THE REPUBLIC OF ECUADOR

FEASIBILITY STUDY ON SMALL-SCALE FISHING PORT DEVELOPMENT PROJECT IN MANABI PROVINCE

MAIN REPORT

JICA

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MARCH 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Republic of Ecuador, the Government of Japan decided to conduct a feasibility study on small scale fishing port development project in Manabi province and entrusted the study to the Japan International Cooperation Agency(JICA).

JICA sent to Ecuador a study team headed by Mr. Fujio Saigusa, Director of Transportation Engineering Department, Nippon Koei Co., Ltd. 2 times between November, 1990 and September, 1991.

The team held discussions with the officials concerned of the Government of Ecuador, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

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

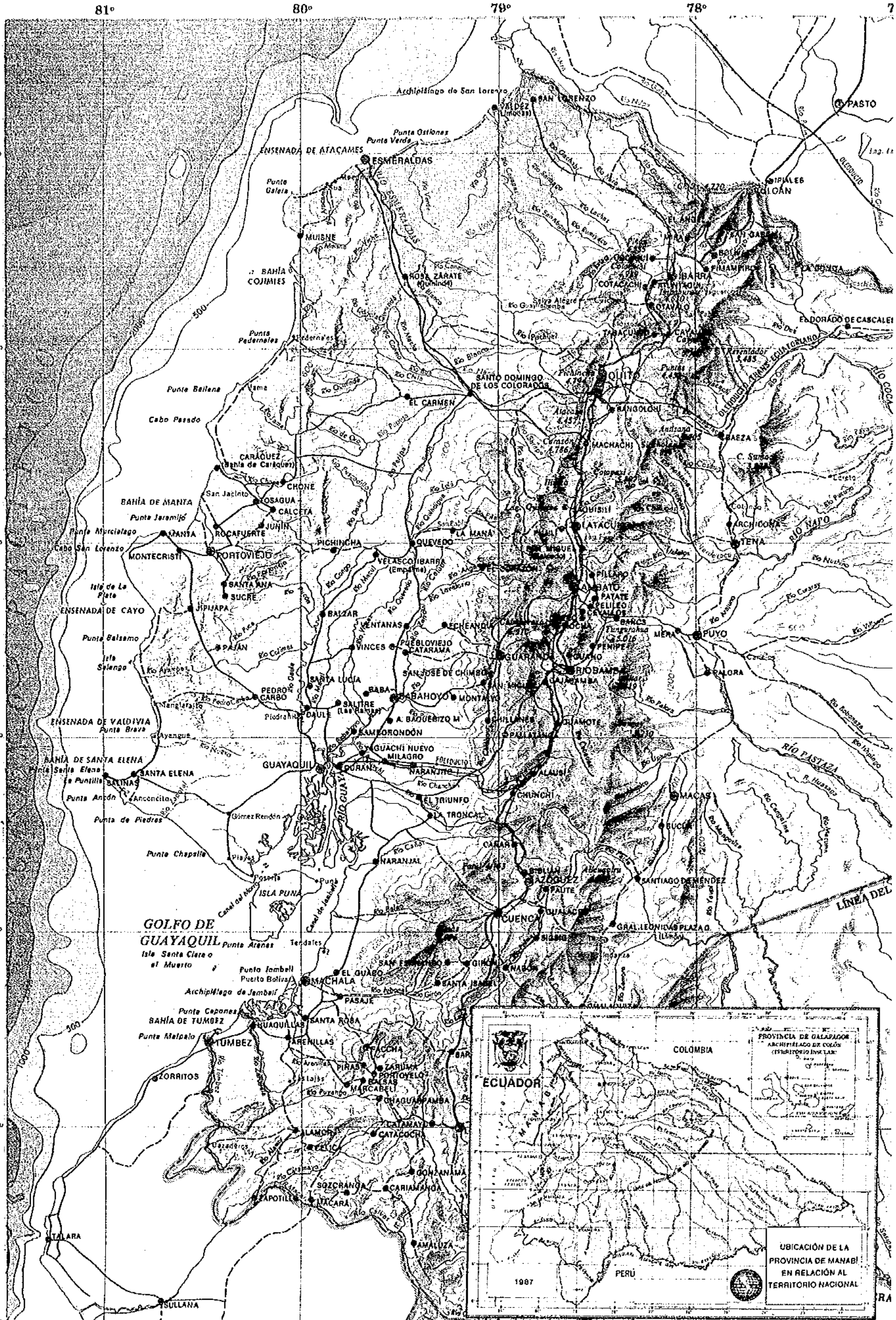
March, 1992

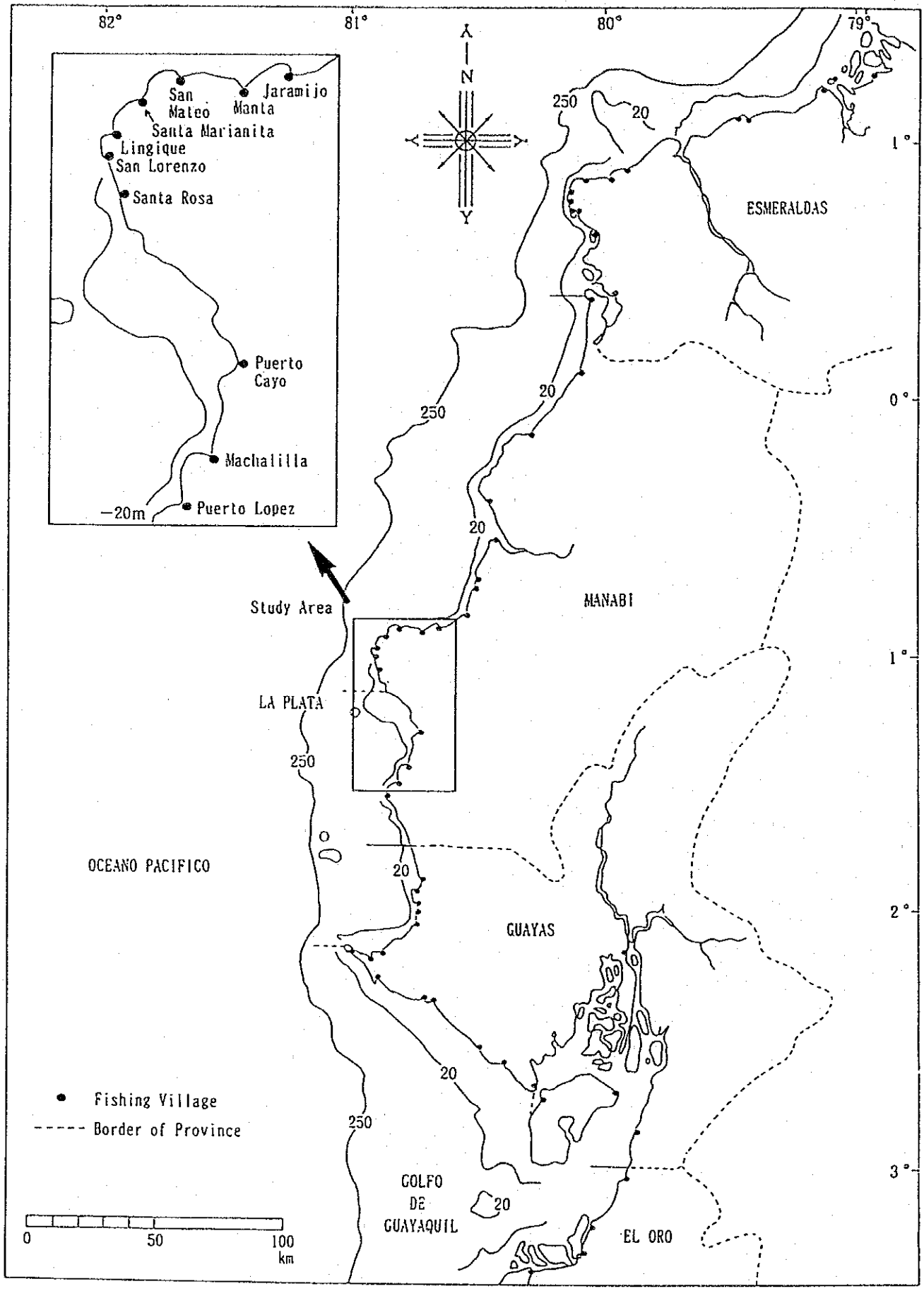
Kensuke Yanagiya

President

Japan International Cooperation Agency

REPÚBLICA DEL ECUADOR - MAPA FÍSICO




82°
81°
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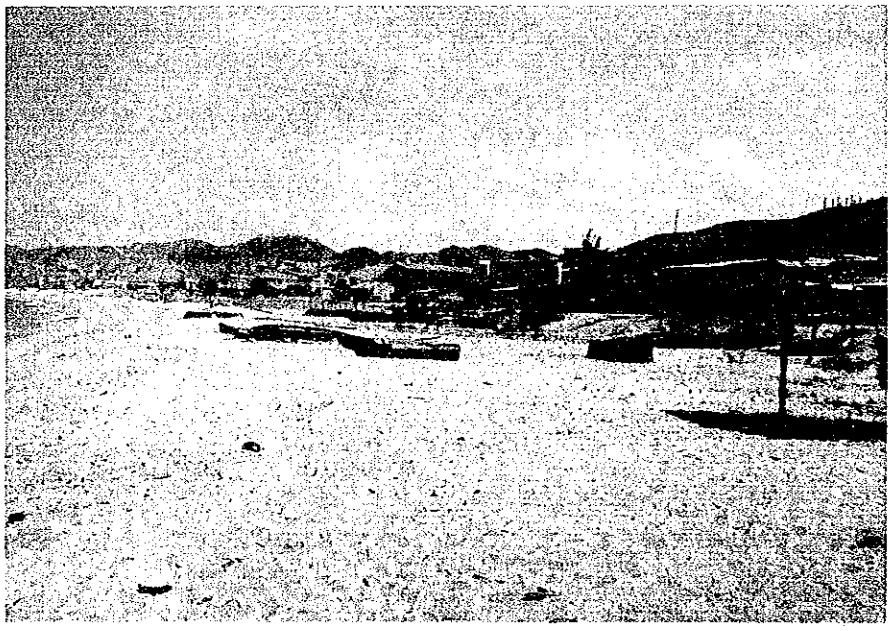
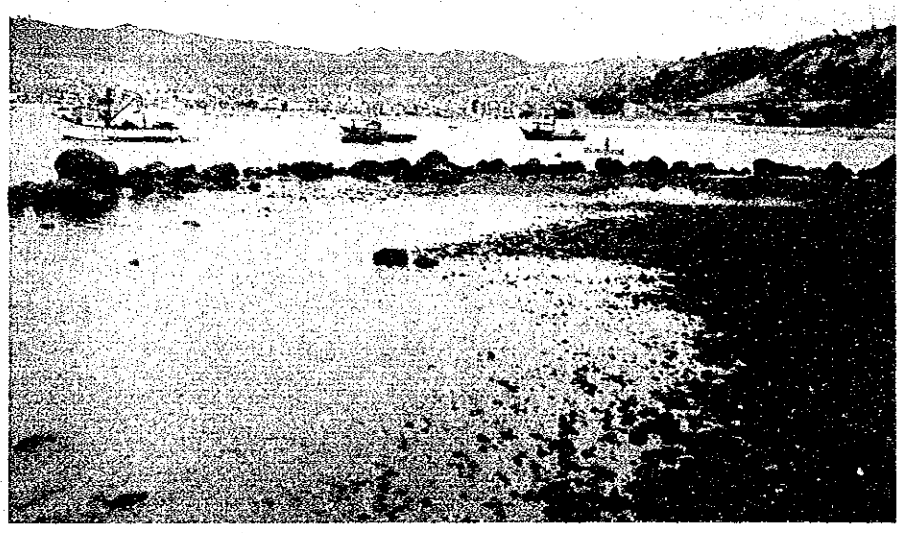
N
Y
San Mateo
Jaramijo
Manta
Santa Marianita
Lingique
San Lorenzo
Santa Rosa
Puerto Cayo
Machalilla
Puerto Lopez
−20m
250
20
ESMERALDAS
MANABI
Study Area
LA PLATA
GUAYAS
OCEANO PACIFICO
GOLFO DE GUAYAQUIL
EL ORO
Fishing Village
Border of Province
0
50
100
km

Fishermen at Manta Beach



Machalilla Beach

Fishing Village of San Mateo



Puerto Lopez Bay

SUMMARY AND RECOMMENDATIONS

Summary and Recommendations

1. Introduction

This report is the final report for the Study on the Small-Scale Fishing Port Development Project in Manabi Province in the Republic of Ecuador. This report presents the results of feasibility study carried out by the Japan International Cooperation Agency (JICA) from December 1990 in close cooperation with the Ministry of Industries, Commerce, Integration and Fishery (MICIP).

The Scope of Work for the Study was agreed upon on April 12, 1990 between JICA and MICIP. It contains the outline of the feasibility study (hereinafter referred to as the Study) and defines the objective and the area of the Study.

Objective of the Study:
The objectives of the Study are to formulate a small-scale fishing port development plan and to conduct feasibility study on the selected priority project.

Study Area:
The Study covers coastal area of Manabi Province from Jaramijo to Puerto Lopez.

The feasibility study commenced from December 1990 and the following reports were submitted to MICIP.

(1) Inception Report (December 1990)
(2) Progress Report I (February 1991)
(3) Interim Report (July 1991)
(4) Progress Report II (August 1991)

This Final Report includes the results of the feasibility study for the Small-Scale Fishing Port Development Project in Manabi Province in accordance with a series of discussions with MICIP concerning above reports.

