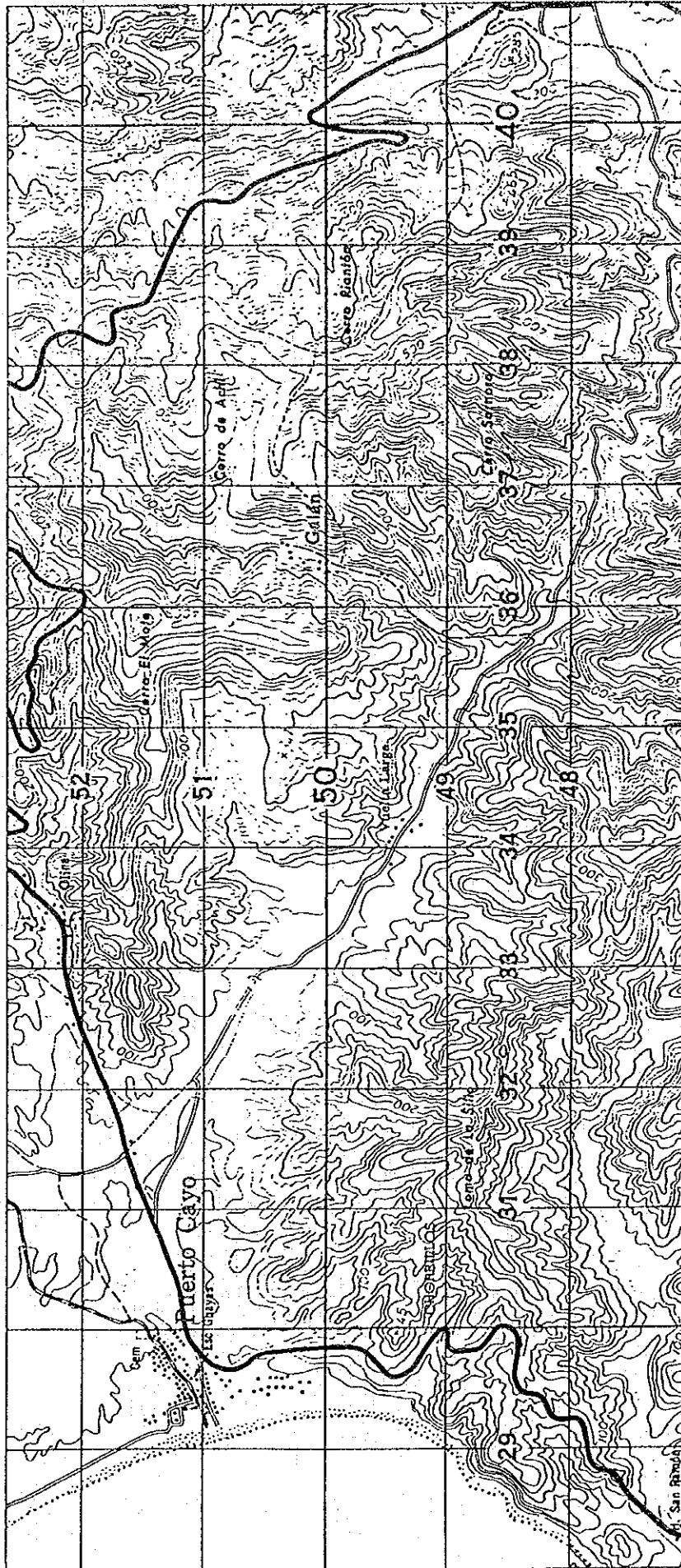
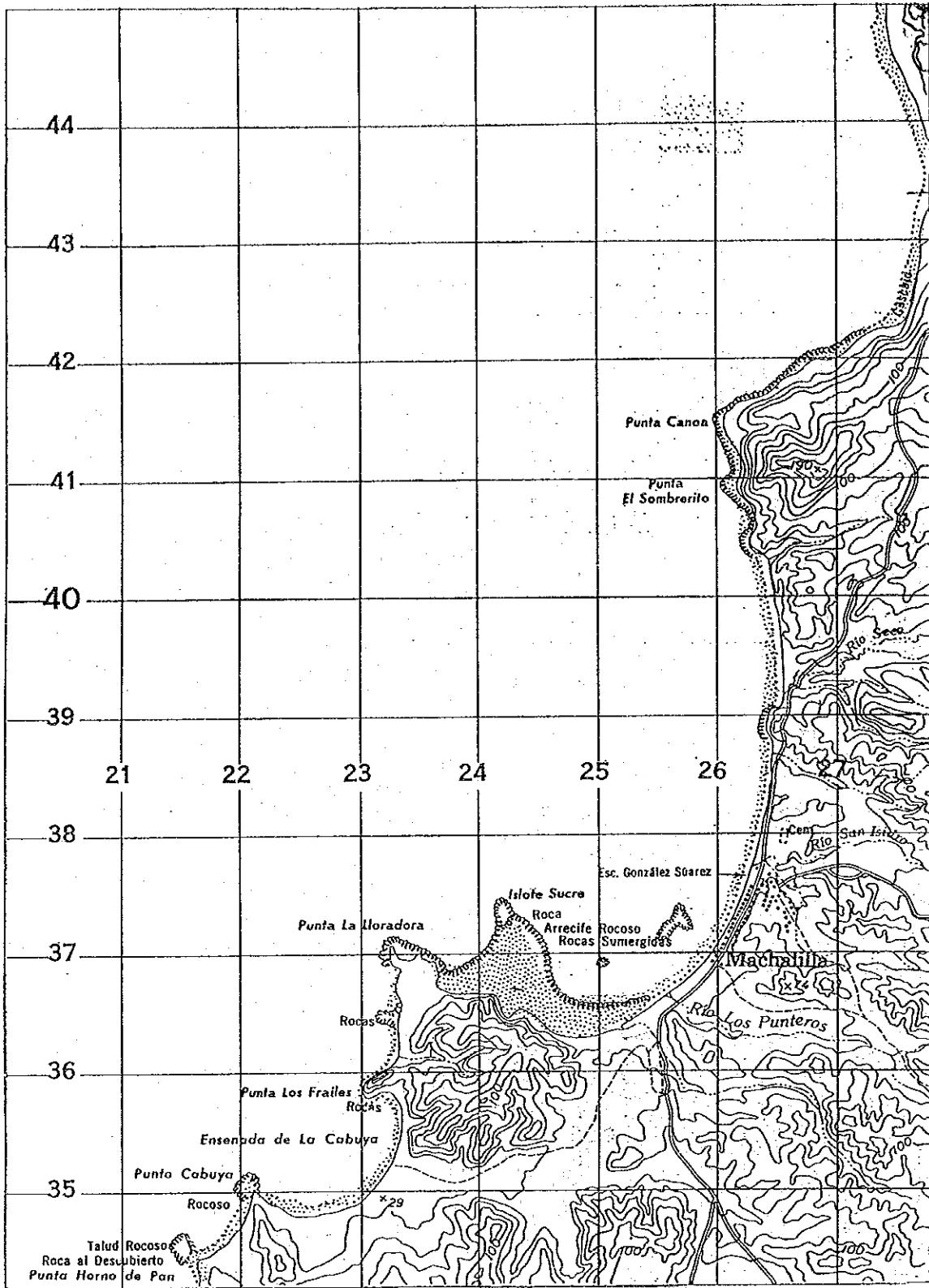


