the navigational courses (5 months and 3 weeks long). Emphasis is placed on the operating and handling of SSB and VHF transmitters and receivers. While giving consideration to the operating qualifications and restrictions based on the applicable regulations, training will be provided through operation of actual equipment. With regard to emergency communication methods, actual samples of SOS buoys, signals, and related equipment will be provided.

5) Machine Tools:

Tools are required mainly in connection with engine and fishing gear instruction. The principal objective is to facilitate training in metal work that can be performed with hand tools, and equipment will be selected for this purpose. In addition to hand tools, universal (ordinary) tools will include gas and electric welders, grinders, air compressors, and parts washing equipment. As to training in machine tools basic for automated production equipment, such as lathes and milling machines, it will be difficult to increase training efficiency unless basic familiarity with mechanical design and metallic materials is

made a prerequisite for taking the course. But, since this problem is related to the sophistication and complexity of the machinery and, from a practical standpoint we can expect a rapid supply of components from manufacturers, we see no need for specific instruction in this area.

6) Vehicles:

Vehicles will be necessary for trainee inspection tours outside the institute compound and for movement from the institute at Chendering to the mooring area for the training vessel at the mouth of the Terengganu River.

The maximum number of classes to be offered simultaneously at the institute will be 10, and so there is a requirement for two 24-passenger microbuses and one 12-passenger light van.

7) Other Items:

The main items not included in the above categories are teaching materials and equipment to produce such materials.

The teaching materials for normal use will be essentially those now in use at the existing facilities but, in addition, the Project will also include charts illustrating construction and operating principles of various equipment, and teaching models. In connection with the production of training materials, there will be a need for audio-visual and printing equipment. The audio-visual equipment will include video cameras for filming videos, monitors, editing equipment, ordinary projectors, overhead projectors, and screens. Printing equipment should include a copy machine, stencil cutter, rotary press, word processor, and binder.

3.2.5 Basic Policy for Cooperative Programs

Fishing port facilities are already functioning at Chendering, the Project site, with a fully developed infrastructure. The Project area is also deemed to be suitable in view of the expectation that the future development of offshore fisheries will be concentrated on the east coast.

The site that has been obtained for the various facilities is virtually flat and has excellent foundation conditions. In addition, efforts are continuing at the Department of Fisheries to obtain land on the western and southern borders of the Project area.

With regard to the operating structure, since the instructors, staff, and operating budgets are to be transferred directly from the existing Fisheries Training Institute, there should be no problems in this connection.

If the target Project is implemented, the existing facilities at Penang and Terengganu will be diverted to other uses, and a decision has already been made to use these facilities as a Fishery Extension Center. In addition, the Department of Fisheries, in the 6th Malaysian Project covering the 1991-95 period, is promoting an integrated operating plan incorporating policies for strengthening fishery training programs predicated on the implementation of this Project. From this standpoint, it has been determined that there is no likelihood of any overlapping between this Project and other similar projects.

With respect to technical cooperation, there has been a request from the Malaysian side for the dispatch of specialists to make proposals with regard to syllabus and training programs development. This would not be for the operation of facilities or equipment but rather to achieve more effective implementation of fishery training under the Project by learning from Japanese experience. We feel, accordingly, that the dispatch of specialists would be an effective method of cooperation.

Based on an evaluation of the above request, we believe that, in implementing this Project, there would be no problems in terms of effectiveness, practicality, or implementing capability of the receiving country, and that the Project would be fully in accord with Japan's grant-aid system, and so the Project is considered to be quite appropriate.

Accordingly, with respect to the Project contents, the Basic Design Plan is to be developed on the premise of funding through grant-aid from Japan.

3.3 Outline of the Project Facilities

In this section shall be discussed the scope and quantity of the facilities and equipment, including the training vessel, considered in Section 3.2.4.

3.3.1 Buildings

(1) Room Composition:

The room composition of each facility was carefully studied to determine their size, including consideration of room arrangement and their respective functions, characteristics, and inter-relationships. In principle, we have located similar, functionally related rooms within the same facility. However, with respect to the maintenance shop within the administrative area, the gymnasium, the net training area, the engine training area, and the processing room within the training area, given their widely different functions, it was necessary to provide different types of structure, such as large spans and high eaves. Thus, these rooms have been located in separate structures. The hostel rooms, considering their high functional inter-relationship, have been grouped together. However, the dining facilities have been located in a separate building, owing to their somewhat different nature. In addition, a guard house has been located near the main entrance, while the machine house has been positioned near the access road.