2. Background of the Project

The National Socioeconomic Development Plan for the period 1989-1992 has a target for the increase of GDP at a rate of 3.1% yearly, and has established some general objectives that have been summarized below:

To strengthen social co-operation as the best means of obtaining a balanced social and economic development.

To improve the access to natural resources and capital to overcome the levels of poverty in the rural populations.

The growth rate in the agricultural, fisheries and forestry sectors is projected at 3.8% annually.
The strategic outline for the Development of the Fishing Sector is to promote the industrial or artisanal fishery activities with the help of the specialized organs of the Country, in order to increase the production and distribution of fish products which corresponds to the domestic demand and increase the exports, by means of the construction of industrial and artisanal fishing ports.

At the year 1990, the total population of Ecuador is 9,620 thousand and its annual growth rate is 2.3%. The population at the year 2005 is expected at 1,390 thousand.
In the past 20 years, economic growth of Ecuador owed to oil sector largely. But recently, the fall in the oil price and the limited oil resources become serious problems to the economy. Under these circumstances, Ecuadorian Government sets up basis to overcome the excessive dependency of the economy upon the oil sector and lays the priority on the fishery sector.

By implementation of this project, effective fish landing, preservation and distribution system are established in southern Manabi. Furthermore, the stable and lasting development of the artisanal fishery is expected through the upgrade of the quality and the stable supply of the fish products.

(Fishery Situation)

The total fish catches volume of Ecuador is at the level between 700-800 thousand tons approximately and it fluctuates largely affected by oceanographic conditions. But the fish catches volume by the artisanal fishery is at the constant level between 80-90 thousand tons.

According to one of the research works on the resources evaluation for the Ecuadorian waters, careful prior consideration for further exploitation in the existing fishing grounds is recommended. Regarding the pelagic resources, on which the potential yield has not yet been evaluated in a secular basis, large pelagic fish are presumed to have still more exploitable potentials at least in comparison with the demersal fish.

The artisanal fishery supplies the nutritious protein as an important source sharing around 20% of the domestic consumption of fishery products. The future demand for fishery products will be increased corresponding to the population increase and the national target for the increase of fish consumption per capita. Exports of fishery products are expected to be increased also according to the current tendency of exports.

According to the study (Fallows & Contreras, 1990), the national total of the artisanal fishing vessels (around 5 gross tonnages) excluding Galapagos Province is estimated at 6860 vessels. This means that around 14% of the artisanal vessels in the mainland of Ecuador exists in the study area. The results of the above study show likewise that the ratio of FRP vessels to the total is 71% in the study area, and 23% in the whole mainland, which suggests some remarkable tendency that the transformation of vessel from wooden to FRP hull in Manabi Province may have more progressed than other provinces. In spite of this tendency, there are no fishing port facilities at all in the study area, which should have an effective function for fishing activities.

The landing volumes by the artisanal fishery at the study area are estimated in the following table.

Landing Volume by the Artisanal Fishery

Districts	Catch/vessel	Landing Vol.
	Tons/vessel	Tons
Jaramijó	11	1,500
Manta	24	8,200
San Mateo	22	4,000
Sta. Marianita	19	1,000
Ligüique	11	70
Sta. Rosa	11	130
San Lorenzo	11	160
Pto. Cayo	11	550
Machalilla	11	470
Pto. López	22	1,600
Total	-	17,000

At 1988 the export volume of fishery products in Ecuador was 220,000 tons; of this volume, the one of fourth was frozen shrimp. Following that, the frozen or canned tuna has a big volume. In recent years the export of fresh white meat fish has increased.Usually these export commodities are exported from Guayaquil, Manta or Quito to United States, Canada or Europe by air or by ship. Sometimes they are exported by land to the countries in Latin America such as Mexico, Colombia etc.

Per capita fish consumption depends profoundly on the tendency of fish landing which may be affected by El Nino. It fluctuates

between 8 - 16 kg/year with a cycle of 2 - 3 years. Therefore, in this project the value 10 kg/year per capita consumption of fishery product is adopted for the facilities planning.

The fact that the fishermen have few choices about buyers prevents them from taking advantage of a competitive market, causing a loss in potential profits. The results of the fishery products distribution survey show the consignment is made to middlemen or wholesalers in all cases. More than 50% of the fishermen surveyed in Manta, San Mateo and Puerto Lopez sell their fish catches through single or specified plural middlemen. Of those fishermen, 63% in San Mateo, 54% in Puerto Lopez and 42% in Manta sell their fish catches through the same broker every time.

In the artisanal sector, 101 Cooperative Pesqueras Artesanales (hereinafter referred to as 'CPA') have been formed between 1974 and 1988 and 2,413 fishermen joined to these CPAs.Manabi Province has 24 CPAs legally recognized and 688 members.There are 9 CPAs at the study area and around 20% of the artisanal fishermen joins to CPAs.MICIP promotes to organize CPAs and gives CPAs various assistance such as technical training, administrative seminars and orientations, etc.

Though average operating scale are still at the artisanal level, the fishermen's households create job opportunities for many working population as one of the local industry in south Manabi Province. Their contribution to the regional economy is also considered to be in a significant level. In most of the project sites, however, any infrastructure suitable for supporting the fishery production is not provided at present. Despite a suitable hull form of lancha for landing at natural beach, a great effort is still always required for landing catch and preparation works.The lack of infrastructure also restricts fish distribution at the level of producer's market. For decreasing such constraints and also for assisting the fishermen's households in their fishery management, it is necessary to prepare the fishing port facilities with fish conservation facilities, fuel oil supply and freshwater supply facilities.

(Natural Conditions)

The study area is located at the tropical zone around the equator but it's climate mild and it's temperature is almost constant and mean temperature is 24-25 degrees centigrade. There are two seasons divided into rainy season (November-April) and dry season (May-October). Precipitation at the coastal area is only about 300-500 mm/year at the average year. But, in 1983 precipitation at the study area was about 2000 mm/year caused by the El Nino Phenomenon. The abnormal precipitations have been caused by the middle class El Nino with a cycle of around 5 years. The precipitation in 1983 is 4-7 times as much as the average year and is presumed to be the biggest in this century.

There are many rivers at study area.Water currents are not observed except rainy season, but, these rivers cause the sediment discharges by El Nino. Average sediment discharges are listed below for each site. These rates of sediment discharges are much at Manta, Pto.Cayo and Pto.Lopez.

Sediment Discharges by Rivers

(unit:M3/year)

Jaramijo	Manta	San Mateo	St.Marianita	Liguique	San Lorenzo
8,000	46,000	3,000	3,000	1,000	3,000
	(Rio Manta)				
	8,000				
	(Rio Bravo)				

Santa Rosa	Pto.Cayo	Machalilla	Pto.Lopez
	42,000	10,000	42,000
		(Rio Panteros)	(Rio Buenavista)
		3,000	4,000

Tide of Ecuador represents two high and two low tide every 24 hours. The period interval is around 12 hours. The highest tide amplitude between low and high tide is 2.90 m. The tide differences at Manta Port are as follows.

MHWS = 3.46m
MHW = 2.99m
MSL = 2.08m
MLW = 1.21m
MLWS = 0.49m

3. Master Plan

The natural conditions, present conditions of the infrastructures concerned, fishery situation and the construction conditions were evaluated for each site at the study area, and Manta, San Mateo, Machalilla and Pto.Lopez were selected as the sites for Master Plans.
Planned numbers of fishing boats at each site for Master Plans are shown as follows.

Planned Number of Fishing Boats

Small Scale Fishing Boats:

Year	Manta	San Mateo	Machalilla	Pto.Lopez	Total
1990	341	183	53	71	648
2005	341	183	53	71	648

Middle Scale Fishing Boats:

Year	Manta	San Mateo	Machalilla	Pto.Lopez	Total
1990	23	0	16	8	47
2005	50	40	45	45	180

* Manta includes Jaramijo.
* Planned midde boats are under 80 GT at Manta, San Mateo.

Landing volume for each site are planned as follows.

Planned Landing Volume (2005)

Descriptions	Manta	San Mateo	Machalilla	Pto.López
Annual Landing : Mt/year				
Artisanal fishing permit.....1)	8,200	4,400	1,300	1,700
Industrial fishing permit				
Purse seiner.2)	27,500	22,000	24,200	24,200
Long liner...3)	1,800	1,400	1,600	1,600
Daily Landing : Mt/day				
1) + 3)	35.7	20.7	10.4	11.8
2)	98	79	86	86

Remarks : 1) Demersal fish, large pelagic fish
2) Small pelagic fish
3) Large pelagic fish

Main port facilities for each site are summarized as follows.

Main Port Facilities

(unit:m)

Fishing Boat	Facilities	Manta	San Mateo	Machalilla	Pto.Lopez
	Breakwater	280	700	430	560
	Training Jetty	1,180	-	80	-
Small-Scale	Landing	150	90	50	50
	Outfitting	150	90	50	50
	Idling	700	370	100	150
Middle Scale	Landing	110	80	80	90
	Outfitting	50	50	50	50
	Idling	350	280	320	320

Functional Facilities

Descriptions	Manta	Puerto López
(1) Cold storage(0°C)	240 cu.m	120 cu.m
(-30°C)	340 cu.m	-
Blast Freezer	12 Mt/day	-
Building area	300 sq.m	70 sq.m
(2) Ice making plant	70 Mt/day	20 Mt/day
Building area	400 sq.m	150 sq.m
(3) Ice storage	420 cu.m	120 cu.m
Building area (including a platform)	700 sq.m	200 sq.m
(4) Fish handling space	400 sq.m	200 sq.m
(5) Fishing gear repairing space	1000 sq.m	1000 sq.m
(6) Warehouse	100 sq.m	100 sq.m
(7) Workshop	100 sq.m	100 sq.m
(8) Fuel oil tank:		
Gasoline	150 Kltrs	30 Kltrs
Diesel oil	190 Kltrs	180 Kltrs
Building area	150 sq.m	80 sq.m
(9) Freshwater tank	15 Kltrs	10 Kltrs
Building area	20 sq.m	20 sq.m
(10)Administration Bld.	150 sq.m	150 sq.m
(11)Parking space	40 vehicles	20 vehicles
	600 sq.m	300 sq.m
Total	4000 sq.m	2500 sq.m

Functional Facilities

Descriptions	Machalilla	San Mateo
(1) Cold storage	110 cu.m	210 cu.m
Building area	70 sq.m	100 sq.m
(2) Ice making plant	20 Mt/day	40 Mt/day
Building area	150 sq.m	250 sq.m
(3) Ice storage	120 cu.m	240 cu.m
Building area (including a platform)	200 sq.m	400 sq.m
(4) Fish handling space	200 sq.m	300 sq.m
(5) Fishing gear repairing space	1000 sq.m	1000 sq.m
(6) Warehouse	100 sq.m	100 sq.m
(7) Workshop	100 sq.m	100 sq.m
(8) Fuel oil tank:		
Gasoline	20 Kltrs	80 Kltrs
Diesel oil	180 Kltrs	160 Kltrs
Building area	80 sq.m	100 sq.m
(9) Freshwater tank	5 Kltrs	10 Kltrs
Building area	10 sq.m	20 sq.m
(10) Administration Bld.	150 sq.m	150 sq.m
(11) Parking space	20 vehicles	20 vehicles
	300 sq.m	300 sq.m
Total	2500 sq.m	3000 sq.m

4. Priority Plan

Manta was selected for the site for the Priority Plan aiming the construction at the target year 1995 and the Priority Plan was formulated. The planned site was selected evaluating the fishing port development potential and the emergent needs for the fishing port construction.

Planned Number of fishing boats

Small Fishing Boats:

(unit:boats)

Year	Manta
1990	341
1995	341

* As like the Master Plans, in the Priority Plan, the number of the small fishing boats is planned as the same level as the present.

Middle Fishing Boats:

(unit:boats)

Year	Manta
1990	12
1995	25
Purse seiner	11
Long liner	14

* Smaller than 40 GT.

Planned landing volume is set as follows.

Planned Landing Volume (1995)

Descriptions	Manta
Annual landing	tons /year
Small fishing boat .....1)	8,200
Middle fishing boat	
Purse seiner....2)	4,620
Long liner.....3)	490
Daily landing	tons/year
1) + 3)	31.0
2)	16.5

Remarks: 1) Demersal fish, large pelagic fish
2) Small pelagic fish
3) Large pelagic fish

Main port facilities for Manta are summarized as follows.

Main Port Facilities
(unit:m)

Fishing Boat	Facilities	Manta
	Breakwater	-
	Training	430
	Jetty	
Small-Scale	Landing	50
	Outfitting & Idling	400
Middle Scale	Landing	90
	Outfitting & Idling	70

Following table summarizes the functional facilities for the Priority Plan.

Scale Outlines of the Planned Functional Facilities
(1995)

Descriptions	Manta
Cold storage(0°C)	30 tons (net capacity)
(-30°C)	100 tons (net capacity)
Blast Freezer	2 Mt/8hr
Ice making plant	10 Mt/day x 2 units
Ice storage	30 tons (0 Centigrade)
	30 tons (insulated)
Fish handling space	Fish selection, preliminary processing, etc.
Fishing gear repairing space	1000 sq.m
Warehouse	Storage for fishing gear
Workshop	Maintenance for outboard engines
Fuel oil tank:	
Gasoline	150 Kltrs
Diesel oil	100 Kltrs
Freshwater tank	12 Kltrs
Administration Bld.	
Parking space	For around 40 vehicles

(Construction Cost)
The construction period for the short-term development plan is scheduled to be three years including the period for the detailed design. The total construction cost is estimated at 18,164 thousand US dollars, the local portion 9,377 thousand of US dollars and the foreign portion at 8,787 thousand of US dollars.