Fig.2-5-2(3) Topography Map of Study Area
(Liguique, San Lorenzo, Santa Rosa)



Escala 1:50,000
 1000 500 0 1000 2000 3000 4000 Metros
 1 1/2 2 3 Millas Terrestres

Fig. 2-5-2(4) Topography Map of Study Area (Pto. Cayo)



Escala 1:50,000
 1000 500 0 1000 2000 3000 4000 Metros
 1 1/2 0 1 2 3 Millas Terrestres

Fig.2-5-2(5) Topography Map of Study Area (Machalilla)

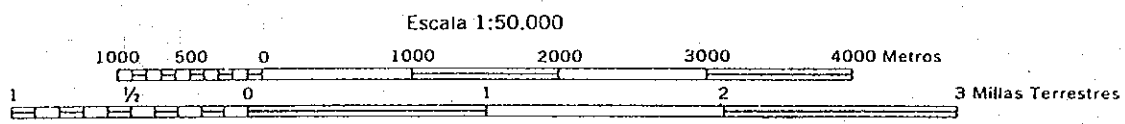
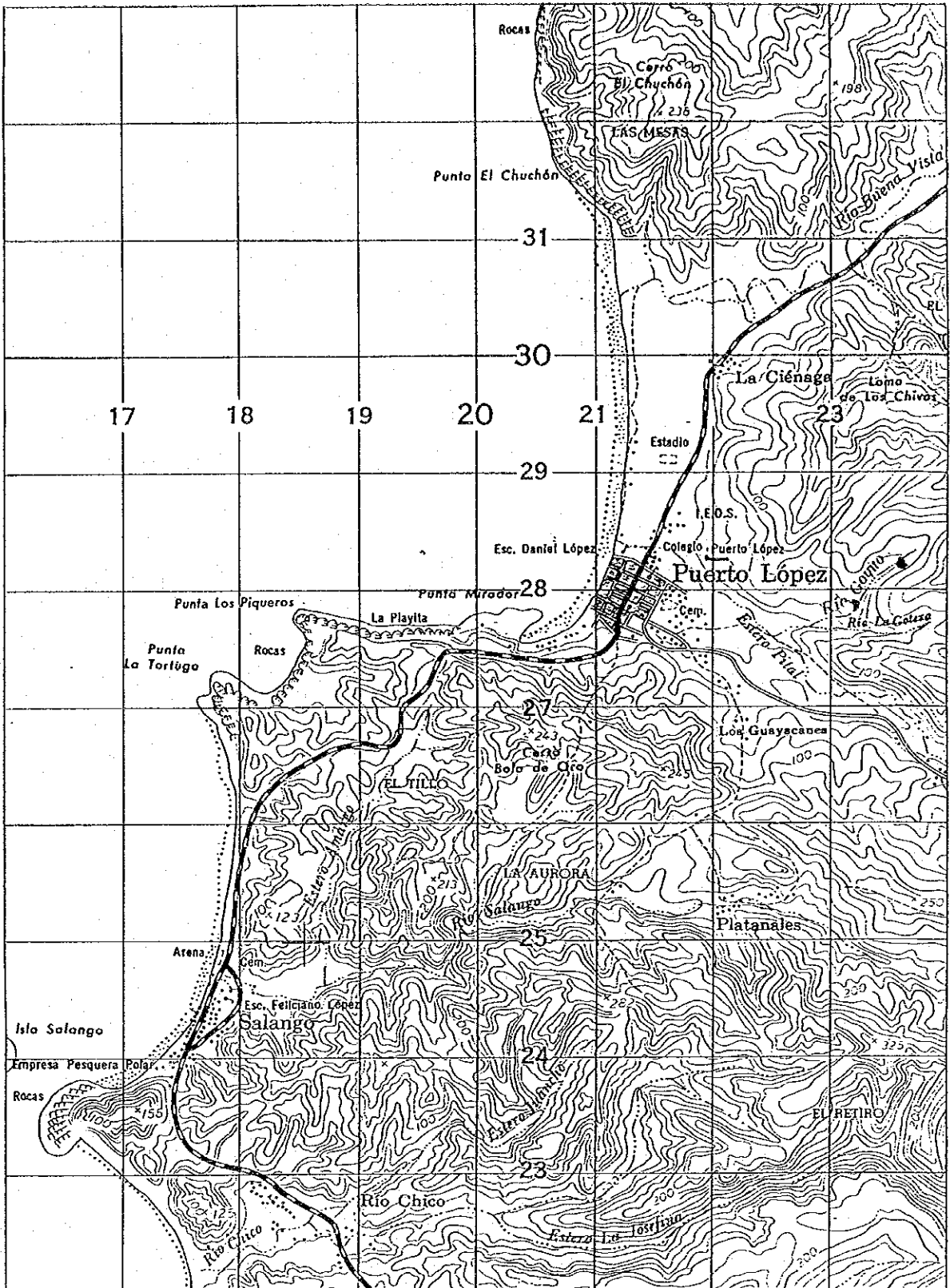


Fig.2-5-2(6) Topography Map of Study Area (Pto.Lopez)