Following is a summary of the room composition for the Project facilities:

Type of Facility	Room Composition
Admi./Training Building	Administration: Offices of the Director, Deputy Director, Secretary; room for office manager, administration office, instructors' room, printing room, AVA room, room for training vessel officer, lounge, conference room, entrance/bulletin board, storage, rest rooms

	Training: General classrooms, navigation room, chart room, library
Processing Building	Processing room, laboratory
Net Loft	Net training area, net storage area, fishing gear storage area
Engine Workshop	Engine training room, parts store, tool store
Maintenance Shop	Metal workshop, parts maintenance room, parts store
Gymnasium	Workout area, storage area, changing room, toilet
Hostel	Residential block: Bedrooms, laundry, toilet/shower, storage area Service block: Supervisor's room, lounge
Dining Hall	Dining room, kitchen, cooks' room, food storage
Guard House	Guard room
Machine House	Machine room

(2) *Size Determination:*

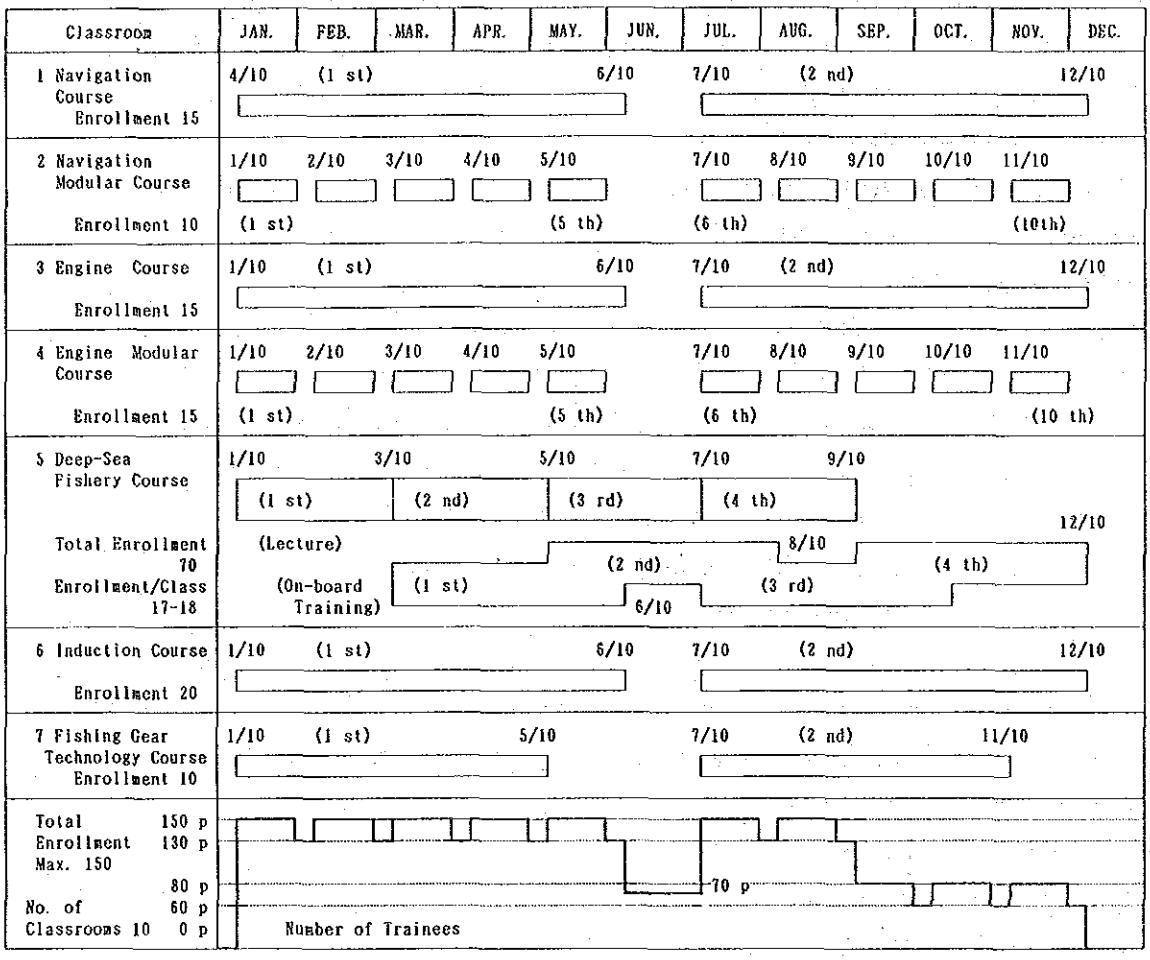
1) Admi./Training Building:

i) Training Rooms:

The following figure illustrates the expected annual training schedule by course. Though the date for the course inauguration may differ slightly considering the holiday period of the year, the number of courses per

year, enrollment per course and the total number of days the trainees are physically present will remain unchanged.

Annual Training Schedule



a) General Classrooms:

It is felt that, according to Fig. 3.1, four classrooms will be required for the Deep-Sea Fishery Course, with an anticipated enrollment of 17-18 students per class. In addition, classrooms for exclusive use will be needed for 6 courses, for a total of 10 classrooms in all.