(Fishing Port Administration)
The fundamental concept in the management of the fishing port facilities is to secure the safety of the fishing boats, to give the sufficient services for usage of the fishing boats and to make use of the port facilities for smooth and efficient landing, storage, processing and distribution of fish catches and speedy supply of stores, provisions, and repairs.

The organization for the administration of the fishing port in this project is proposed to be established within APM and is composed of the followings.
-Administrative Committee of Fishing Port
-Administrative and Operational Department of Fishing Port

(Economic Viability)
The economic viability of the project is examined from the viewpoint of Ecuador's national economy.Cost-benefit analysis in which the quantifiable benefits derived from the construction of the Manta fishing port are compared with the project costs is adopted and an appropriate economic internal rate of return (EIRR) is calculated to serve as a measure of the viability of the project.From the project costs and benefits calculated in this project, the EIRR has worked out at 3.6%, which is lower than the opportunity cost of capital in Ecuador. However, it is considered appropriate to implement the project, since it is an infrastructure project having the high public characteristics and is expected to contribute largely to the promotion of the regional development. From the view point of the economic analysis, that is, the benefit of the project to the nation, this project can be regarded as feasible.

The current account of the balance of payments shows the profits after depreciation at the year 1995. The durable years of the fishing port facilities are long, and from the viewpoint of the financial viability this project is financially feasible for the fishing port management body.

5. Recommendations

The construction of the small-scale fishing port in Manabi Province promotes the improvement of fishery products quality and the stable supply of fishery products, and realize the increase of the income of the artisanal fishermen. And as a result, it contributes to the stable and lasting development of the artisanal fishery.

It is also expected that the construction of the fishing port brings the continuous effect for the socioeconomic progress not only for the construction site but also for Manabi Province and the country.

Especially, the short-term development plan for the Manta fishing port is feasible enough from the view points of the technical assessment and economic analysis. Therefore, this project should be started as early as possible jointly with the construction works concerning the urban development plan which currently started at the area adjoining the planned site of the Manta fishing port.

Furthermore, it is desirable that the feasibility study on the fishing ports of San Mateo, Machalilla and Puerto Lopez would follow this project aiming at the achievement of Master Plans.

1. ABBREVIATION

MICIP	Ministry of Industries, Commerce, Integration and Fishery Ministerio de Industrias, Comercio, Integración y Pesca
SRP	Subsecretary for Fisheries Resources Subsecretario de Recursos Pesqueros
DGP	General Directorate for Fisheries Dirección General de Pesca
INP	National Institute for Fisheries Instituto Nacional de Pesca
EPNA	National Fishery Company Empresa Pesquera Nacional
CONADE	National Development Council Consejo Nacional de Desarrollo
INEC	Institute of Nationl Statistics and Census Instituto Nacional de Estadística y Censos
INEN	Normalization Ecuadorian Institute Instituto Ecuatoriano de Normalización
INOCAR	Oceanographic Institute of Army Instituto Oceanográfico de la Armada
DAC	Civil Aviation Office Dirección de Aviación Civil
EIU	Economic Inteligence Unit Unidad de Inteligencia Económica
IMF	International Monetary Fund Fondo Monetario Internacional
APM	Port Authority of Manta Autoridad Portuaria de Manta
ESPOL	Politechnic Littoral College Escuela Superior Politécnica del Litoral
BEDE	Ecuadorian Development Bank Banco Ecuatoriano de Desarrollo
FAO	Food and Agriculture Organization of the United Nations Organización de las Naciones Unidas para la Agricultura y la Alimentación
CIF	Cost Insurance and Freight Coste Seguro y Flete
FOB	Free on Board Franco a Bordo
BEDE	Equadorian Development Bank Banco Ecuatoriano de Desarrollo
GDP	Gross Domestic Product
PIB	Producto Interno Bruto
GRP	Gross Regional Product
PRB	Producto Regional Bruto
EAP	Economically Active Population
PEA	Población Económicamente Activa

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

Until 1960's, agricultural products such as banana, cacao and coffee were mainly exported, but afterward oil found at Amazon area were produced and exported from 1972 increasingly. As a result, the national economic growth was performed remarkably owing to the oil production in 1970's. Ecuador became the oil production country, but in the agriculture and fishery sector, its products still share 17% of the GDP and its employees occupy 34% of the total economically active population. Therefore, the agriculture and fishery sector is expected to be developed by the technical evolution and to play the important roll in the industries along with the oil by using its energy and natural resources.
The National Socioeconomic Development Plan (1989-1992) has a target to develop the fishery and aims to increase the fish products, to improve the collection and distribution system coping with the increase of the domestic consumption and exports.
The fishing activities are carried out around the areas where the Humboldt cold current and El Nino' current join, and the exports of the fish products amount to 449 million US dollars in 1988. The fishery industry plays an important roll for the acquisition of foreign currency.
The worldwide shrimp demand promoted the current fishery development although it depends on the development of the shrimp culture mainly. The production of shrimp has been enlarged as per the technical development of the culture.
On the other hand, the present conditions of the artisanal fishery are low level in the fish catches and the productivity in spite of it's important roll. So, the artisanal fishery is requested to increase the fishermen's income, to develop the fishing villages and to contribute the regional development by means of the improvement of fishery conditions with the construction of the fishing ports and the functional facilities.

Under these circumstances, the cooperation relating to the study on the small-scale fishing port development project in Manabi Province was requested by the Ecuador Government to the Japanese Government. In compliance with the request, the implementation of the study was made based on the scope of work for the study agreed upon on April 12, 1990 between JICA and MICIP.

1.2 Objectives and Area of the Study

The objectives, the area and the implementation method of the study are as follows.

(1) Objectives of the Study
The objectives of the study are to formulate the small-scale

fishing port development plans for the southern area of the Manabi Province and to conduct the feasibility study on the selected priority plan.

(2) The Study Area
The study covers the coastal area of Manabi Province extending from Jaramijo located at the north of Manta to Puerto Lopez in the southern part of Manabi Province.

(3) Implementation Method of the Study
The study is divided into the Phase I and Phase II. At the Phase I of the study, the sites for the fishing ports aiming the construction at the target year 2005 are selected and the Master Plans are formulated for these sites by evaluating the fishery port development potential. The Priority Plan to be constructed urgently is also studied. The site for the fishing port aiming the construction at the target year 1995 is selected. At the Phase II, the supplementary field survey for the priority planned site is implemented and the feasibility study is to be carried out.

The field survey of the Phase I commenced at December 1990, and the Interim Report was made based on the field survey. In the Interim Report, Manta, San Mateo, Machalilla and Puerto Lopez were proposed as the sites for the Master Plans and the planned Master Plans where agreed. The site for the Priority Plan aiming the construction at the target year 1995 was discussed and agreed to select Manta.

The field survey of the Phase II commenced at July 1991, and the Draft Final Report was made based on the supplementary field survey. In this Draft Final Report, the feasibility study is conducted for Manta as the planned priority site.

The flow chart of the study schedule is shown below

1.3 Implementation of the Study

The Subsecretary for Fisheries Resources (SRP), Ministry of Industries, Commerce, Integration and Fishery, was assigned as the counterpart executing agency of the Government of Ecuador while the Japan International Cooperation Agency (JICA) was assigned as the official agency responsible for the implementation of the technical cooperation programme of the Government of Japan.
The study was conducted from December, 1990 to March 1992. The members involved in the study are listed below.

(1) JICA Advisory Committee
Mr. Koji Mitsuhashi : Chairman
Dr. Masaaki Yamamoto: Member
Mr. Syoichi Shikada : Member
Mr. Noboru Oshima : Member

(2) JICA Study Team

Mr. Fujio Saigusa	: Team Leader
Dr. Francisco Medina	: Analysis of Natural Conditions
Mr. Takuro Terashima	: Littoral Drift Analysis
Mr. Iwao Mizuishi	: Fishery Products Distribution Analysis
Mr. Shigeru Iwasaki	: Fishery Products Distribution Analysis
Mr. Mamoru Watabe	: Fishery Economic, Organization
Mr. Noboru Murai	: Fishing Port Planning
Mr. Toyomitsu Terao	: Fishing Facility
Mr. Katsumi Naito	: Design of Fishing Port Facility

(3) Ecuadorian Counter Part

Mr. Max Aguirre Auad	: Undersecretary of Fisheries Resources, Ministry of Industries, Commerce, Integration and Fishery (MICIP)
Ing.Torres	: Technical Advisor, Subsecretary for Fisheries Resources (SRP),
Ing.Carlos Ormed	: Technical Advisor, SRP,
Mr. Pablo Larrea	: President, Manta Port Authority (APM)
Ing.Alfred Flores	: Technical Dept. APM
Ing.Bolivar Ortiz	: Technical Dept. APM
Ing. Jorge Palau	: Director's Board, APM

1.4 Acknowledgement

The study team conducted two times of field surveys in Ecuador from December, 1990. During their stay, the study team got various support and cooperation from the related organizations under the Government of Ecuador and all the personnel concerned. On this occasion, the study team wishes to express its deep appreciation for the cooperation and assistance rendered by them through discussions and data collection.
The study team would also like to express its heartfelt gratitude to the officials of SRP and APM who gave valuable advice and provided various support for the performance of the study.

Año/mes	11	12	1991/1	2	3	4	5	6	7	8
Etapa del estudio		Fase I								
Objeto del estudio	Trabajo de preparación	Estudio sobre el terreno I		Formulación del plan maestro I			Estudio sobre el terreno		Formulación del plan de más alta prioridad	

Items de trabajo

1. Trabajo de preparación en Japón
2. Presentación del informe inicial
3. Estudio de reconocimiento
4. Recopilacion y análisis de los datos existentes
5. Estudio oceanográfico
6. Estudio de arrastre litoral
7. Estudio del ambiente socioeconómico
8. Sistema de recopilación y distribución de los productos pesqueros
9. Investigación del sitio del proyecto
10. Evaluacion del sitio del proyecto
11. Presentación del informe de progreso I
12. Análisis de los datos recopilados
13. Formación del plan de desarrollo a largo plazo (plan maestro)
14. Selección del plan de más alta prioridad
15. Presentación del informe provisional
16. Informe suplementario del del área de más alta prioridad
17. Estudios:
    - Estudio batimétrico
    - Estudio de litoral
    - Estudio topográfico
18. Estudio de subsuelo
19. Presentación del informe de progreso I

- Características del puerto pesquero planificado
- Locales de planificación
- Determinación de la escala de planificación
- Plan de distribución
- Efecto del arrastre litoral (simulación con computadora)
- Diseño preliminar
- Estimación de los costes

Informe	Informe inicial	Informe de progreso I	Informe provisional

	5	6	7	8	9	10	11	12	1992/1	2	3
	Fase II										
	Estudio sobre el terreno		Formulación del plan de más alta prioridad								

ficado

n

computadora)

15. Presentación del informe provisional

16. Informe suplementario del del área de más alta prioridad

17. Estudios:
- Estudio batimétrico
- Estudio de litoral
- Estudio topográfico

18. Estudio de subsuelo

19. Presentación del informe de progreso II

20. Aálisis de los estudios recopilados

21. Estudio de factibilidad del plan de desarrollo a corto plazo (el plan de más alta prioridad)
- Plan de distribución
- Diseño básico
- Plan de construcción y estimación de costes
- Gerencia y operación:
- Análisis económico:
- Análisis financiero

22. Presentación del borrador del informe final

23. Presentación del informe final

▲ Borrador del informe final

▲ Informe final

CHAPTER 2 BACKGROUND OF THE STUDY

CHAPTER 2 BACKGROUND OF THE STUSY

2.1 Natural Conditions

2.1.1 Meteorology

(1) Temperature

Temperatures of the study area are almost constant and the mean temperature is 24-25 degrees. Monthly mean temperatures of the observation stations (Manta, Jipijapa, Julcuy and Lopez) are shown in Table 2-1-1.(1970-1985)

(2) Humidity

Humidity of Manta is about 77%. Humidity of Lopez is about 85%. Monthly mean humidity of Manta, Jipijapa, Jullcuy and Lopez are shown in Table 2-1-1.

(3) Velocity of the Wind

Monthly velocities of the wind at Manta, Julcuy, and Lopez are shown in Table 2-1-3. The wind is not so strong along the coast. Monthly mean velocity is less than 3 m/sec.

Table 2-1-1 Monthly Average Temperature at Coastal Area :C

Station	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Manta	26.1	26.4	26.3	26.3	25.7	24.8	24.1	23.7	23.5	24.1	24.3	25.2	25.0
Julcuy	24.9	25.3	25.3	25.4	24.8	24.1	23.9	23.1	23.3	23.5	23.4	24.4	24.3
Lopez	25.1	26.3	26.2	26.1	25.2	25.6	22.4	22.2	22.4	22.7	23.5	24.3	24.3

Table 2-1-2 Monthly Average Humidity at Coastal Area :%

Station	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Manta	75.3	76.5	78.5	76.6	75.9	77.6	77.2	81.0	77.8	76.4	73.3	74.7	76.7
Julcuy	82.9	82.7	84.4	82.8	82.8	83.8	83.3	83.7	82.3	82.0	83.3	81.3	82.9
Lopez	81.3	80.5	83.5	83.3	82.3	86.8	86.6	88.5	87.8	88.6	87.1	84.0	85.0

Table 2-1-3 Monthly Average Wind Velocity at Coastal Area :m/sec

Station	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Manta	2.4	2.2	2.2	2.4	2.9	2.9	3.2	3.3	3.6	3.3	3.2	3.4	2.9
Julcuy	1.2	0.9	1.0	1.2	1.6	1.5	1.8	1.8	1.9	1.8	1.8	1.7	1.5
Lopez	3.0	2.4	3.0	2.5	2.7	2.5	3.0	3.1	3.1	3.0	3.2	2.7	2.8

(4) Precipitation

Precipitations of Ecuador coastal area are about 400-500 mm/year. But in 1983 precipitations of study area was about 2000 mm/year by big El Nino occurred in 1983. Precipitations of Monticristri, Sancan, Cayo and Julcuy from 1970 to 1985 are listed in Table 2-1-4. Distributions of precipitation in 1982 and 1983 are shown in Fig. 2-1-2.