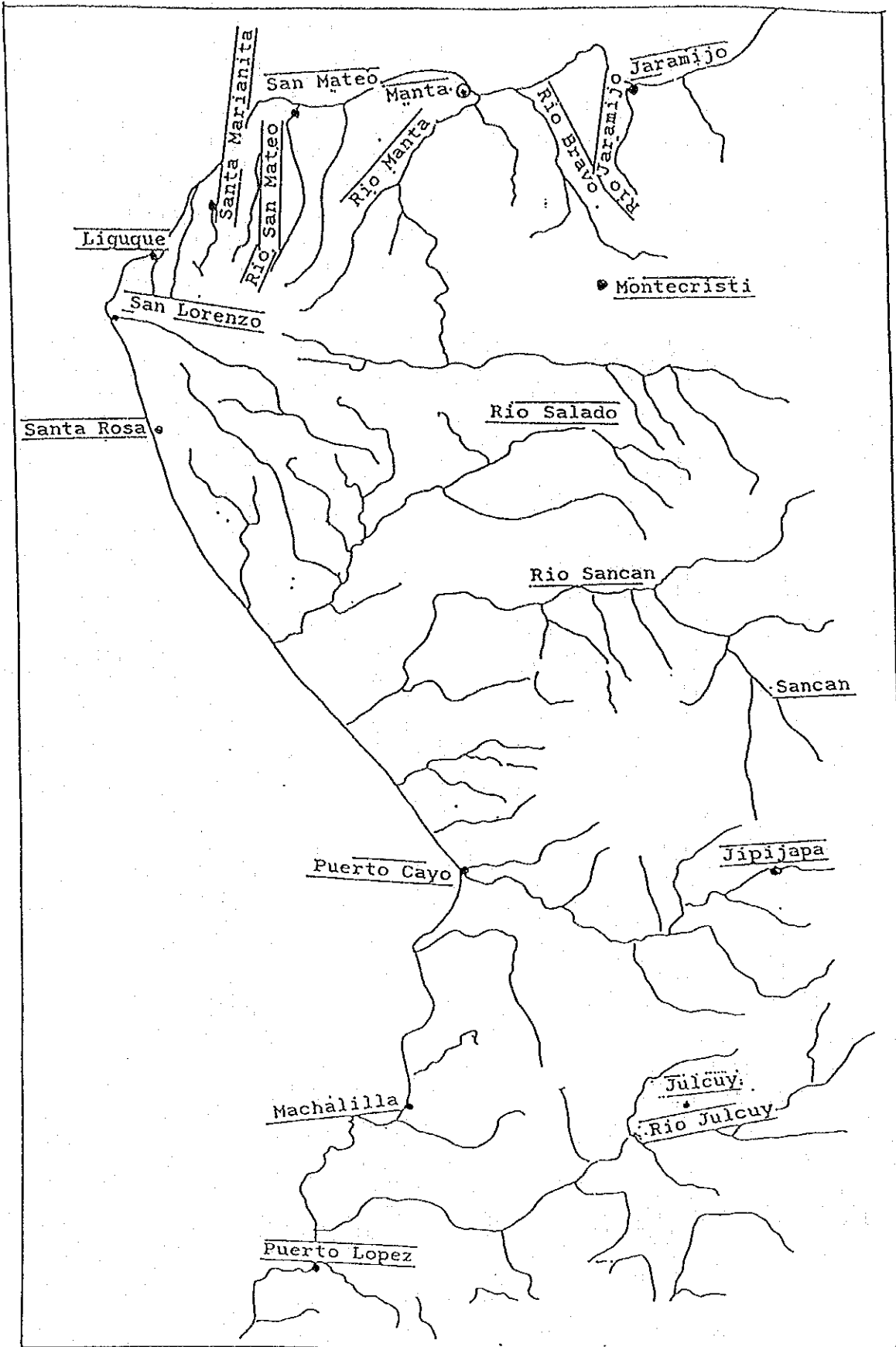


Fig 2-5-3 Rivers at Study Area

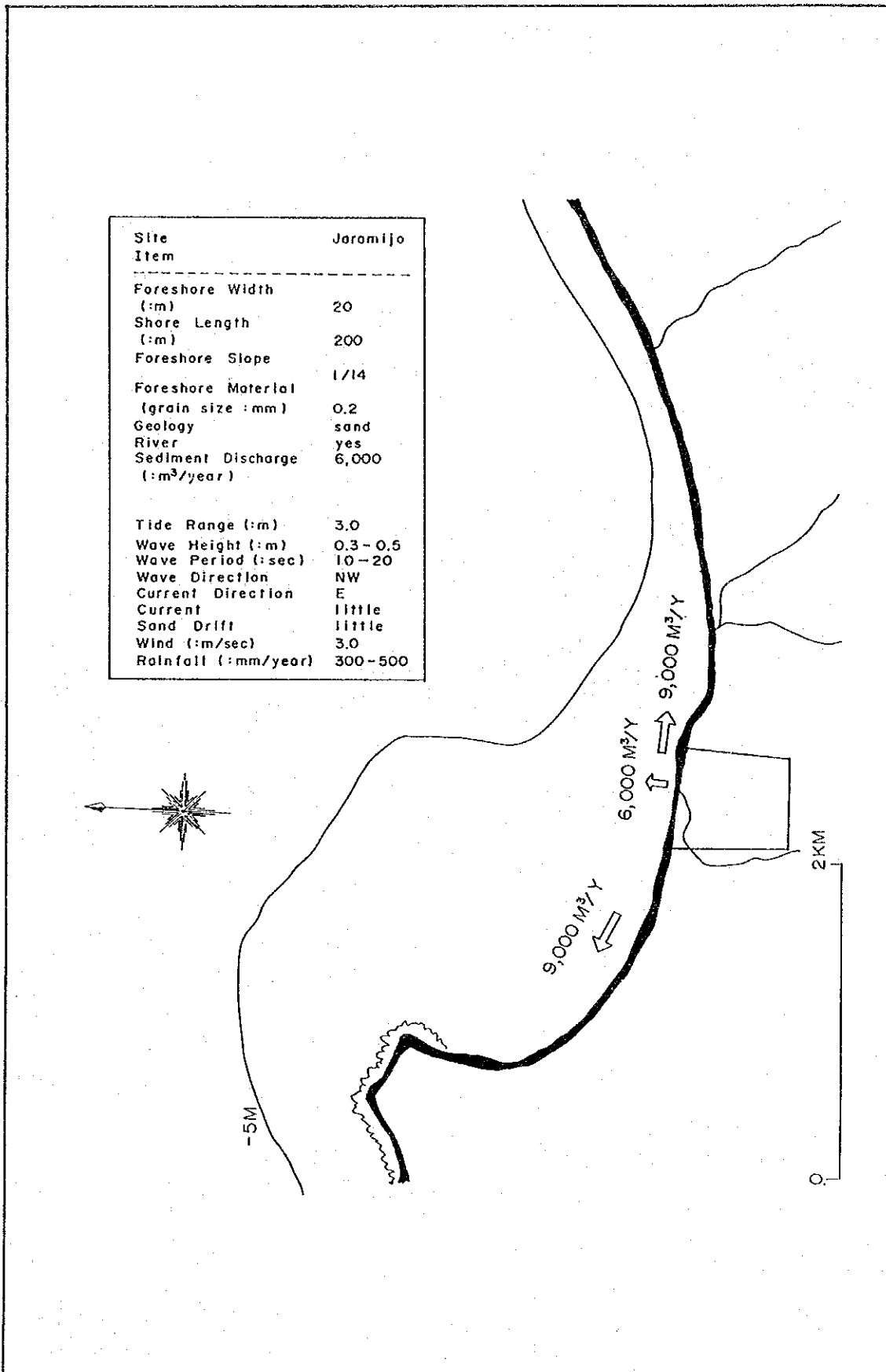


Fig.2-5-4(1) River Discharge and Littoral Drift at Jaramiyo