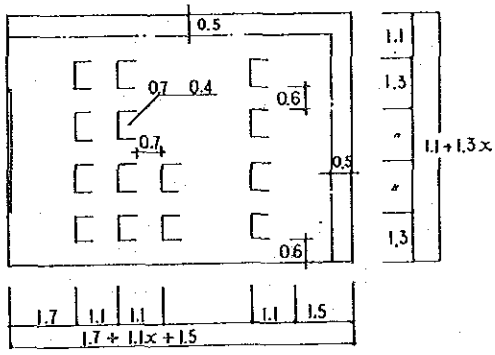
Classroom	Enrollment	No. of Rooms	Total Enrollment
Navigation Course	15	1	15
Navigation Modular Course	10	1	10
Engine Course	15	1	15
Engine Modular Course	10	1	10
Deep-Sea Fishery Course	17-18	4	70
Induction Course	20	1	20
Fishing Gear Technology Course	10	1	10
Total	--	10	150

Appropriate classroom size has been calculated with reference to the length of the room, based on the number of occupants, and assuming four rows of desks. In addition, considering the optimum span breaks, as determined from the structural conditions of the building, we have, in principle, set two basic modules, with classroom size computed on the following basis.

Module A 6.5m(Width) x 6.5m(Depth) = 42.25m^2

Module B 8.0m(Width) x 6.5m(Depth) = 52.20m^2

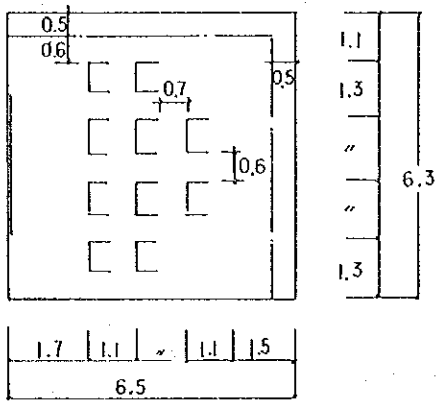
The desk size, distance between desks and to wall, and size of the counter shelf have been set as follows.



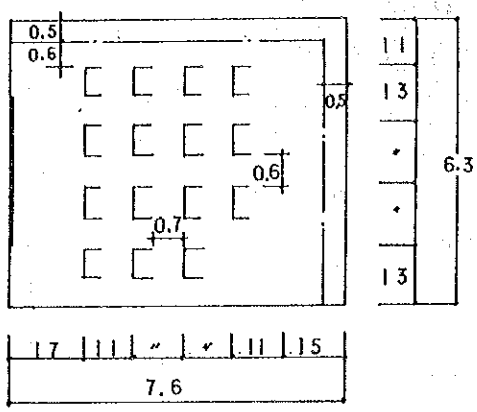
x: No. of desks

The required area for classrooms has been calculated as shown below.

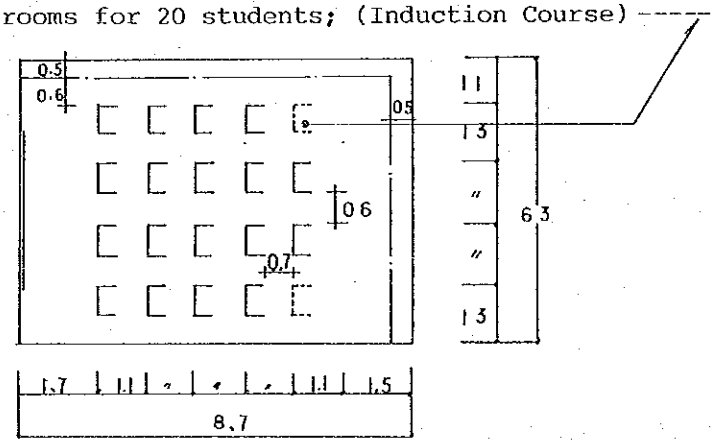
Classrooms for 10 students;
(Navigation Modular Course,
Engine Modular Course, Fishing
Gear Technology Course)



Classrooms for 15 students;
(Navigation Course, Engine
Course)



Classrooms for 17-18 students; (Deep-Sea Fishing Course)
Classrooms for 20 students; (Induction Course)



The following table shows the calculated area and applied type of module for classrooms.

No. of Trainees	No. of Classrooms	Calculated Area (W x D)	Applied Module	Area/ Person
10	3	6.5 x 6.3=40.95m^2	Type A; 42.25m^2	4.2m^2/psn.
15	2	7.6 x 6.3=47.88^2	Type A; 42.25m^2	2.8m^2/psn.
18	4	8.7 x 6.3=54.81^2	Type B; 52.00m^2	2.8m^2/psn.
20	1	8.7 x 6.3=54.81m^2	Type B; 52.00m^2	2.6m^2/psn.
Total	10			

b) Classroom for the Navigation Course:

This classroom will be used mainly to give instruction in navigational instruments and radio equipment in both the long and short Navigation Courses. The room will be equipped with radar (fitted with an image reproduction device), depth sounder, sonar, SSB radio, and other navigational and radio equipment. The area must, therefore, be large enough to permit smooth instruction and practical training on these types of equipment.