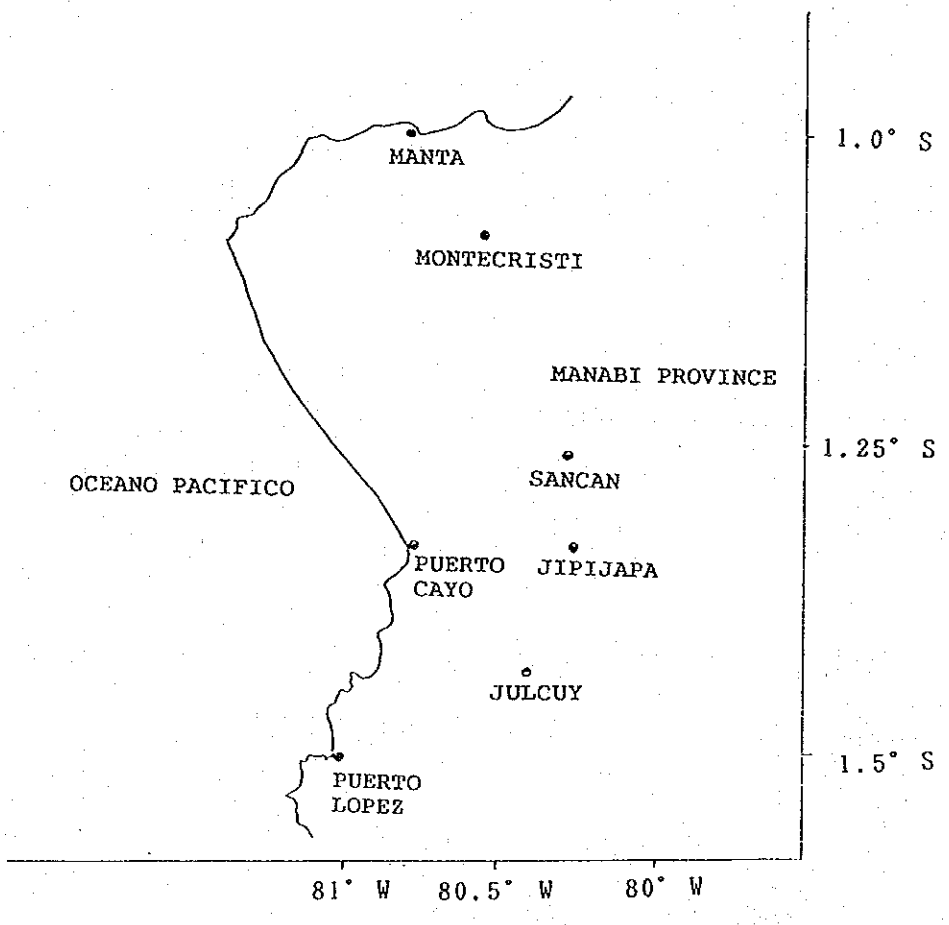

Fig.2-1-1 Location of Meteorological Station

2.1.2 Oceanography

(1) Tide

The tide characteristic of Ecuador shows the two high and two low tides every 24 hours. The period interval is 12 hours. The highest tide amplitude between low and high tide is 2.96 m.

(2) Wave

Wave visual observation was carried out along the Ecuadorian coast by ship liner between Guayaguil and Galapagos islands.

The report in which wave observation data of 1 year are comprised is shown in Table 2-1-5 and Fig. 2-1-3.

Wave directions and heights of Ecuadorian coast observed by US Navy are shown in Fig. 2-1-4. According to these data, predominant deepwater wave direction of Ecuadorian coast is S-SW. The distributions of the wave heights are 16% for 0.5m, 74% for 0.6 to 0.2 m and 10% for over 2.0 m.

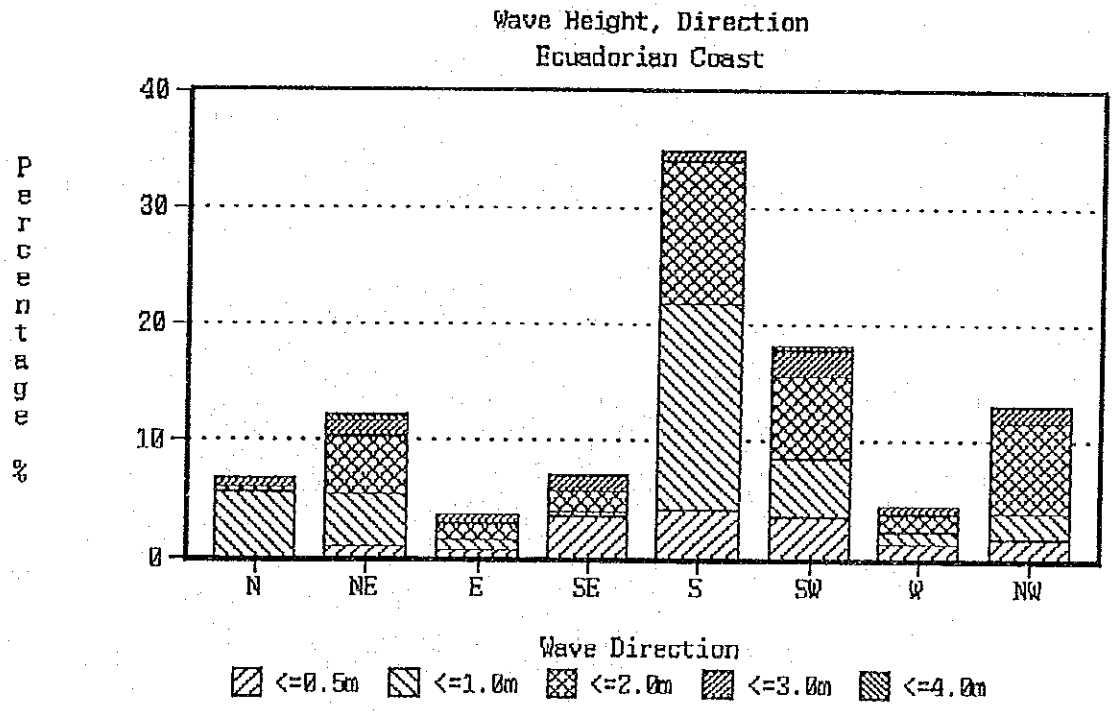

Fig.2-1-3 Wave Height and Direction at Ecuatorial Sea

2.1.3 El Nino Phenomenon

In the past century El Nino occurred in (1981), 1912, (1917), (1925-26), (1940-41), 1953, (1957-58), 1965, 1969, (1972-73), 1976, (1982-83), and 1986-87. The ( ) ones had the greatest effects. Each El Nino has its own particularities, the effects are also somewhat different; for example, rainfall is not a constant parameter, the El Nino of 1982-83 being probably the wettest since 1925. The 1982-83 El Nino has been the strongest event of this century. In 1982-83 rainfall data reached 5-10 times values greater than the average value of ordinary year. Fig. 2-1-5 shows the annual rainfall for the city of Guayaguil lasting from 1920 until 1982. It also relates the annual rainfall with El Nino occurrence; a good relationship is found. A very large positive deviation from the 20 year mean is also shown in Fig. 2-1-6. According to these data, medium El Nino occurred about every 5 years, but it is very difficult to make an appropriate prediction of next strong El Nino event.

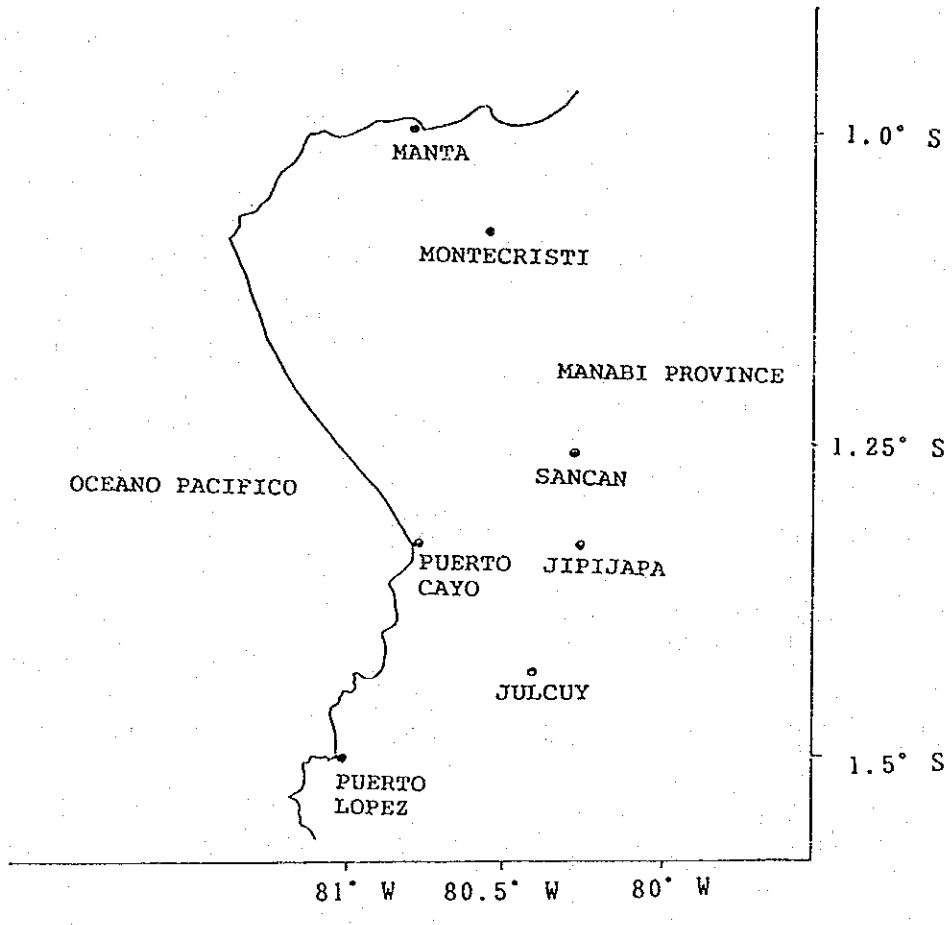

Fig.2-1-1 Location of Meteorological Station

2.2 Socioeconomic Conditions

2.2.1 Socioeconomic Conditions of Ecuador

(1) General

The Republic of Ecuador is located in the northern part of South America facing to the Pacific Ocean and on the equatorial line where the country gets its name. It borders on the Republic of Columbia in the north; on the Republic of Peru in the south and the east. The Galapagos Islands, which have become famous by Darwin's theory "The Evolution of Species", also belong to Ecuador and are situated 1000 km from the Ecuadorian Coast.

From the geographic point of view, Ecuador is divided into three regions; the Coast or littoral zone, the highlands, and the Amazon, the jungle plains at the west of the country.

These three regions have their own characteristics in the social and environmental aspects. The Coast is a plain area with the ground elevations less than 300 m. This region shows climate variations according to a combination of marine current movement, of the escortings of the rivers, and the speed and direction of the continental winds. The average annual temperature of Guayaquil, the largest city with 1.3 million inhabitants, located almost in the center of the coastal region is 25.0C. Due to the influence of the cold current of "Humboldt", the environmental temperature of Guayaquil is not as high as other coastal regions of the world located on the equator.

The highlands consist of the mountain ranges with ground elevations between 1,500 and 5,000 m. Quito, the capital of Ecuador with 1 million inhabitants, is located in the central zone of the inter Andes Alley at an elevation of 2,800 m. The temperature of the highlands vary according to ground height. Quito, though located right on the equator, has an average annual temperature of 18.C. The Amazon or Orient Region constitutes a vast plain covered by virgin forests, and is the origin of the Amazon river. It is scarcely populated.

From the administrative point of view Ecuador is divided into 20 provinces; these are shown on the table below:

Provinces of Ecuador

Regions and Provinces	Regions and Provinces
Amazonia	Sierra
M. Santiago	Azuay
Napo	Bolivar
Z. Chinchipe	Canar
Pastaza	Carchi
	Cotopaxi
	Chimborazo
Costa	Imbabura
	Loja
El Oro	Pinchincha
Esmeraldas	Tungurahua
Guayas	
Los Rios	
Manabi	
Insular	
Galapagos	

(2) Population

1) Demography

The total population of Ecuador based on the 1990 census is shown in Table 2-2-1. Country's total is 9,622,608 in 1990. The rate of population growth from 1982 is 2.27%.

Over 95% of the country's total population is concentrated in the coastal and highland regions. Particularlly, about 54% of the total population is concentrated in three provinces: In Guayas where Guayaguil is located; Pichincha where Quito the capital is located; and Manabi where Manta is, an important port, and Portoviejo the capital of the province.

The rate of national urbanization is 55% in 1990. The provincial rate of urbanization in Guayas and Pichincha is 76% and 74% respectively, while the rate corresponding to the provinces of Manabi is 42%.