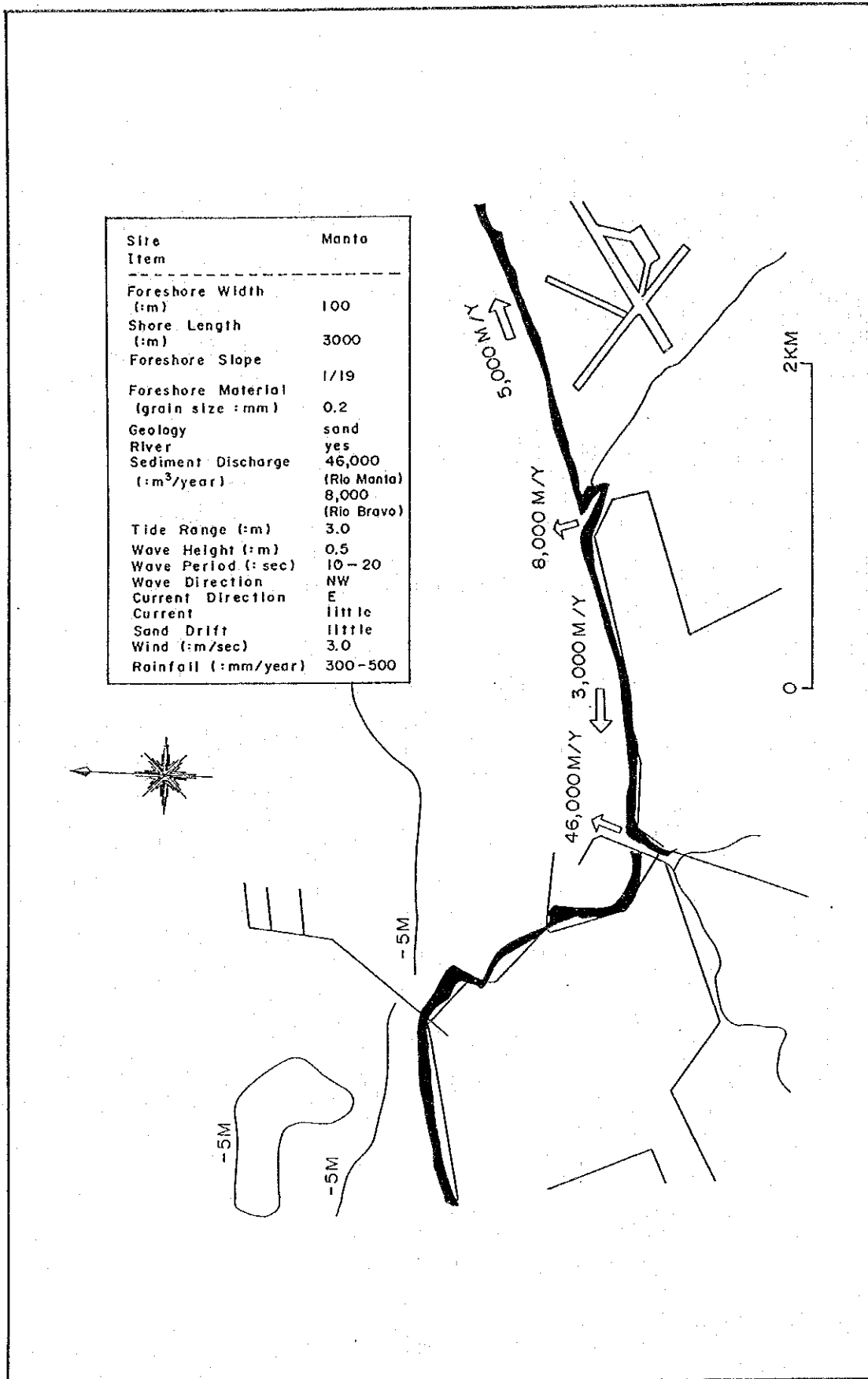


Fig.2-5-4(2) River Discharge and Littoral Drift at Manta

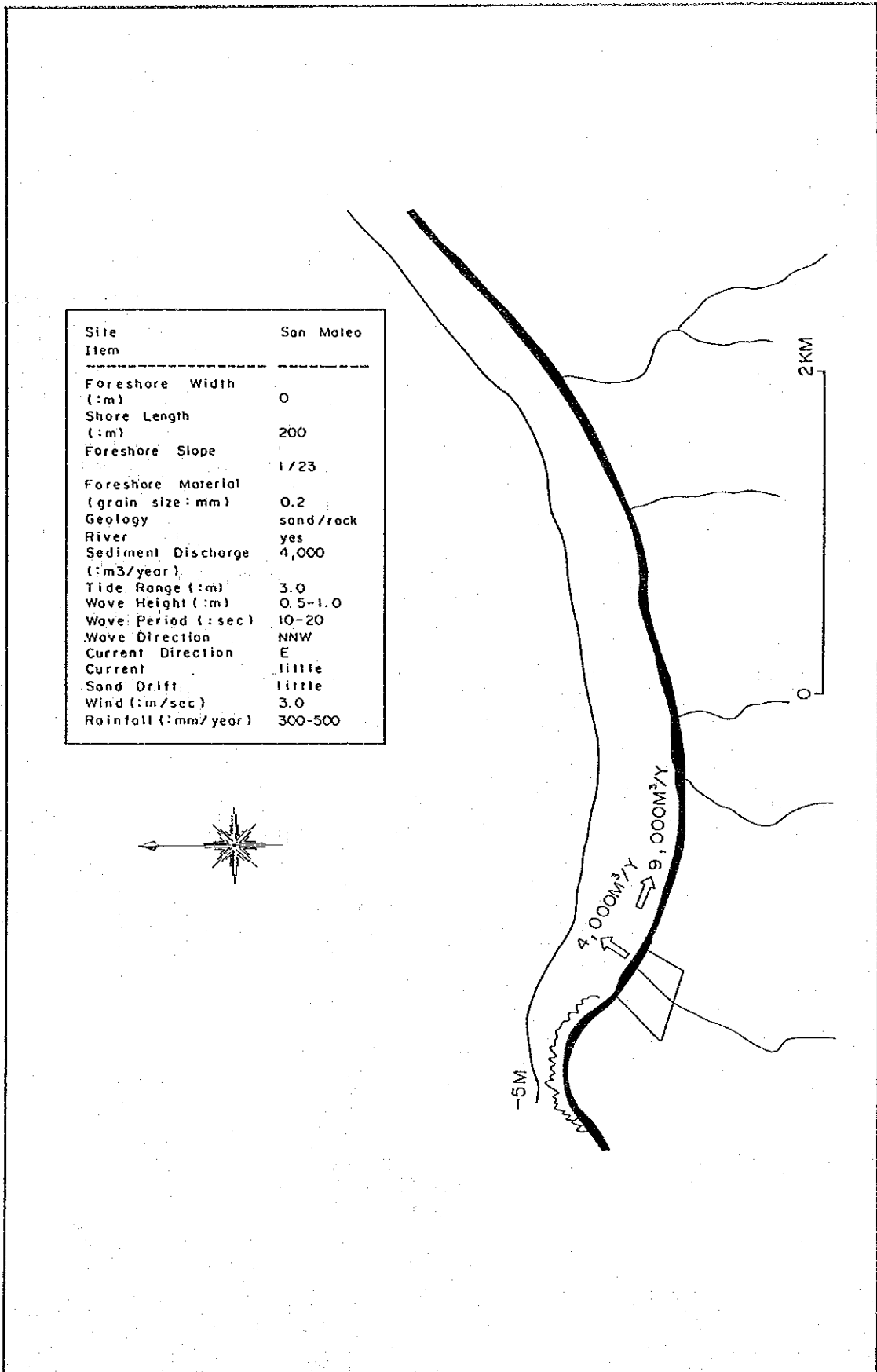


Fig.2-5-4(3) River Discharge and Littoral Drift at San Mateo