The required area was 81.0m^2, which was calculated from the space for placing various training equipment and for movement of trainees. This room area exceeds that of the module already established and if the area is secured by the combination of the modules, it becomes difficult to maintain a suitable proportion between room width and depth. Owing to this fact, the navigation room has been designed independently.

c) Chart Room:

This classroom will be used for training in the reading and measurement of charts in the long and short Navigation Courses, with a maximum enrollment of 15 persons. Required fixtures will include chart tables, chairs, and chart cases, and the room must be large enough to accommodate fixtures for 15 students and a platform for the instructor.

The required area was developed from the arrangement of chart tables and other furniture and was caluculated at 84.5m^2, which is identical to two Module A units combined.

d) Library:

The planned size of the library has been determined on the basis of the number of volumes and the number of seats in the reading room. We have planned for an average of 15 volumes per person for the 185 persons involved in the course programs (150 trainees and 35 instructors). The reading room capacity has been set at 24 seats, which will accommodate about 13% of the above total (185 persons).

The fixtures to be accommodated in the library are reading tables, chairs and book shelves. The floor space derived from the arrangement of this furniture corresponded to the total area of two Module A units combined and so we have planned to apply two Module A units to the library.

ii) Administrative Quarters:

a) Offices for the Director, Deputy Director, and Secretary:

These rooms will be used by the senior executives of the Project facility and have been planned basically as private rooms. The Director's Room will have space for 6 visitors and for small meetings. A secretarial room will be provided for secretarial and administrative functions as an ante-room to the Director's and Deputy Director's offices.

b) Administrative Office:

This room is intended to serve as an administration office for the entire facility and will be used by the office manager and his staff. In the target Project, the office staff requirement has been set at 10% of the total trainee population (or about 15 persons), and so the room must accommodate one office manager and a staff of 14 persons. The fixtures in this office will include desks, chairs, filing cabinets, and other necessary items, along with an office for the office manager.

From the arrangement of the furniture and work area, the Administration Office area came close to 84.5m^2, which is identical to the area of two Module A units.

c) Instructors' Room:

In the Project, the number of visiting instructors has been set at 2 and that for the resident instructor at 38, considering a possible future increase in instructors. Since the teaching staff will be allocated among four specialized divisions--navigation, engine, fishing operations and gear, and processing and handling--, we have allowed 4 rooms, accommodating 10 persons for each division. These rooms will have to be

large enough to hold desks, chairs, filing cabinets, and cabinets for storage and jointly used materials.

Comparison between the calculated area from the actual arrangement of fixtures and the module unit indicates that the use of Module B is most suitable. The room size therefore has been set at 52m^2.

d) Training Vessel Officers' Room:

This room will be used by the senior officers on the training vessels, including the captain, fishing master, and chief engineer. It has been designed to accommodate 18 persons in all-- three from each of the six training vessels-- but, it is anticipated that simultaneous use by all of these people will occur only rarely and so have set the room's capacity at 10 people in this Project. Fixtures will include chairs and tables for 10 persons, but with private lockers for all 18.

The required area can be secured by the use of Module A and the room size is then set at 42.25m^2.

e) Conference Room:

This room is to be used for instructors' conferences, executive meetings, and liaison with visitors. The maximum use frequency is likely to be for instructors' meetings, and so this room must be able to accommodate all 35 instructors. The required fixtures will include such items as conference chairs and tables for 35 persons, cabinets for storage of materials, and a blackboard. The size of the room has been set on the basis of a rectangular layout pattern for the desks. These fixtures can be accommodated within 63.375m^2 space, which is 1.5 times the area of one Module A unit.

f) Printing Room:

This room will be used for printing and binding teaching materials by the center staff and is expected to be used by 3-4 employees. Required equipment will include a word processor, printer, binding machine, copier, cutter, and working desks. The space requirement has been set on

the basis of equipment layout, storage cabinets, and working space. A room size of 21.125m^2 is planned, which is half of the area of a Module A unit.

g) AVA Room:

The room is to be used for video recording and editing and is to accommodate a studio and an editing room. The fixtures required for the studio includes a lecture table and a work table to display model kits and other materials for engines, fishing gear, etc., on which lectures are to be given. In the editing room, a counter table and chairs will be provided for the installation of a video system and other related equipment.
The required space for the studio and editing room has been determined from the arrangement of tables, video equipment and the work space. The floor area set from a layout plan was 26m^2, which is half of the area of one Module B unit.

h) Dressing Room

This room will be for the use of female employees and should accommodate about 10 persons. Fittings will include comfortable lounge chairs, tables, and clothes lockers. The room size has been set at 21.125m^2, which is identical to the half of the area of one Module A unit.

i) Rest rooms:

The intended users of the rest room facilities will be trainees from the training block and instructors and employees from the administration block.

The number of projected trainees will be 150. Rather than concentrate the rest rooms in the center of the facilities, it has been deemed preferable to divide them into three locations, and the layout plan has been devised accordingly. For each location, we have allowed 2 toilets and 3 urinals.