2) Projections

The national population forecast was made in 1985 by INEC up to the year 2000 and it is shown in Table 2-2-2. For that year, the Ecuadorian population is estimated to reach the sum of 13,939,000 inhabitants. The rate of population growth was estimated in five years periods and is shown in following Table.

The population growth forecast shows annual lessening, however a 2.5% level still exists for the year 2000.

Five year Projected Population and Increase Rate

Year	Projected population (in thousands)	Average annual increase rate (%)
1985	9378	2.915
1990	10782	2.830
1995	12314	2.693
2000	13939	2.510

Source: INEC, Projected Estimation 1985-2000

3) Economically Active Population

As shown on Table 2-2-3, the economically active population (EAP) for 1987 was 3,340,000 inhabitants. The most important sector of the EAP, with 35%, corresponding to Agriculture, Forestry, Hunting and Fishing; followed by community services, social and personal with 24%; and 16% for industrial manufacturers. These three sectors share over 70% of the total EAP.

The increase rate of the total economically active population for the period of 1983 - 1987 was 3.1% by sectors, while the increase rate for the manufacturing sector was 3.0%. On the other hand, the rate for the Agricultural sector was negative -1.2% for the same period. High increases were registered for the financial and mining sectors, that were 14.8% and 10.2%.

(3) Gross Domestic Product (GDP)

The historical data of GDP by sectorial origin is shown on Table 2-2-4. As shown on this table the GDP in 1989 reached 5,464,613 million S/. (in nominal terms) which is the equivalent to 10,080 millions of dollars, using the exchange rate of S/.542 per dollar. The Gross Domestic Product (per capita) for 1988 was calculated at S/.520,000 that converted into US$960, according to "CONADE" determinations.

The historical Gross Domestic Product in real terms, at constant prices in 1975 are shown on Table 2-2-5. The actual increase of GDP reached a rate of 1.9% per year in the period 1985-1989. However, the increase rate of population for the same period was 2.27% which means the decrease tendency of GDP per capital.

(4) Foreign Trade

1) Export and Import

The statistics on exports is shown on Table 2-2-6. In 1985, Ecuador registered highest export value of 2,905 million of US dollars, the contribution of oil reached 63% of the total amount of exports.

From 1980, Ecuador began to export shrimp. In 1987, shrimp and fish exports reached 409 million of US dollars, and it was placed in second place among export products, after oil.

In 1990, the total value of export reached 2,714 millions of US dollars. The exports was composed of: 46% for oil; 13% for shrimp and fish; 17% for banana; 4% for coffee ; 3% for cocoa and 1% for tuna. These six products constituted the 84% of the exports.

The statistics on imports are shown on Table 2-2-7. In 1990, the total amount of imports reached 1,861 million of US dollars. The most staple products were the raw materials and intermediary products for the industry, combustibles and lubricants.

2) Customs

Export tax of non-petroleum products (banana and marine products) has been imposed at low rate. Average tax rate including petroleum products is 0.6% while in case of excluding petroleum products is only 0.01%. This system leads with the result promoting exports.

On the contrary, import system is different from export one. Import taxis imposed at the rate of 200-300% in peculiar case. Average import tax is imposed more than 13% of import price (CIF price), of which, 8.3% is customs. (Refer to Table 2-2-8)

(5) International Payment Balance

1) International Payment Balance

The current account of the balance of payment are found on Table 2-2-9. In 1990, exports exceeded imports by 1,003 million of US dollar.

2) External Debt.

The value of the Ecuadorian external debt for the period 1970-1988 is shown below:

The external debt in 1988 reached 9,714 million of US dollars. The external debt in 1980 reached 9 times compared to 1975. This is equivalent to 55% annual growth rate for the period. This trend is owing to the increase of investment largely in petroleum exploitation.

External Debt Amounts of Ecuador (million of US dollars)

Concept	1970	1975	1980	1985	1986	1987	1988
External Debt	242	513	4652	7439	8329	9161	9714
% of the GDP	16	12	43	77	89	98	136

Source: Planning Office, CONADE

3) Exchange Rate.

The applicable exchange rate, from 1970 to 1988, of the US currency, has been summarized as follows:

The sucre had the exchange rate of 25 sucres per US$, for a long period, on 1970's. However, since 1982, the sucre was devaluated several times and in August, 1986, a floating exchange system was introduced. In January, 1991, the exchange rate was around S/. 910 per US$1 (monthly average) in the open market.

Quotation for the US$
(in the open market, annual average)

Concept	1970	1975	1980	1985	1986	1987	1988
Purchase	23.14	25.24	27.41	115.52	148.08	193.23	435.03
Sale	23.18	25.33	27.97	116.29	148.51	193.80	436.19

Source: Planning Office, CONADE

4) Monetary Reserve

According to the IMF statistics, the exchange reserve of Ecuador, in the period 1982 - 1988, were as follows:

After 1985, the monetary reserves have begun to decrease ; to a point where in 1987 the reserves only lasted for the necessary requirements of four months of importation.

Monetary Reserve (million of US dollars)

1982	1983	1984	1985	1986	1987	1988
304.0	644.5	611.2	718.2	644.1	491.1	397.6

Source: IMF, International Financing Statistics.

(6) National Budget

The income and spending of the general budget of the Government are shown on Table 2-2-10.

On 1986, valid income totaled S/. 271,800 million, the valid spenditures S/. 254,000 million and capital spends at S/.35,700 million, so the deficit in the resource balance totally close up to S/. 17,900 million.

In 1986, the CEPE taxes (CEPE, Vorporacion Estatal Petrolera Ecuatoriana-[name of oil company]) constituted 43% of the total paid taxes. On 1985, when oil prices were very high, CEPE reached 56% of the total valid income.

In relation to the constitution of valid spenditures, the payment of interest to the external debt occupied the 21% of the total volume of valid spenditures. The ratio of spends for the service of the external debt has been increasing as the debt has gained or gotten bigger; 3% in 1975; 9% in 1980; 18% in 1985; and, 21%, in 1986.

(7) Inflationary Process and Unemployment

The statistics on consumer prices is summarized below:

Consumer Prices Indices
(to December of each year; May/78-April/79 = 100)

Concept	1970	1975	1980	1985	1986	1987	1988
General index:	39.7	71.3	122.3	423.1	538.8	713.8	1,325.6
Inflation:							
-to December (%)	5.1	15.3	13.7	24.4	27.4	32.5	85.7
-Average (%)	5.4	14.3	12.8	28.1	23.0	29.4	57.0

Source: Planning Office, CONADE

As seen above the consumer price indices have remained stable in the first years of the 1980's: 12% yearly for the period 1975-1980. However, during the period 1980-1988, the rate of increase of the consumer prices indices was 35%.

Regarding to unemployment, the following table indicates statistics:

Unemployment Percentage

Year	1970	1975	1980	1985	1986	1987	1988
Unemployment	4.2	4.1	5.7	10.4	12.0	12.0	12.3

Source: Planning Office, CONADE.

Since 1985 the unemployment index has gone over 10%. The coverage of unemployment is concentrated in the rural areas, but it has been also found in the urban areas. A survey done by INEC on unemployment showed that the rate in Quito was 9.8% and 7.2% in Guayaquil.

A summary of statistics on minimum wages is below:

Minimum Wages (salaries) in Ecuador
(Monthly Basic salaries, in thousand sucres)

Concept	1980	1985	1986	1987	1988	1989	1991
General(essential)	4.0	8.5	12.0	14.5	22.0	32.0	40.0
Small industry	3.0	6.5	10.0	12.0	18.7		
Artesanal	2.8	6.0	8.7	10.4	16.6		
Domestic Service	1.5	3.9	5.5	6.6	11.0		

Source: Planning Office, CONADE.

The rate of increase in minimum salaries has not been the same as those of inflation described in previous pages.

In January, 1991, the Ecuadorian Government decided to increase the minimum wage to 40,000 s/. from 32,000 s/. of the previous year. This increase corresponds to the high rate of inflation in the country.

2.2.2 Development Plan

(1) National Development Plan

1) Historic performance

A list of national development plans is shown below in chronological order:

a) National Integral Development Plan (1973-1977)
b) Long Term Development Strategy (1979)
c) National Development Plan (1980-1984)
d) Guide for National Development (1984-1988)
e) National Development Plan (1985-1988)
f) National Socioeconomic Development Plan (1989-1992)

The plans mentioned above were those of short to medium term, with goals set up to four and five years; with exception to the document: "Development Strategies of Long-Term," which was prepared in 1979 with a target for the year 2000.

The National Development Plan for the period 1985-1988 had a target for the increase of GDP at a rate of 3.7%, yearly; and an annual increase of 0.8% of the GDP per capita. However, Ecuador was affected by the "petroleum crisis" and the real increase was 2.0% in terms of GDP and -0.9%, each year for the GDP per capita.

2) National Socioeconomic Development Plan (1989-1992)

The National Socioeconomic Development plan for 1989-1992 was announced by the Ecuadorian government in August 1989. Considering that the Ecuadorian economy has given great importance to stabilize inflation and eliminating tax deficit, that development Plan has established some general objectives that have been summarized as follows:

a) Strengthen social co-operation as the best means of obtaining a balanced social and economical development.

b) To set up the basis to overcome the actual dependency of the economy on the oil industry.

c) Progressively to incorporate to the productive activity to the poor population, which has been estimated to be in 55% of the total population, so that act the end of this century it won't be over.

d) To improve the access to natural resources and capital to overcome the levels of poverty in the rural populations.

e) To readjust the process of industrialization by selective substitution of importations and to improve the production of exportation.

f) To substantially increase the internal savings and its allowance for better productions.

In the National Plan Text, economic reality of Ecuador is described in critical terms; the service of the external debt has passed the level of 50% of the total exportation volume; and, more than 10% of GDP of 1988. The oil exportations is not enough to cover the service of the debt. It is also expressed that the oil resources are quite frankly declining.

Based on these realities and with the attempt to reach the objectives described above, the national plan emphasizes the need to increase internal savings and its investments in production activity; especially in the agricultural sector including fishery; it also emphasizes to impulse the selective situation sizes the "social debt," that is what the state and the social groups, those less affected by the crisis, owe to those living in very extreme poverty.

The National plan shows the strategies for economic development in the four year period of 1989-1992. Table 2-2-11 shows the sectorial goals of increase of the GDP, expressed in constant prices in 1975. The general target for GDP increase is established at 3.15 annually, as a average in the period. the increase rate in the agricultural, fisheries and forestry sectors is projected at 3.8% annually and the industrial sector at 3.2% annually. The increase of these sectors is hoped to reestablish the Ecuadorean economy. On the other hand, the increase of the oil sector is established at modest levels at 1.9% annually.

The investment of the National Plan for the target period, is S/.3,413,000,000 million (US$7,940 million) as shown on table 2-2-11, 12.

Priority is given to the energy sector, with a 28% of the total investment, followed by the agricultural sector with 18% and transportation with 17%. These three sectors require a total investment of 63% of the nation's total.

According to the investment programme for 1990, the public in vestment would reach a level of S/.943,000 million of which S/.499,000 million or 1,162 million of US dollars, would be financed by foreign sources. Those financial requirements correspond to the 53% of the total investment for 1990.

(2) Development Plan of fishing Sector

The development plan of fishing sector in the National Socioeconomic Development Plan (1989-1992) is summarized as follows:

1) Critical Problems

The critical problems of the fishing sector in Ecuador are identified as follows:

a) The country has not shipyards for construction and attending the demand of maintenance and repair of boats.

b) There is a general obsoleteness of the fishing boats, the unit of which should be renovated with modern fishing methods and should have conservation systems for increasing the catches.

c) Scarce infrastructures and port facilities for landing and conservation of the fish.

d) Low productivity of the shrimp culture which is not operated intensively.

e) Low productivity of the artisanal fishery.

f) Excessive utilization of marine species as raw materials for production of fish meal, harming the internal consumption and the exports.

g) Nonfulfillment of the closed season for lobster, shellfish and crabs.

2) Strategic Outline for the Development of the Fishing Sector

To promote the industrial or artisanal fishery activities with the help of the specialized organs of the Country, in order to increase the production and distribution of fish products, to attend the internal demand and increase the exports.

In order to realize the general objectives, different projects of action will be prepared, which will be subject to the following strategic outlines.

a) To increase the size of fishing boats and modernize the fish ing boats.

b) To construct industrial and artisanal fishing ports and centers of the culture to give the fishermen the necessary serv-ices in the work of capture, processing and commercialization.

c) To intensify the investigation to obtain a rational evaluation, capture and efficient utilization of the bioaquatic re sources.

d) To promote the knowledge of the science and the fishing technology, based on the investigation and the training of the personnel who work in the fishery sector.

e) To seek the balance of the installed capacity of the industrial plants, in relation to the availability of the bioaquatic resources.

f) To favor the installation of repairing berths for maintenance

and repair of fishing boats.

g) to promote the internal commercialization and promote the increase and diversification of the exports.

h) To revise the legislation and strengthen the organizations of management, coordination and control of the fishing activities.

2.2.3 Socioeconomic Conditions of Manabi Province

(1) General

The Manabi Province is located in the northwestern part of Ecuador. It occupies a territorial extension of 18,744 km2 and is the second largest province in the Ecuadorian coast after Guayas. The Manabi Province faces the Pacific Ocean, and it extends 80 km from East to West, and 190 km from North to South. The middle-western part of the province is a plain that extends slightly toward the East gaining elevation until it turns into a mountainous range with 300-800 m height.