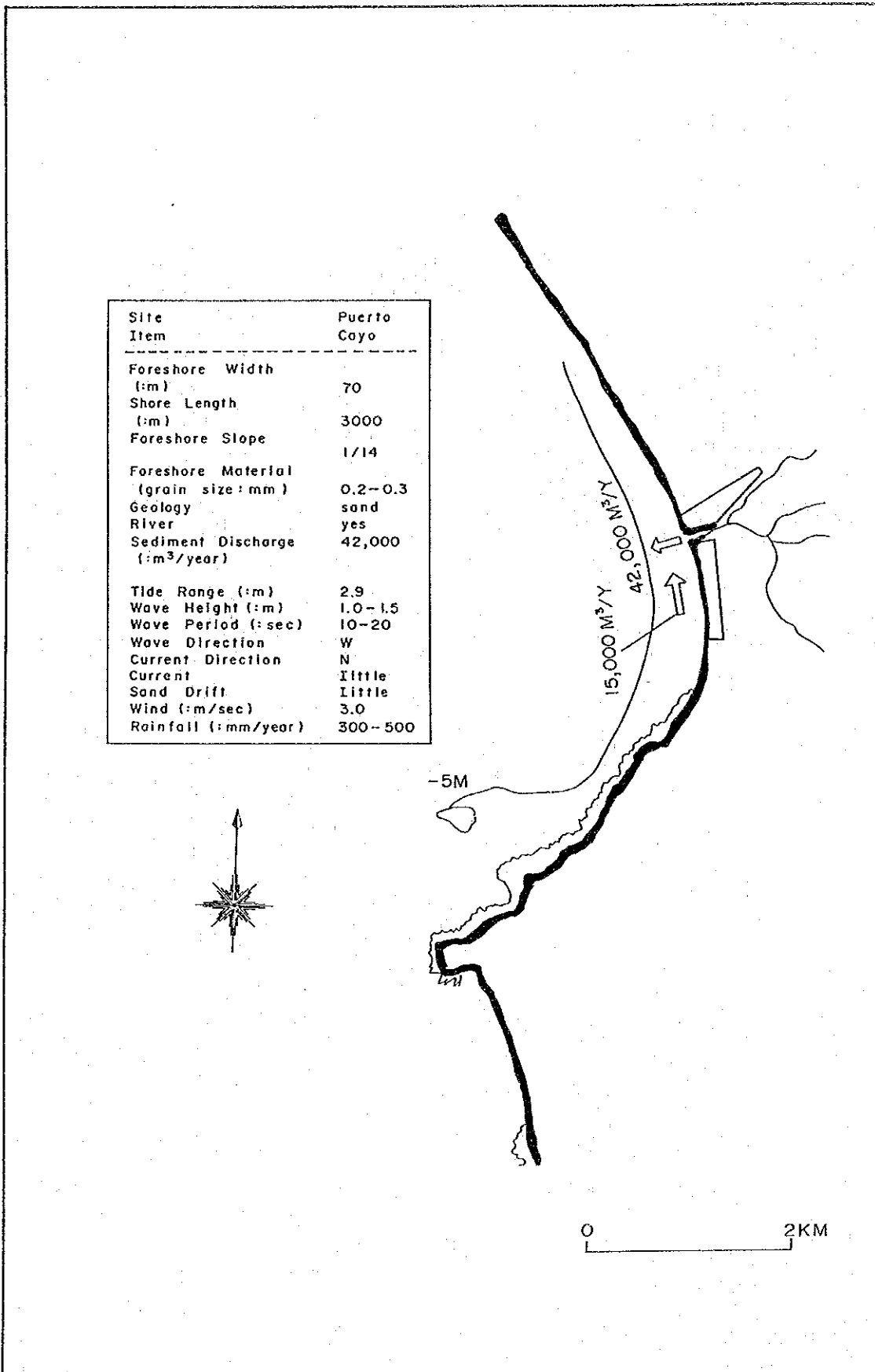


Fig.2-5-4(4) River Discharge and Littoral Drift at Pto.Coyo

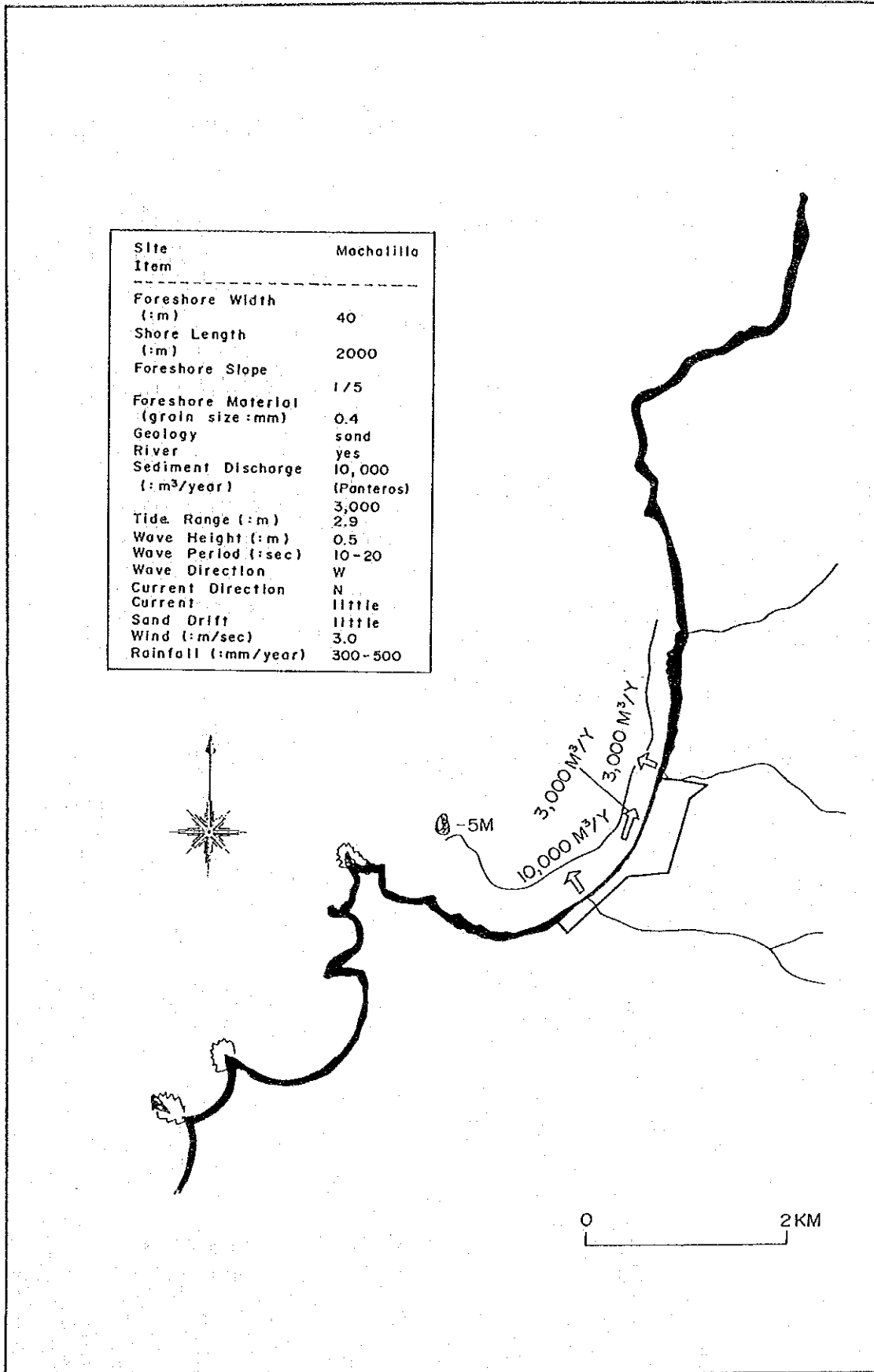


Fig.2-5-4(5) River Discharge