The projected users of the rest rooms in the administrative block will comprise 43 men and 10 women, and one location should be adequate. The rest rooms will include the following fixtures:

	Toilets	Urinals	Washbasins
Men's room	2	2	2
Ladies room	2	--	2

As for the required area, half of one Module A unit, or 21.125m^2, is sufficient for this rest room.

j) Lobby, Entrance, Corridor, Storage:

The hallways and entrance provide lead space to all of the rooms. The display space will be used to display materials for the training programs and, in this Project, will be located in a corner of the entrance hall. The required area will be secured in accordance with the development of the layout plan for the facility.

2) Engine Workshop:

This building will be the site of training in the operation, dismantling, assembly, adjustment and maintenance of engines, using actual diesel models. These models will comprise 1 engine of 250 ps, 1 of 100 ps, and 6 of 30 ps. In addition, we have provided, as necessary fixtures, a work table, parts racks, compressor, and bench drills. A ceiling crane will also be installed for the movement of heavy items. Storage space will also be provided for tools and parts required for the training programs.

From the arrangement of space for equipment and fixtures, the work area, and parts and tools storage space, a floor area of 180m^2 has been set for the Engine Workshop.

3) Net Loft:

The requirements for this facility include a roofed area for net training, space for fishing gear repairs, a storage area for fishing gear

and nets, and a toilet. The roof will be required to permit uninterrupted net training under inclement or rainy conditions. The room should be large enough to accommodate three training groups working on net mending practice at a time. Since the net repair room will be used mainly for wire splicing and end treatment, and the fabrication and repair of fishing gear, space must be allowed for work tables, wire cutters and other equipment, and an area for the display of model gear and related activities. In addition, we have provided a storage area for nets, wire ropes, and gear used in the repair training phase of the courses. In view of close connection with neighbouring facilities, the toilet will be arranged to allow for usage from the outside of the net loft. The required area came to 510m^2.

4) Processing Building:

Processing is a common subject in all the courses and so this facility will be used by all trainees. The largest single requirement will be for the 20 students in the Induction Course for staff. The area will comprise a processing room and a laboratory. The major equipment and fixtures for this area have been established as follows:

1. Refrigerator	(1)
2. Freezer	(1)
3. Refrigeration display unit	(1)
4. Processing tables	(3)
5. Surimi processing mini-line	(1)
6. Canning mini-line	(1)
7. Other processing equipment	(1 set)

The main equipment in the analysis room will comprise such scientific instruments as K-value measurement units, salinometers, and fish thermometers, with a counter and central lab table provided to hold these pieces of equipment. The floor area for the Processing Building has been set at 160m^2.

5) Gymnasium:

The main purpose of this facility is physical training, but the gymnasium will also be used for institute functions, indoor sports, and conferences. The maximum capacity for ILPM events has been set at 190 persons, including all 150 trainees, 35 instructors, and a few members of the office staff. Among the various types of indoor sports activities, the maximum usage will be for badminton matches, and we have provided two badminton courts (single and double). For physical training purposes, the maximum requirements will be for about 20 persons per class. We have allocated sufficient space to accommodate all of the above demands.

It has been calculated that the required space for performing functions is 310m^2, and for badminton games 393m^2, and the workout area has therefore been set at 393m^2. The total floor space comes to 460m^2, including space for a stage, changing room, toilet and storage for chairs, etc.

6) Maintenance Shop:

This area will function as a maintenance shop for training vessels and other facilities of the Fisheries Training Institute. However, it will also be used for training in metalworking techniques, mainly in the Engine Course, for component repairs, and the fabrication of minor components. The rooms will include a metal workshop, principally for welding operations, a parts processing room for the repair and fabrication of components, using work tables, and a storage area. The required space was calculated at 90m^2.

7) Hostel Building:

The hostel facility will be composed of two blocks: a residential block and a service area block.

i) Residential Block:

The number of people expected to require accommodation is as follows;

1. Trainees for long courses (2-5 months) 100 persons
2. Trainees for short courses (3 weeks) 20

3. Government staff trainees (4-5 months) 30

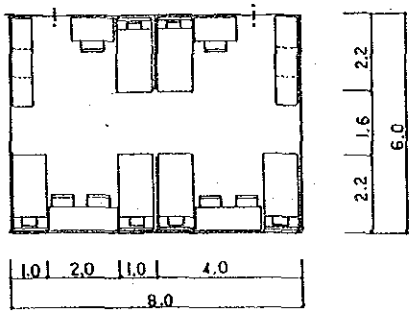
4. Visiting instructors 2

In setting occupancy levels per room, it was necessary to consider length of stay, age, and occupations of the prospective occupants. It was found necessary to lower the number of persons per room in the case of older trainees and those taking the longer courses. The bulk of the trainees are active fishermen with a broad age distribution from young to mature and a wide variation in home areas. Thus, the range of age groups among residents will be quite broad and so, considering living customs, we have decided to specify rather low occupancy rates of 4-6 persons per room. In the case of trainees from government departments, we have provided double rooms equipped to afford a certain measure of privacy, and one toilet/shower room for common use by two rooms, in view of the usage by female staff trainees. Visiting instructors will have to be accorded regular faculty treatment. In principle, they will be given private rooms equipped with the minimum amenities, including toilet, shower, and running hot water.