According to the demographic census of 1982, the population of the Manabi Province was 906,700 inhabitants, with 144,400 homes. It is estimated that for the middle of 1989 the population of Manabi will be over one million.

A comparative analysis of various demographic economic indicators between the Manabi Province and the Country are shown below:

Comparison of Characteristics between Manabi and the Country

Item		Country	Manabi	%(M/C)
Population,	1982	8,606,116	906,676	10.5
	1990	9,622,608	1,026,066	10.7
Density (hab/km2),	1982	32	48	150.0
	1990	36	54	150.0
GDP/GRP (1987, *1000 S/.)		159,016	10,514	6.6
GDP/GRP (per capita S/.)		16,030	10,110	63.0
EAP,		3,340,000	300,000	9.0

Source: Oficina de Planificacion, CONADE

GDP = Gross Domestic Product
GRP = Gross Regional Product
EAP = Economically Active Population

The coffee and cocoa produced in Manabi were the major products of exports, before oil was discovered in 1967. At that time, a flowering economy characterized Manabi with a commercial center in Manta. But, after the worldwide reduction in prime products prices in the 1960's, the economy of the province began to decline. The contribution of the province in national population has declined since the 1960's.

Manabi Province locates near the highway Quito-Guayaquil and the main cities in Manabi are connected to this highway. So, the transportation conditions to the consumer markets are good.
The highway Troncal-Portoviejo-Manta has become an industrial

corridor. Many manufacturing industries consisting of food processing locate along this trunk road. However, the main industrial sector of Manabi Province is agriculture including fishery and its share is 45%. Few years ago, the shrimp culture has been introduced in the coastal region which includes Manabi, and the shrimp products become one of the major items of exports.

(2) Administration

From the administrative point of view, in 1987 the Manabi Province was divided into 16 cantones. Each canton is subdivided into urban paroquias and rural parroquias.

There were 27 urban parroquias and 46 rural ones.

These are listed on the table below. (cf. Fig. 2-2-1)

Administrative Division and Population of the Manabi Province (1987)

Cantones	Inhabitants	Cantones	Inhabitants
Bolivar	38,303	Pichincha	27,545
Chone	161,935	Portoviejo	209,456
El Carmen	44,813	Rocafuerte	28,793
Jipijapa*	80,529	Santa Ana	64,222
Junin	19,134	Sucre	94,441
Manta**	142,357	Tosagua	28,792
Montecristi***	37,171	24 de Mayo	38,233
Pajan	45,000	Flavio Alfaro	-
		Total	1,060,655

Source: INEC

Notes :
* Canton Montecristi includes rural paroquia "Jaramijo".
** Canton Manta includes urban parroquias "Manta", "San Mateo" and rural parroquia "San Lorenzo".
*** Canton Jipijapa includes rural parroquias "Puerto Cayo", "Machalilla" and "Puerto Lopez"

(3) Population

1) Demography

The following table shows the population of the Manabi Province in the last five census.

Population and Growth Rate of Ecuador and the Manabi Province

	Population			Annual growth rate (%)	
Year	Country	Manabi	%(C/M)	Country	Manabi
1950	3,310,080	401,378	12.1		
1962	4,695,805	612,542	13.0	2.95	3.58
1974	6,829,457	817,966	12.0	3.17	2.44
1982	8,038,435	874,803	10.9	2.06	-0.04
1990	9,622,608	1,026,066	10.7	2.27	2.01

Source: INCE

In 1990, the fifth census has been carried out.
As shown above the population of the Manabi Province was 874,803 in 1982 and 1,026,066 in 1990.
The population density in 1990 was 54 persons/km2, which is larger than the density of the Country, that is 36 persons/km2.

2) Emigration

Since the 1962 census, it was detected that in Manabi emigration was higher than immigration. According to the 1982 census, the net exodus population or the difference between immigration and emigration, reached 200,000 people in the period 1974-1982. This phenomenon is observed mainly in the rural areas especially in the South-East zone of Manabi neighboring the Guayas Province. These areas are exclusively for agriculture, and low productivity of the ground has caused a tendency to migrate to other places.

Guayaquil constitutes the center of attraction for the flow of migrants of Manabi, because of its high capacity to offer employment.

3) Population Projection

The projections up to the year 2020 of the Manabi Province were made on the basis of INEC estimation by CPM.
In 2020, the population of Manabi is estimated to reach 23,043,000 inhabitants, 2 times compared to that of at present, and the annual growth rate is forecasted to be 2% almost same

the rate as for the Country. But, for Manta the growth rate is forecasted to be 2.96% larger than the Province average. (Table 2-2-13)

4) Economically Active Population and Fishery

The economically active population of the country, and Manabi Province for 1987 were 3,340,000 and 295,905 inhabitants respectively. (Table 2-2-14) The share of Manabi Province is 9% of the country.

When compared the sectorial structure of the employed population in Manabi with that of the Country's, agriculture, fishery and forestry in Manabi at 47% is higher than the Country's at 35%.

Among the economically active population, the circumstances of fishery employment at project area is explained the followings.

The fishery activity on the sea is limited to the 5 Provinces of coastal area and Galapagos. The employment of fishery distributes these regions. Despite there is no statistics regarding the population of employment by province, the following fishery activities are assumed divided into industrial fishery and artisanal fishery.

a) The employed population by the industrial fishery is estimated to be around 250,000 in 1988. (Table 2-2-15)
Above population includes employees and labour workers employed by processing, culturing, ship-companies and larvae laboratories. It also includes personnels employed temporarily. The breakdown of the contents is shown in Table 2-2-16. There is no statistics of the breakdown by province, but it is estimated that Guayas and Manabi occupy the big share judging from the present conditions of the processing and culturing.
The statistics concerning to number of crew members of industrial fishery by province show that both Guayas and Manabi Provinces occupy the most part.(Table 2-2-17)

b) The registered number of the artisanal fishermen by year, by province, by Inspector's office are shown in Table 2-1-18. According to the Fisheries Low, the persons who wants to get involved within fisheries activities shall be registered, but actually there are many artisanal fishermen who are not registered. The estimation of these non-registered members might be two or three times of the registered members. Therefore, the total number of artisanal fishermen might be between 18,000 and 24,000 and the artisanal fishermen in Manabi to be between 4,500 and 6,000 individuals.

c) The total workers concerned to the fishery, that is 270,000 individuals, including the industrial and the artisanal sector, correspond to 17% of the total EAP (1.67 million) of the Costa region in Ecuador, and it means the fishery has a great effect to the regional economy.

(4) Gross Domestic Product (GDP)

The statistics corresponding to the economic indicators of the region are scarce. The information on GDP of the Province are only available for 1987. For the year 1987, the GDP of the Province reached a sum of 118, 805 million S/. composed and structured in the following way; 45% for agriculture and fishery, 15% for commerce and 15% for commerce and 14 % for manufacture. These three sectors covered 74 % of the GDP. (Table 2-2-19)
Among GDP, commerce, service industry and transport communication contribute to tourism in Manabi.
Agriculture and fishery contributed 38 % in Manabi comparing with 16 % of the Country's manufacture reached 13% in Manabi comparing with 20% of the Country's. In other words, Manabi has the largest agriculture and fishery sector and the smallest manufacture sector in the country.
The GRP of Manabi occupied 6.5% of the Country's GDP for 1987. The GRP per capita of Manabi corresponds to 53% of the GDP per capita. This inequality may be explained because of low productivity of industry in Manabi.

1) Agriculture and Fishery Sector

Agriculture and fishery sector in Manabi Province correspond to 45% of the GDP, 47% of economically active population.

The province of Manabi has been characterized itself in the country for being main agriculture and fishery region, similar to the provinces of Los Trios and Guayas. Staple agricultural products are coffee, cocoa and corn.

The shrimp culture was introduced in Manabi from the late 1970's. At the end of 1986, about 214 shrimp farm owners operated total culture areas of 8,376 ha. of this total areas, located at coasts and bays with mangrove. The zone, Bahia - San Antonio has the largest shrimp farms and occupies 50% of total shrimp farm surface in the province of Manabi.

Regarding artisanal fishery, the number of fishermen is approximately 5,000 (25% of total fishermen) and catch is 17,000 tons (60% of total catch). So, Manabi Province play an important role in fishery in Ecuador as well as Guayas Province.

Mangroves and Swamps Occupied by Shrimp Farms in Manabi
(in hectares, 1986)

Location	Shrimp farms	Mangroves occupied	Swamps occupied
Bahia - San Antonio	4,188.4	2,298.6	584.0
Cojimies - Pedernales	2,955.7	2,083.0	3.7
Boca de Jama-La Quebrada	1,128.4	58.9	-
Las Gilces	103.1	1.8	71.0
TOTAL	8,376.0	4,442.3	658.7

Source: IGM/CLIRSEN.

2) Manufacturing Sector

The predominant industries are those of food processing and beverages, with 70% of the total industries, 88% of total employees and 95% of total production value. Also, this food industry has 95 employees per factory, which is the highest in reference to the total manufacturers with 70 employees per factory.

The small scale manufacture in Manabi in 1985 had 219 enterprises and 2,310 employees. The average number of employees per enterprise averaged to 11. The most important sub-sectors include agroindustry, food processing, graphic arts and metal-mechanics. These four sub-sectors covered 59% of total number of small scale manufactures and 64% total value of production.

3) Tourism

The tourism industry is new, but very important in Manabi, having 43 touristic beaches out of a total of 107, Manabi gets some domestic tourists from the highlands and foreign tourists from Colombia mainly. The development of tourism has concentrated along the Manta Coast and San Clemente and further than Bahia to San Vicente. In 1985, out of 95 existing hotels in Manabi, the 60% were located in the Manta and Bahia area. According to INEC's estimations, the value of tourism production in Manta was 800 million sucres, while the rest of the province produced 950 million sucres.

In the southwest of the province, the National Park of Machalilla was built. The coastal zone between Puerto Lopez and Machalilla is known by its beautiful landscapes of islands, bays and beaches.

(5) Infrastructure

1) Road

In the entire province, there are roads of total length 5,651 km of which only 857 km are asphalted. The average of asphalted roads is 15% that coincides with the average of asphalted roads in the Nation.

The asphalted roads in Portoviejo are in good condition, while, in turn, there are no asphalted roads in the northern developed zone and few asphalted roads in the southeast and south.

The main road that join together Quito with Guayaquil, crosses the east limit of the Province with branches, from Daule, Quevedo, Santo Domingo de Los Coloradoes, Manta and Chone come together to the principal cities of Manabi. The busiest roads correspond to Manta-Montecristi-Portoviejo, with a total of 4,000 vehicles per day; Guayaquil-Jipijapa-Puerto Cayo-Machalilla-Puerto Lopez-Santo domingo with a total of 1,400 vehicles per day.

2) Ports

There are three commercial airports in the Manabi Province: Manta, Portoviejo and San Vicente. In 1985, according to DAC, the number of total travelers in the Province amounted 143,000, which correspond to 11% of the total nation. During 1979-1983, the increase rate of the passengers was of 26% annually.

The Manta port is the only international port in Manabi Province. Staple cargo handling at Manta port are shown in the followings.

Export		
Frozen tuna	25,300	(tons)
Coffee	22,400	
Frozen shrimp	2,200	
Import		
Newspaper	15,000	
Steel pipe	6,600	
Wire	6,300	
Soybean oil	3,100	
Oils and fats	2,000	

The capacity of cargo handling at Manta port is estimated at 700,000 metric tons, annually; however, the volume of loads registered in 1987 was only 101,030 metric tons. After the peak volume registered in 1977, the cargoes movement has been decreasing and import cargoes, drastically decreasing. In relation to the number of passengers transported annually, Manta in 1987 has its important position, it has been placed the second among the seven important ports of the country, followed by Esmeraldas.
There are 70 landing places of fish catches along the 1,100 km coastline of Ecuador, of which 24 landing places are in the Manabi Province. These places are densely located at the southern part

of Manabi. Landings made by the artisanal fishery accounted for an estimated 17,000 tons in 1989. There are no fishing port facilities, and landings are conducted using beaches.

3) Utilities

According to the housing census in 1982 the percentage of houses with electric energy was 86% in the urban areas, and 19% in the rural areas. Generally, the Province of Manabi is well served referring to the electrical supply with exception of some southern cantones that have very poor service.
The above mentioned census also examined the availability of the sanitary infrastructures; water and sewers in the Province of Manabi. The amount of houses with water supply was 77% in the urban areas and 13% in the rural areas.

The situation relating to sewage is not good, same as the water supply. The amount of houses connected to the sewer system is 63% of the total houses in the canton capitals and 12% in the parish capitals. This amount is less in Jipijapa and Pajan.

2.3 Outline of the Fishery in Ecuador

2.3.1 Fishery Production

(1) Introduction
The fishing boats fisheries in Ecuador can be classified into the artisanal fishery and industrial fishery by the scale of fishing boats or by the category of fishing permit. It is essential, for the examination of the justification of the Small-scale Fishing Port Development Project, to study the nature and present situation of these fishing boats fisheries. In this section, the study results on the fishing boats and fishery production at provincial level are reported.

1) Artisanal fishery: There is no measurable or quantitative definition at present in Ecuador on the category of artisanal fishermen nor on artisanal fishing boats. "Ley de Pesca y Desarrollo Pesquero" (D.178, 1974) defines the artisanal fishery as follows;

Art. 22.- La pesca puede ser:
a) Artesanal, cuando la realizan pescadores independients u organizados en cooperativas o asociaciones, que hacen de la pesca su medio habitual de vida o la destinan a su consumo domestico; utilizando artes manuales menores y pequenas embarcaciones.