and Littoral Drift at Machalilla

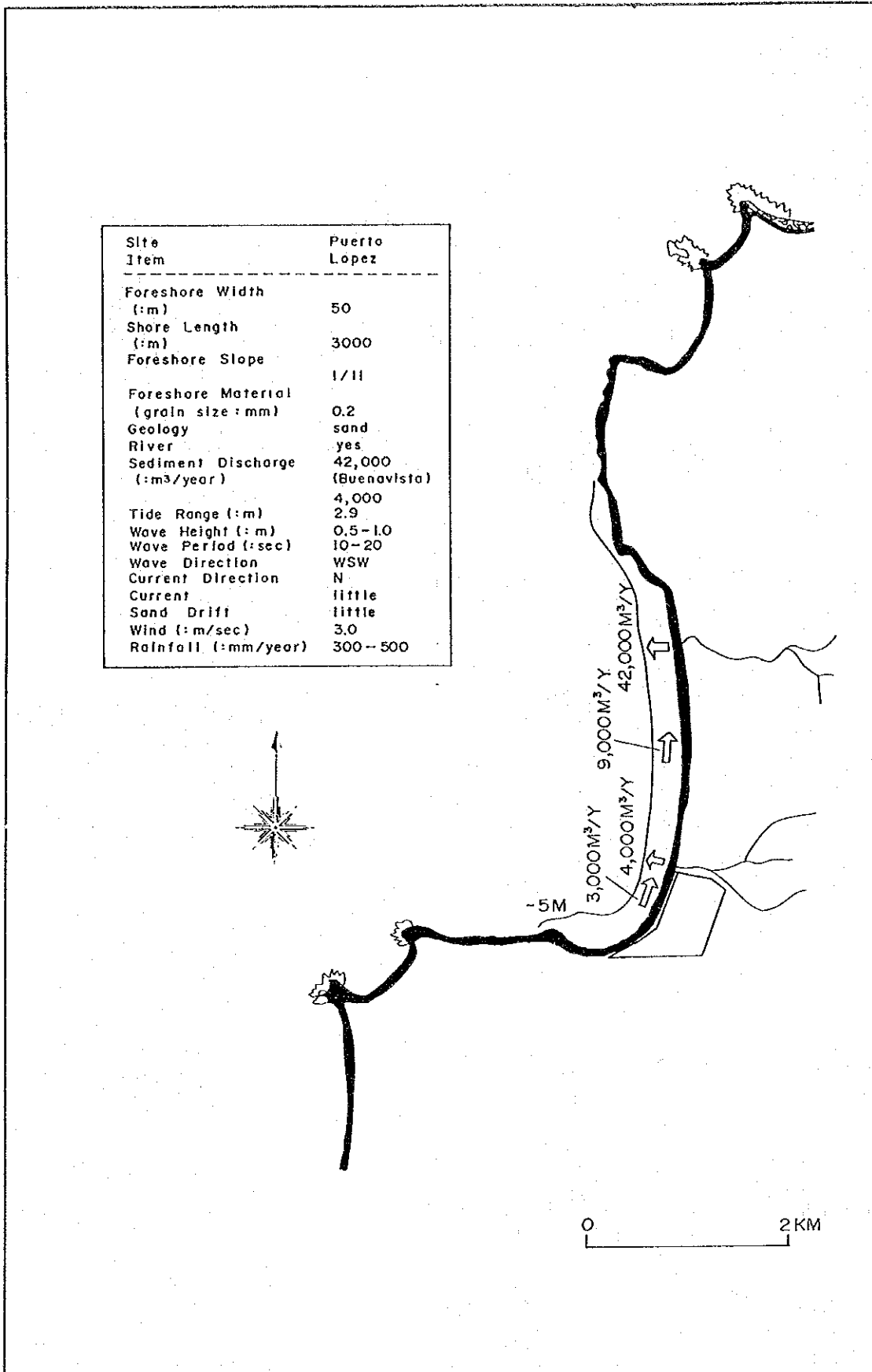


Fig.2-5-4(6) River Discharge and Littoral Drift at Pto.Lopez

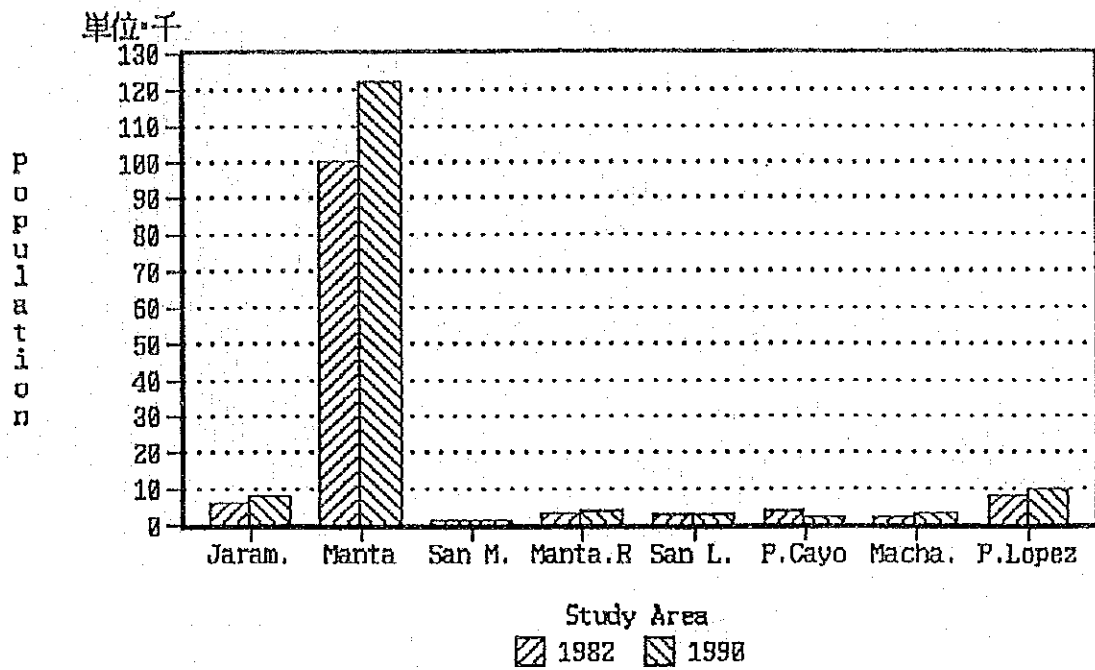