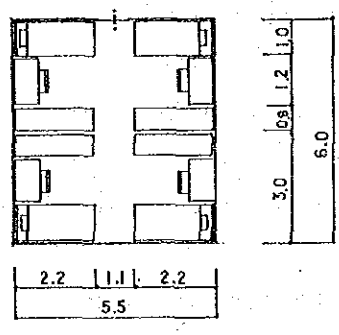
Based on the above, the occupancy rates per room will be as follows:

Short-term trainees	6 per room
Long-term trainees	4
Government trainees	2
Visiting instructors	1

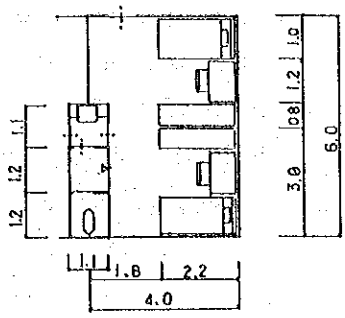
As shown in the following arrangement plans, we have set the space for bedrooms for 6 persons at 48m^2, for 4 persons at 33m^2, for 2 persons at 24m^2, and for visiting instructors at 24m^2.



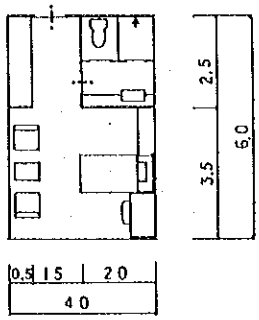
For 6 persons



For 4 persons



For 2 persons



For visiting instructors

The hostel is composed mainly of bedrooms for trainees. From the required space, a 6m depth for bedrooms will be appropriate and the width will become 4 - 8m. Accordingly we have planned the following two modules for the Hostel.

Module DA 5.5m x 6.0m = $33m^2$

Module DB 4.0m x 6.0m = $24m^2$

The following table summarizes an outline of the bedrooms in the Hostel.

Room Classification	No. of Trainees	No. of psn/Room	No. of Rooms	Room Area	Area/ Person	Applied Module
Short-term Trainee	20	6	2	$8x6m=48m^2$	$8.0m^2$	Type DB
		4	2	$5.5x6=33m^2$	$8.25m^2$	Type DA
Long-term Trainee	100	4	25	$5.5x6=33m^2$	$8.25m^2$	Type DA
Government Staff	30	2	15	$4x6=24m^2$	$12m^2$	Type DB
Visiting Instructor	2	1	2	$4x6=24m^2$	$24m^2$	Type DB

b) Toilet and shower room; laundry room:

These rooms will be used by 120 trainees, excluding visiting instructors and government staff trainees. There will be one toilet, urinal, and shower unit for every 6 persons, or 20 units in all. However, it is felt that, on the basis of the usage scope in the Project, these facilities should be spread over 4 locations. Consequently, we have allowed for 5 shower, toilet, and urinal units at each location.

For the laundry rooms, we have allocated sufficient space for 8 persons to do their washing, ironing, and drying at a single time. Laundry rooms will be set up at two locations. Required equipment will include electric washers, ironing boards, and a drying place for rainy day use. The Module DA can be applied to toilet/shower and laundry rooms, each have an area of $33m^2$.

c) Linen store:

The items to be stored will include bedding (sheets, blankets, etc.), cleaning utensils, and sundries. We have also allowed space for storage racks and an enclosure for sundries. These storage areas have been placed at 2 locations. The floor space will be determined in accordance with the layout plan of the Hostel.

ii) Service Area Block:

a) Lounge:

Based on a study of conditions at the existing facilities, the capacity of the lounge area has ben set at about 30 persons, corresponding to 20% of the trainee boarders, and will be divided into two rooms accommodating 15 people each. The fixtures will include lounging chairs, tables, and a television. We have set the floor area at $33m^2$ using Module DA.

b) Hostel Supervisor's Quarters:

This facility is to accommodate two persons and will comprise an office, nap room, dining-kitchen, and a shower/toilet room. For the arrangement of these rooms, we have calculated $36m^2$ could be required. This area corresponds to 1.5 times the area of Module DB.

c) Stairs and Hallways:

As lead space to the main facilities, we will consider the form and size of the stairs and halls in connection with the floor plan.