2) Industrial fishery: The above Fishery Law also defines the industrial fishery as follows;

Art. 22.- La pesca puede ser:
b) Industrial, cuando se efectua con embarcaciones provistas de artes mayores y persigue fines comerciales o de procesamiento.

3) Fishing vessels: Some terminology to classify artisanal fish ing vessels as well as ways of classification for them are seen in the recent research works on this sector in Ecuador. The ways of classification are usually based on construction design of vessels and sometimes on their size or hull materials. The way of classification is not commonly defined at present. One of the examples is summarized as follows;

a) Bongo: Small rowing or sailing canoe which has the bottom made of one single wood and the sides are constructed from wooden panels.

b) Panga: Skiff boat with or without outboard engine which is used as an auxiliary boat for the purse seine fishery, or open deck type wooden boat which is driven by outboard engine or by sails and engaged in fisheries of various fishing methods.

c) Lancha: Panga which is constructed from FRP. (glass fiber reinforced plastic)

d) Barco: Decked vessel usually equipped with inboard engine.

4) Fishing methods: Many type of fishing method are reportedly practiced in the artisanal fishery in Ecuador. Among these methods the principal ones include;

Palangre, espinel	-Long line
Linea de mano, cordel	-Hand line
Trasmallo, agallero, enmolle	-Gill net, trammel net
Red de cerco, chinchorro	-Purse seine
Red de arrastre	-Trawl net
Red(or chinchorro) de playa	-Beach seine

(2) Fishery Resources

1) Oceanographic Conditions

Oceanographic structure of the Ecuadorian waters is affected predominantly by the Humboldt current throughout a year. The Humboldt current flows north westward near the coast of Ecuador. In the winter of the southern hemisphere, surface temperature less than 20°C is occasionally observed off Punta Sta.Elena. The coastal waters in the northern area from Cape San Lorenzo are less affected by this cold current but still show annual fluctuation over 2°C.

The area of the continental shelf of Ecuador and trawlable areas are estimated as shown in the following table.

Table 2-3-1 Continental Shelf in Ecuador

Zone	Continental shelf	Trawlable area in 10 to 150m
1	3,342 sq.km	918 sq.km
2	14,262	6,686
3	(included in Zone 2)	3,225
4	10,109	5,291
5	1,411	1,101
Total	29,124	17,221

Source: Areas of continental shelf...FAO/BID,1986
Trawlable areas...INP, Boletin Cientifico y Tecnico (Vol.8,No.5,1985)
Zone : Zone 1...Northern waters west of 80°W
2...East of 80°W and north of 1°S
3...South of 1°S and north of 2°10'S
4...South of 2°10'S
5...Specified waters off the Province of El Oro

Trawl fishery: Long line and purse seine fishery gener ally more dominate than trawl fishery in the fishing boats fisheries in Ecuador.
Among the project sites in this study, northern four sites

(Jaramijó, Manta, San Mateo and Santa Marianita) face to Zone 2, and southern six sites (Ligüique, San Lorenzo, Santa Rosa, Puerto Cayo, Machalilla and Puerto López) face to Zone 3. With the above estimation, 60% of the whole continental shelf is considered to be trawlable.

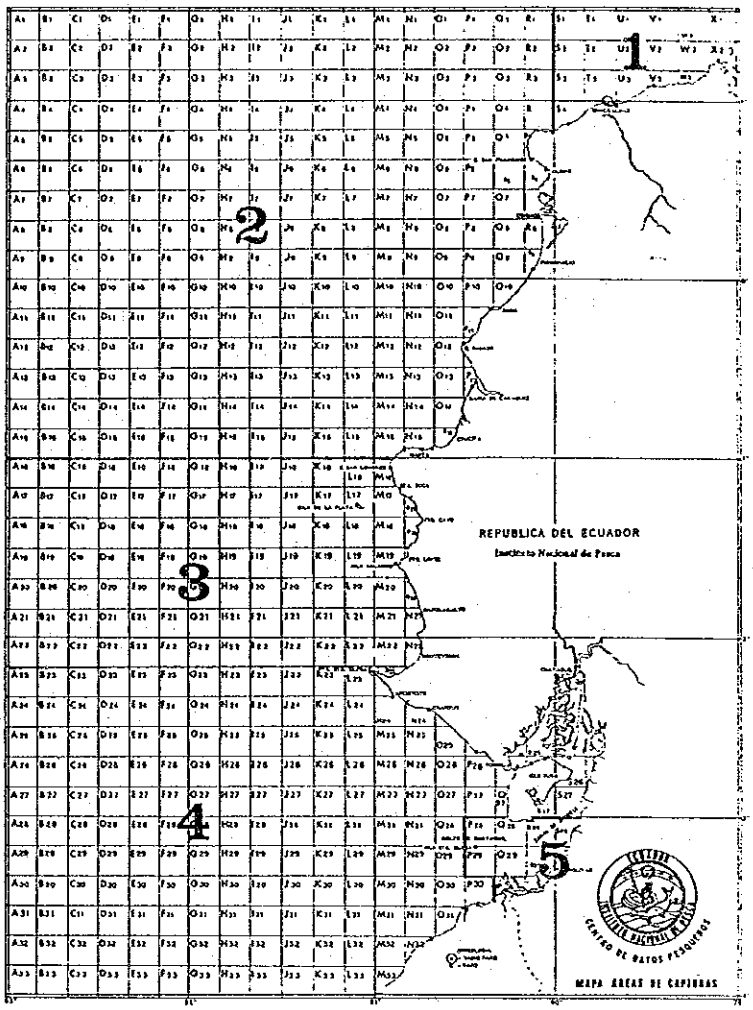

Fig 2-3-1 Locations of 'Zone"
(Source: INP)

2) Principal Species

According to a study carried out on the fish landing by the artisanal fishery in the mainland of Ecuador (Herdson, et al., INP, 1985), over 170 species of marine fish were observed during its field survey. It is also reported that there are more than 500 species of fish identified from the waters of Ecuador and that most of these are caught in the artisanal sector (ditto,

1985). By another study (J.Martinez, CEPLAES, 1987), principal species caught by the artisanal fishery are classified to demersal fish of the first and second grade, small pelagic fish, medium and large pelagic fish, crustacean, and mollusc as shown in the followings.

Table 2-3-2 Principal Species Caught in the Artisanal Sector

Family Name	Common Name
(1) Demersal fish (1st. grade)	
Cetropomidae	Robalo
Serranidae	Cherna, colorado, mero, cabrilla, perela, guato, murico
Lutijanidae	Pargos
Sciaenidae	Corvina, rayado
Bothidae	Lenguados
Branchiostegidae	Cabezudo
(2) Demersal fish (2nd. grade)	
Ariidae	Bagre
Scianidae	Corvinon, torno
Gerridae	Mojarra
Pomadasyidae (Haemulidae)	Roncador, teniente
Opbidiidae	Corvina aguada, culiflojo, corvina lenguado
(3) Small pelagic fish	
Clupeidae	Pinchagua, sardina
Engraulidae	Anchoveta, carduma, pelada
Mugilidae	Lisa
Scombridae	Macarela
(4) Medium and large pelagic fish	
Alopidae	Tiburon zorro
Lamnidae	Tiburon tinto
Carcharhinidae	Tollo, tintorera, cazon
Sphyrnidae	Tiburon martillo, cachuda
Carangidae	Juarel, pampano, carita, pampanillo, chicuaca
Coryphaenidae	Dorado
Sphyraenidae	Picuda, choca
Scombridae	Albacora, atun, sierra, bonito
Xiphiidae	Pez espada
Ishiophoridae	Gacho, picudo, merlin
(5) Crustacean	
Penaeus vennamei	Camaron blanco
P. stylirostris	ditto
P. occidentalis	ditto

(continued)

Table 2-3-2 Principal Species Caught in the Artisanal Sector (continued)

Family Name	Common Name
P. brevirostris	Camaron rojo
Trachypenaeus sp.	Camaron cebra
Xiphopenaeus riveti	Camaron pomoda
Solenocera sp.	Camaron carapachudo
Panulirus sp.	Langosta
Ucides occidentalis	Cangrejo rojo, cangrejo de manglar
(6) Mollusc (part)	
Anadara tuberculosa	Concha prieta, concha negra
A. grandis	Pata de burro
Mytella guyanensis	Mejillon
Chione subrugosa	Almeja, concha rayada

Source: J.Martinez, R.Montano, 1987

3) Resources of Demersal Fish

Two resources studies have been conducted during the last two d ecades to evaluate the demersal fish stock in the Ecuadorian waters. In 1964 to 1968 an experimental trawling survey was carried out by a German aid agency. During the period of October 1980 to July 1985, the Instituto Nacional de Pesca (INP) carried out a survey of demersal fish resources of the continental shelf with technical cooperation from the British Overseas Development Administration (ODA). In the latter survey by INP, 366 trawl operation were made in the seven cruises by R/V Tohalli and the demersal fish resources were estimated by means of the swept area methods (Herdson,et al.,INP,1985).

According to the results of the above study by INP, the demersal fish stock and potential yield in the trawlable areas of the continental shelf in depth of 10m to 150m are evaluated as shown in the following tables.

Table 2-3-3 Estimated Mean Stock Size of Demersal Fish in the Trawlable Areas of the Continental Shelf.

	Area 1	Area 2	Area 3	Area 4	Area 5
Mean Density (ton/sq.km)	1.9	1.1	2.6	9.6	3.1

Source: Herdson,et al., Boletin Cientifico y Tecnico, INP, 1985, "The Demersal Fish Resources of the Continental Shelf of Ecuador. Part One."
Note : The geographical locations of Area 1 to 5 correspond to those of Zone 1 to 5 in Table 2-3-1.

Table 2-3-4 Sustainable Potential Yield of Demersal Fish in the Trawlable Areas (unit:ton/sq.km)

	Area 1	Area 2	Area 3	Area 4	Area 5
Sustainable Potential Yield	0.35	0.20	0.46	0.65	0.44

Source:Herdson,et al., Boletin Cientifico y Tecnico, INP, 1985, "The Demersal Fish Resources of the Continental Shelf of Ecuador. Part Two."

Note :In the estimation of the sustainable potential yield, gurnard (Prionotus stephanophrys) is excluded. In the above report, the maximum realizable yield is also estimated. The maximum realizable yield, which counts the optimum fishing rates, is evaluated a little more than the sustainable potential yield in most of the area.

In the study by INP, the comparison with the actual landing records of "white fish" (Herdson,et al.,1985) was made. As conclusions, the study reports by INP say, although "it should be taken into account that these estimates are minimum levels and include only the trawlable areas", "the majority of these resources are at present being fished at around their optimum levels and any further developments that would increase the fishing effort on demersal resources which are at present being exploited should be approached with caution".

These comments on the demersal fish resources should be noted on the formulation of the master plan.

4) Resources of Pelagic Fish

Some research works have been made on the pelagic fish in the Ecuadorian waters. Among these the studies were made on the pelagic fishery in the northern waters in relation to "El Niño" phenomenon (C. Martinez, 1987, A. Menz,et al. 1988). In the study by A. Menz, the natural mortality and catch rate of the pacific mackerel have been estimated and the recent fishing tendency has been evaluated in relation to El Niño phenomenon. An examination of catch and effort data on the coastal purse seiners has been recently made (Patterson & Castello, 1990). This study, based on the fishery companies production reports on fish meal and can, has evaluated the production volumes of the small pelagic fish, and examined fishing effort from the log books of purse seiners, and then evaluated catch per unit effort on the principal small pelagic fish.

Another research work (Herdson,et al., 1985) says "The dolphinfish are plentiful, migratory and have a very fast growth rate (Palko, et al., 1982). Therefore prospects for the fishery based

on this species are good, if a suitable market exists for the each", and also indicates "However it should be noted that the present level of fishing for large pelagic species is probably too high to be sustainable by the pelagic shark stocks and there will probably be overfishing of the sharks as a by-catch".

(3) Fishing Vessel

1) Registration System

Fishery inspectors' offices (Inspectorias de pesca) report on the fishing vessels registered under the fishing permit regulation to Direccion General de Pesca (DGP). The fishery inspectors are assigned to twelve major fishery ports at present which include Esmeraldas, Limones, Bahia de Caraques, Manta, Puerto López, Salinas, Playas, Posorja, Puerto Bolivar, Chanduy, Emgabao and Galapagos. In the project area, two fishery inspectors are assigned in Manta and an inspector in Puerto López. They are responsible to report to DGP on catch data in the following 12 landing spots (beach).

Inspectors in Manta: Jaramijó, Manta, San Mateo,Sta.Marianita
Ligüique, Las Pinas, Sta. Rosa
(7 spots)

Inspector in Pto.Lopez: San Lorenzo, Puerto Cayo, Machalilla,
Puerto López, Salango
(5 spots)

Fishing vessels except nonmotorized "bongo" class are required to obtain an artisanal or industrial fishing permit which is valid for a year. The files for past five years of these fishing permits are kept in Unidad de Estudios Pesqueros y Estadisticas (UNEPE) of DGP, and give information on principal particulars of the registered fishing vessels. UNEPE prepares the fishing vessel statistics that are classified by the artisanal and industrial sector and by principal species of catch.

The present form for fishing permit identifies the names of owners and operators of the vessels, but does not their address nor regular landing spot. Due to this lack of information, it is difficult at present to locate registered vessels with the fishing permit records. It is only possible to know the districts of fishery inspectors' offices where the vessels are registered.