Fig. 2-5-5 Population at Study Area

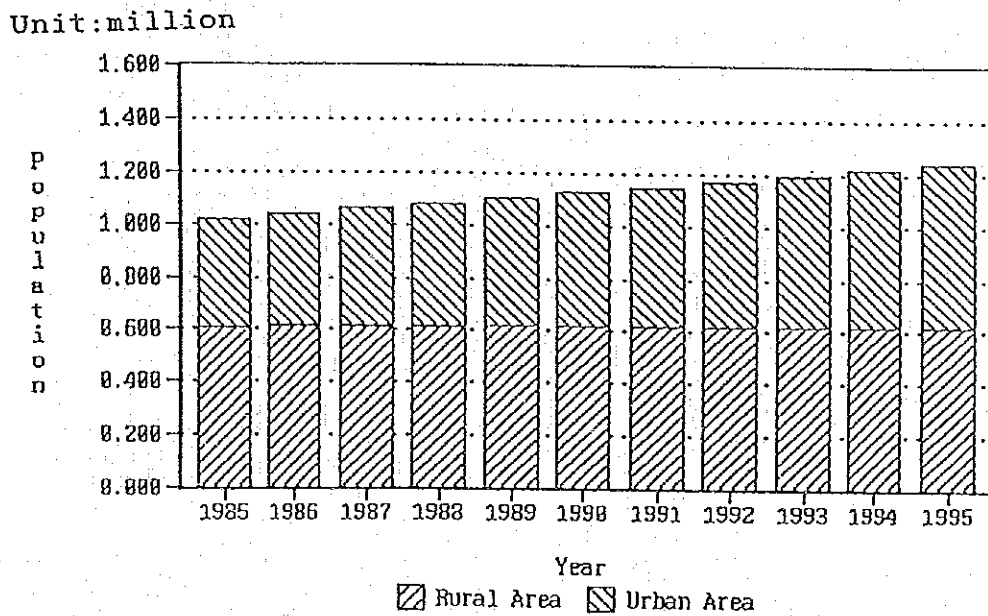


Fig. 2-5-6 Population Projection of Manabi Province

Table 2-1-4(1) Precipitation at Coastal Area(Montecristi)