8) Dining Hall:

a) Dining Room:

All 150 resident trainees will be using this facility, which will have to provide meal service to trainees 3 times a day as well as light refreshments through the day for all persons involved in the training activities. It will be necessary for all trainees to take their meals at a certain time, and so the number of seats will have to match the number of trainees (i.e., 150). Fixtures will include chairs and tables. Based on the arrangement of tables and chairs, and also access space, the total floor area comes to 208m^2 for the Dining Room.

b) Kitchen:

The kitchen will contain a sink, cooking table, gas range, refrigerator and other necessary items. The required area has been computed via correlation with the size and number of seats in the dining room and comes to 99m^2.

c) Food Storage:

The principal items to be stored here are cooking ingredients such as dried foods, rice, seasonings, canned goods, along with cooking utensils and tableware. We have provided shelves on 3 sides, with a small storage and lead space in the center for a total area of 20m^2.

d) Cook's Room:

A cook's room has been provided in view of the long operating hours, extending from early morning till late at night. This area will comprise a nap room, dining-kitchen, and shower/toilet room, which can be arranged in a floor space of 45m^2.

e) Rest Rooms:

These rest rooms must serve 150 persons but, considering the fact that the stay in the dining hall will not exceed one hour, they can be of minimum size. Anticipating usage also by female staff members, the floor

space for the facilities have been set at $20m^2$ and have been designated as follows:

	Toilets	Urinals	Washbasins
Men's room	1	2	2
Ladies' room	1	--	1

9) Other Items:

a) Guard House:

This area is to accommodate two persons. The required fixtures include a reception counter, chairs, and storage shelves, which will require about $9m^2$ space.

b) Machine House:

This room is to hold the various types of equipment that support the Project facilities, including water pumps to the elevated water tank and a stand-by generator. We have allocated a floor area of $10m^2$ for this facility.

3.3.2 Fishery Training Vessel

(1) General Considerations:

The fishery training vessel for this Project will be used mainly (1) for general training of crews for purse-seine vessels; (2) to provide actual experience on purse-seine fishing operations; and (3) to provide training in fishing navigation. Since the training periods at the Project facilities extend from January through November, the main requirement is to make the vessel seaworthy so that training can be safely undertaken for five days during the northeast monsoon season from November to March.

Net sizes will be somewhat smaller than the standard purse-seine specifications for taking such pelagic species as big-eye scad and

bonito in east coast waters. Specifically, the nets will be purse-seine type of 450 m length and 80 m depth targeting scad, and 650 m length and 80 m depth for bonito.

(2) Crew:

The most labor-intensive operation on a mechanized purse-seine vessel is net hauling. The chart below shows the deployment of deck hands during that operation. In addition to the 12 persons on deck, one man each will have to be stationed in the wheel house, engine room, and galley.

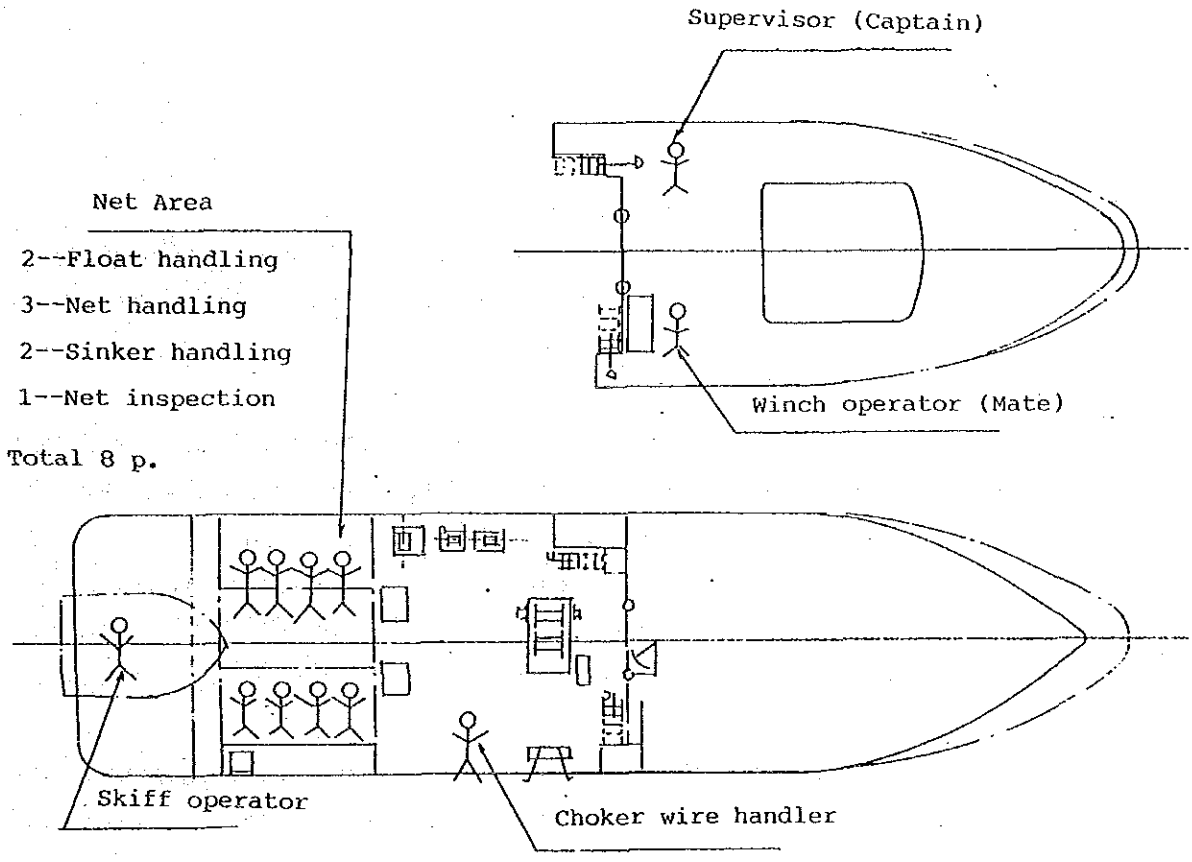


Fig. 3.1 Crew Deployment during Net Hauling Operations

At this time, the safest and simplest operations for the inexperienced trainees to engage in would be in the net area, where trainees could replace 4 of the 8 men required for this activity. On this basis, the crew composition on the training vessel will be as follows:

	Number of Persons
Captain	1
Mate	1
Quarter master	1
Crew	2
Chief engineer	1
Engineer	1
Oiler	1
Cooks	2
Trainer	1
Trainees (minimum)	10
Total	21

(3) Output of the Main and Generator Engines :

Based on the BHP curves shown in Appendix V-4 and the required speed during navigational training, the minimum economic speed of the training vessel has been set at 10 knots.

The BHP for 10 knots is shown as 530 ps but, allowing a safety margin of 15%, 610 ps will be required, and this has been designated as the continuous output. Applying 85% of the maximum rated engine output as the continuous output, the maximum rated capacity of the main engine becomes:

$$610 \text{ ps} \quad / \quad 0.85 = \quad 717 \text{ ps}$$

With respect to the generator, based on power consumption calculations, a unit of 100 ps can handle all requirements. We have, therefore, provided for two such generators, with one to serve as a standby unit.

(4) Fuel Tank Capacity:

At a continuous main engine output of 610 ps, the fuel consumption ratio will be 155 gr/ps.hr. For the generating engine,this ratio becomes 180 gr/ps.hr, at an output load of about 75%. The combined consumption under both conditions per day works out to:

155gr/ps.hr x 610ps x 24hrs + 180gr/ps.hr x 75ps x 24 hrs
= 2,270 kg + 324 kg = 2,594 kg

Thus, the total requirement for a five-day voyage becomes:

2,594 kg x 5 days = 12,970 kg

Allowing for a 10% fuel reserve on return to port, a specific gravity of diesel oil at 0.85, and a tank volume ratio of 90%, the required capacity of the fuel tank becomes:

12,970 kg x 1.1 / 0.85 / 0.9 = 18.649m^3 rounded to 19 m^3.

This consumption can be considered the maximum required during normal training operations, but the actual tank capacity, particularly in the case of small vessels, is determined on the basis of the structure of the double bottom or fitting work convenience.

(5) Capacity of the Fresh Water Tank:

Freshwater consumption per person has been set at 50 liters per day. The total crew will be 21 persons and, with a training program covering 5 days at sea, plus one extra day as a buffer against bad weather, the total days at sea have been set at 6. In addition, targeting a 10% reserve on return to port, the total capacity of the fresh water tanks becomes:

50 lit. x 21 crew x 6 days x 1.1 = 6.93 tons, rounded to 7 tons

(6) Capacity of the Lubricating Oil and Hydraulic Oil Tanks:

The size of these tanks is established on the basis of inside fitting work operations and cleaning requirements, rather than on the basis of the capacity requirements that must be satisfied. The capacity of both tanks has been set at 1.5 - 2m^3.

(7) Deployment and Structure:

1) Below the Upper Deck:

As living quarters for the crew and trainees, we have allowed space for 6 crew members, 1 trainer (single cabin) and 10 trainees plus a storage area for provisions, engine room, fish hold, a steering gear room with storage area, and a ballast water tank in the stern cant. Both the fore peak tank and stern ballast water tank will permit the use of seawater ballast and will be used as ballast tanks to adjust to normal trim when changes occur in trim as a result of fuel or water consumption or the loading of catch during the latter part of the voyage.

The area directly below the living quarters and engine room will be of double bottom construction, with the fresh water tank, cofferdam, fuel, lubricant, and hydraulic oil tanks placed from the bow side. For structural reasons, a capacity of $25m^3$ has been allocated for the fuel tank and $8m^3$ for the freshwater tank.

2) Above the Upper Deck:

The level above the upper deck, from the bow side, will accommodate the boatswain store, the dry provisions, and cabins for the captain, chief engineer, and crew. In deference to their positions, the captain and chief engineer will be given private cabins. The mess will seat 10 people at a sitting or about half of the vessel total complement. Two showers (fresh cold water) and toilets will be provided respectively. The steering house will contain a chart table and instruments rack. Air conditioning will be provided in the living quarters and public rooms.

3) Upper Deck:

The upper deck will accommodate the winches and related equipment needed for fishing operations and also provide net space so as to ensure the smooth conduct of purse-seine operations. Since hauling operations will be conducted from the starboard side, the area in the stern around the net storage section will be arranged to accommodate this pattern. Also, since the vessel will be small, some of the operating winches will be mounted on masts or booms. This will permit remote control operations from a console stand and will compensate also for inadequacies in the deck space, thereby greatly rationalizing vessel operations.