2) Artisanal Fishing Vessels

a) Registered Numbers in the Fishing Permit

According to the statistics by UNEPE, numbers of the registered artisanal fishing vessels and their target species from 1980 to 1989 are shown as follows;

Table 2-3-5 Registered Numbers of the Artisanal Vessels and Their Target Species

	1980	'81	'82	'83	'84	'85	'86	'87	'88	'89
1 Camaron	268	128	90	217	184	102	124	100	208	257
2 Pesca blanca	289	558	681	1022	865	1164	920	1149	1204	1083
3 Langosta	76	39	74	37	34	34	31	39	38	19
4 (2,3 combi.)	0	0	0	0	0	0	246	339	287	317
5 Others	0	0	0	0	30	52	107	186	28	24
Total	633	725	845	1276	1113	1352	1428	1813	1765	1700

Source: UNEPE, based on fishing permits by DGP and fishery inspectors' offices

The registered numbers of the artisanal fishing vessels in 1990 by the inspectors' offices are as follows;

Table 2-3-6 Registered Numbers of the Artisana Vessels in 1990 by Inspectorias

Inspectors' Offices	No. of Vessel
Esmeraldas Province	(104)
Esmeraldas	104
Limones	n.a
Manabi	(743)
Bahia de Caraques	n.a
Manta	743
Guayas	(335)
Salinas	126
Playas	39
Posorja	58
Chanduy	28
Emgabao	n.a
(Babahoyo)	84
El Oro	(32)
Pto. Bolivar	32
Galapagos	(19)
Galapagos	19
Total	1233

Source: Fishing permits by DGP and inpectorias(1990)
Note: By an UNEPE official, in case of 1990, the records on the vessels of Puerto López are included in a file of "Manta" district. A figure of 743 registered vessels therefore represents these two districts or 12 landing spots.

According to the above table, number of fishing vessels that have obtained fishing permit in 1990 at the inspectorias in Manta and Puerto López is around 60% of the national total. However, this ratio should be considered not to show the

present national distribution of the artisanal fishing vessels because of the underestimation of the national total, which is discussed in the next section.

b) Study by INP on the Artisanal Fishing Vessels

According to a recent study (INP:Fallows & Contreras, 1990) on the artisanal fishery sector in Ecuador, the numbers of the artisanal fishing vessels in the coastal provinces are as shown in the following table.

Table 2-3-7 Number of Artisanal Fishing Vessels by Fallows & Contreras (1990)

Province	Fishing Vessels	
	FRP boats	Wooden boats
Esmeraldas	423	1515
Manabi(North)	82	449
Manabi(South)	669	270
Guayas	301	2093
El Oro	78	980
Galapagos	n.a	n.a
National Total	1553	5307

Source: Work papers, INP, 1991

As shown in the above, a remarkable difference in the numbers of fishing vessels exists between the fishing permit record and the study by Fallows, et al. Many government officials support the results of this study on vessel's number as more reliable than ones obtained from the records of fishing permits. If based on the study results by Fallows (1990), on a national average, only 20% of the artisanal fishing vessels are considered to obtain fishing permit. In the project area, however, the registered vessels represent around 80% of the actual total numbers as shown in the above two tables.

3) Industrial Fishing Vessels

By the present statistics on the industrial fishing boats by UNEPE, the provincial breakdowns are not available. Table 9 and 13 in the statistics book (UNEPE:1988,etc.) gives the total numbers of the industrial fishing vessels (508 vessels in 1989) and the provincial breakdowns of the personal fishing permits for the industrial sector. Dividing the former in proportion to the yearly average of the latter, the provincial breakdowns of the industrial fishing vessels are estimated. The results are shown in the next table. Unless the number of crew per boat is largely different among the provinces, these estimated vessel numbers are considered to give an approximation of the actual numbers.

Table 2-3-8 Estimated Numbers of Industrial Fishing Vessels

Province	Numbers of Vessels
Esmeraldas	78
Manabi	196
Guayas	226
El Oro	6
Galapagos	2
National Total	508

Source: UNEPE, the statistics book, Table 9

(4) Fish Landing

1) Fish Landing by the Artisanal Fishery

a) Landing Statistics

Fishery inspectors' offices report on the landing volumes to DGP, and UNEPE processes and records these primary data. From these catch data, UNEPE prepares the statistics on the landing volumes in the artisanal fishery sector by species and by the above twelve districts where the fishery inspectors are assigned. Among those based on the reports by the fishery inspectors, presently there is no available landing statistics that are compiled and classified by landing spots including major fishery ports.

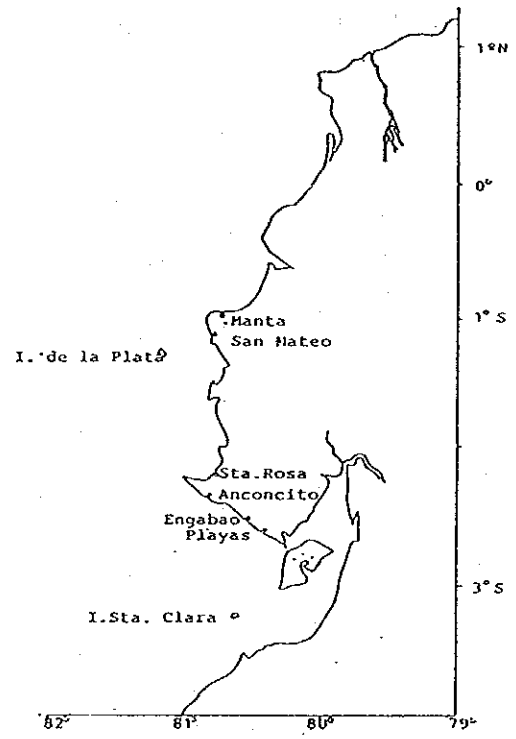

Fig. 2-3-2 Survey Spots by INP on Artisanal Fishery Landing

In one of the monthly reports that are prepared for DGP by Department of Fishery Resources of INP, landing volumes in the artisanal fishery sector are estimated for selected seven ports; Esmeraldas (Esmeraldas Province), Manta, San Mateo (Manabi Province), Sta.Rosa, Anconcito, Engabao, and Playas (Guayas Province). This INP statistics are based on the landing data collected by INP staffs every two weeks and are classified by species and by the ports.

b) Landing Statistics by UNEPE

According to the UNEPE statistics based on the fishery inspectors reports, the annual landing volumes during the period of 1985 to 1989 by the artisanal fishery sector in Ecuador are summarized in the following table.

Table 2-3-9 Landing Volumes in the Artisanal Sector Reported by Fishery Inspectors (Unit:metric tons)

Province	1985	1986	1987	1988	1989
Esmeraldas	5768	5129	4130	5811	6646
Manabi:North	2959	3845	3349	3817	2843
:South	7721	5419	5192	3671	4191
Guayas	12986	11719	11204	8386	7016
El Oro	2335	1333	6462	1118	1300
Galapagos	1500	127	101	19	118
Nation	33269	27572	30438	22822	22114

Source: UNEPE, inpectorias de pesca

c) INP Study

The survey by INP on the artisanal fishery landing started practicably in 1989, and INP information on this field up to the end of 1990 is available at this stage of the study. Based on the INP landing statistics, landing volumes at Manta and Puerto López in 1989 and 1990 are estimated as shown in Table2-3-10(1).

From the following two tables (1) and (2), the annual total landing volume in 1990 at the principal six ports, excluding Esmeraldas, is estimated as around 23,400 metric tons. In 1989 the total landing at these six port was likewise estimated as around 22,800 tons. Meanwhile, by the UNEPE statistics, the national total of the landing by the artisanal sector in 1989 is 22,114 tons. Considering the landings at the districts that have not been covered by the INP study, it should be noted that there exists a remarkable difference between these two statistics.

Table 2-3-10(1) Landing Volumes in the Artisanal Sector (INP) (Unit:metric tons)

Province	Total Survey Months	Landing Vol.
	months	MT/boat/year
Esmeraldas Prov.		
Esmeraldas	2	18.5
Manabi		
Manta	12	24.0
San Mateo	12	24.0
Guayas		
Sta. Rosa	12	19.1
Anchoncito	11	21.9
Engabao	9	7.3
Playas	11	15.7

Source : INP (DRP-30/90,etc.)

Table 2-3-10(2) Number of Fishing Vessels by Fallows,et al (1990)

Province	FRP	Wooden	Wooden/FRP
	No.	No.	Ratio
Esmeraldas Prov.			
Esmeraldas	200	100	0.50
Manabi			
Manta	317	24	0.08
San Mateo	178	5	0.03
Guayas			
Sta. Rosa	72	40	0.56
Anchoncito	214	78	0.36
Engabao	0	180	>> 1
Playas	0	100	>> 1

Source : INP (DRP-30/90,etc.)

From the above two tables (1) and (2), the annual total landing volume in 1990 at the principal six ports, excluding Esmeraldas, is estimated as around 23400 metric tons. In 1989 the total landing at these six port was likewise estimated as around 22800 tons. Meanwhile, by the UNEPE statistics, the national total of the landing by the artisanal sector in 1989 is 22114 tons. Considering the landings at the districts that have not been covered by the INP study, it should be noted that there exists a remarkable difference between these two statistics.

The UNEPE landing statistics give, for an example at Manabi Province, approximately 4 metric tons as an average annual catch volume per vessel in 1989, which is considered too small when comparing with the results of the interview by the study team at project sites. Meanwhile, the landing statis-

tics by INP, although the data cover for only last two years and are not still enough for the analysis on secular change, give for the example at Manta around 24 metric tons as an average annual catch per vessel in 1990, which seems to explain more appropriately the actual production level.

From the above consideration, this study refers to the INP statistics when considering landing volumes of the artisanal fishery sector in the project area.

d) Landing Volumes Estimated from Fishing Vessel Numbers

Based on the studies by Fallows, et al.(1990) and by INP, the national total of the fishery production by the artisanal fishery was estimated. The landing statistics by INP represent the fishery production at the seven ports. Landing volumes in the other many districts not covered by the INP study are therefore required to estimate. In order to give an approximate value for the national total, the following measure was applied.

As shown in the previous two tables 2-3-10(1) and (2), the INP study on the fish landings indicates that the annual catch per vessel has variation among the survey spots. It is also shown that catch per vessel has a possible tendency to vary by the ratio of the numbers of wooden boats to FRP boats. If this regional difference of the productivity can be simply explained only by the difference of seaworthiness between wooden and FRP boats, the ratio of such type of fishing boats may give a basis to estimate the fishery production level at the unsurveied districts. By this assumption, annual catch per vessel at a province or district was estimated and then its landing volume was evaluated. The results are summarized in the following table. In this estimation, in case that the ratio of the numbers of wooden boats to FRP boats is much more than 1.0, the ratio was defined as 1.0 and, as a corresponding catch per vessel, 11 tons/year was adopted, which is a average catch of Engabao and Playas as shown in table 2-3-10.

Table 2-3-11 Estimated Landing Volumes in the Artisanal Sector (INP, unit:metric tons)

Province	Catch per vessel	Landing Vol.
	MT/boat/year	MT/year
Esmeraldas Prov.	12	23,000
Manabi: North	11	6,000
: South	18	17,000
Guayas	13	31,000
El Oro	11	11,000
Guayas	11	(200)
National Total		88,000

If the above assumption is applicable to the actual situation, it can be estimated that the total landing volume by the artisanal fishery in Ecuador is on the level of around 80,000 MT/year to 90,000 MT/year, and that a quarter of which is landed in Province of Manabi.

e) Principal Species

By the results of the landing survey by INP, the catch composition in 1990 by the artisanal fishery at the six ports of many surveying frequency is summarized as the following table.

Table 2-3-12 Principal Fish Species in the Artisanal Fishery (1990) unit: Kg/boat

Species	Manta	San Mateo	Sta.Rosa	Anconcito	Engabao	Playas
Small pelagic:						
CLUPEIDAE	87	0	10	0	38	0
LUTJANIDAE	74	0	127	14	0	45
Large pelagic:						
ALOPIIDAE	374	330	1,220	250	0	0
CARANGIDAE	12	0	546	26	8	3
CARCHARHINIDAE	24	23	1,109	220	2	0
CORYPHAENIDAE	7,514	7,749	3,417	14,374	0	0
ISTIOPHORIDAE	8,098	5,717	1,246	1,291	0	0
LAMNIDAE	160	293	575	371	0	0
SCOMBRIDAE	5,818	6,785	5,617	962	10	3
SPHYRNIDAE	29	35	362	277	0	3
TRIAKIDAE	261	96	91	135	0	3
Demersal:						
BRANCHIOSTEGIDAE	12	1	65	448	0	0
BROTULIDAE	397	0	358	28	0	0
SCIAENIDAE	0	0	68	21	2,922	10,517
SERRANIDAE	28	4	482	614	0	0
Mollusc and Others:						
Mullusc	568	90	1,593	64	2	0
Others	293	835	2,197	2,762	4,281	5,114
Total:	24,009	21,958	19,083	21,859	7,263	15,689

Source : INP, DRP-30/90 etc.

Remarks: Data at the districts of 11 or less surveying months are extrapolated to 12 months.

At Manta and San Mateo, a 90% of the catch belongs to CORYPHAENIDAE (principally dorado), ISTIOPHORIDAE (picudo species) and SCOMBRIDAE (atun, albacora, bonito, etc.). At Sta.Rosa the ratio of these species is around 50%. At Anconcito, More than 60% is occupied only by CORYPHAENIDAE. As shown in these ratios, large pelagic fish is principal species at these four districts. In contrast with this, at Playas and Engabao, the principal species is SCIAENIDAE (corvina, etc.).