Year	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
'70	23.6	13.2	28.5	29.8	16.2	6.8	5.8	3.1	1.3	1.1	0.8	3.1	133.3
'71	11.0	48.7	284.6	1.5	0.3	7.9	2.4	1.0	6.7	2.8	0.2	0.0	367.9
'72	96.4	168.8	140.6	87.1	0.0	43.7	0.6	0.0	2.8	1.0	3.1	3.5	547.6
'73	196.3	235.5	29.8	20.4	16.1	9.6	3.7	1.2	5.2	4.0	2.1	4.3	528.2
'74	38.4	73.5	77.8	63.6	7.0	4.8	8.5	0.7	3.8	3.9	3.5	25.1	310.6
'75	176.8	167.4	144.5	98.2	0.3	6.8	3.0	1.8	3.2	5.2	4.5	3.4	615.1
'76	254.9	253.9	150.9	103.4	30.2	6.2	0.0	0.8	4.1	0.7	0.6	20.5	826.2
'77	39.4	85.4	99.1	82.6	0.0	6.8	0.8	3.9	4.6	3.2	0.0	0.0	325.8
'78	70.9	57.8	60.2	1.9	2.1	0.5	1.3	0.0	2.0	1.3	0.0	0.0	198.0
'79	38.2	49.6	7.8	4.3	4.1	3.2	0.2	0.0	3.4	2.6	0.0	0.0	113.4
'80	21.2	10.3	68.4	59.0	12.6	8.9	0.3	1.6	0.1	2.5	0.5	0.6	186.0
'81	33.8	92.4	13.6	7.1	0.4	0.3	3.9	2.9	2.4	3.4	0.5	1.5	162.2
'82	24.3	3.8	1.7	7.0	5.3	0.4	0.2	0.0	0.6	9.7	28.0	138.5	219.5
'83	326.6	232.1	185.0	321.3	368.7	240.4	177.4	1.2	36.9	1.4	0.8	24.0	1915.8
'84	0.0	133.6	178.3	14.7	0.0	4.6	1.9	3.5	2.3	4.3	2.1	41.9	387.2
'85	18.4	57.1	54.8	4.7	27.1	3.8	0.0	0.0	0.0	0.0	0.0	0.0	165.9
Mean	85.6	105.2	95.4	56.7	30.7	22.2	13.1	1.4	5.0	2.9	2.9	16.6	437.7

Table 2-1-4(2) Precipitation at Coastal Area(Sancan)

Year	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
'70	58.3	26.7	49.5	73.3	48.8	5.9	2.4	0.5	6.7	0.2	0.7	7.8	280.8
'71	22.4	135.6	193.4	4.8	0.3	43.9	1.0	0.6	3.4	2.1	4.7	5.4	417.6
'72	71.9	100.3	100.5	51.8	13.6	35.5	7.9	4.3	2.2	2.5	1.7	19.7	411.9
'73	126.0	184.4	126.2	59.2	45.3	9.0	2.0	2.0	7.0	5.6	0.8	4.0	571.5
'74	18.7	107.6	57.6	94.8	15.3	5.6	2.2	0.5	3.0	1.4	3.2	20.8	330.7
'75	231.3	183.2	212.3	33.7	17.8	25.9	6.4	2.0	4.3	3.3	1.9	15.9	738.0
'76	156.6	169.1	267.7	98.3	36.8	31.6	3.1	7.9	3.1	1.1	1.6	11.8	788.7
'77	24.0	139.3	91.7	97.3	0.2	1.9	0.3	1.9	2.2	0.3	0.0	10.2	369.3
'78	61.7	108.8	56.4	1.9	21.1	3.2	2.7	0.7	1.8	1.0	0.3	0.7	260.3
'79	29.3	50.2	27.6	41.7	5.2	1.8	6.2	0.0	1.0	0.0	0.3	0.0	163.3
'80	14.8	17.1	89.8	47.2	29.7	0.0	0.0	0.0	0.0	0.2	0.0	0.0	198.8
'81	47.0	86.3	37.9	39.2	0.0	0.4	6.0	0.4	0.5	0.3	0.0	3.3	221.3
'82	21.2	5.3	7.0	45.5	18.8	6.7	0.0	0.0	14.3	9.7	43.4	76.4	248.3
'83	539.1	153.7	253.4	432.8	578.3	291.6	132.3	13.6	29.2	0.4	2.3	25.5	2452.2
'84	14.7	246.6	191.6	45.8	4.5	4.8	0.0	0.0	0.0	0.4	0.0	78.0	586.4
'85	30.9	88.8	60.1	9.4	81.7	0.2	0.0	0.0	3.8	0.2	0.0	33.5	308.6
Mean	91.7	112.7	113.9	73.5	57.3	29.2	10.8	2.2	5.2	1.8	3.8	19.6	521.7

Table 2-1-4(3) Precipitation at Coastal Area(Pto.Cayo)

Year	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
'70	18.7	10.7	39.4	13.8	43.9	21.2	24.8	6.5	6.4	3.3	1.4	5.0	195.1
'71	20.6	112.0	139.4	4.4	0.5	32.7	2.7	13.5	16.9	7.2	8.0	3.9	361.8
'72	28.8	193.0	80.5	61.5	2.8	46.3	4.6	3.8	16.7	6.7	2.3	4.9	451.9
'73	158.6	69.3	22.9	13.5	15.6	42.1	5.4	10.9	26.5	15.7	8.5	3.5	392.5
'74	6.7	10.5	39.7	32.9	6.6	6.9	7.0	4.0	12.1	10.6	9.4	10.7	157.1
'75	166.7	133.9	248.0	16.0	4.2	35.1	8.9	7.7	13.9	19.4	10.5	3.0	667.3
'76	123.7	214.7	250.6	30.0	9.8	3.1	0.0	13.0	25.8	0.0	0.7	24.3	695.7
'77	32.8	54.9	50.5	16.1	0.0	7.4	6.0	10.1	4.5	8.7	0.3	6.8	198.1
'78	79.4	11.3	64.8	1.6	6.6	14.9	9.5	5.1	7.3	7.6	0.0	0.0	208.1
'79	34.2	12.5	21.6	12.8	0.1	15.3	9.2	2.9	5.9	11.9	0.0	2.4	128.8
'80	16.2	8.1	67.0	25.8	19.3	3.1	3.6	12.2	3.6	16.2	1.2	4.8	181.1
'81	36.1	82.3	19.9	4.7	0.2	2.6	12.5	26.9	12.3	5.7	4.2	0.3	207.7
'82	12.4	0.7	4.6	18.9	18.5	0.5	0.0	0.0	11.9	6.0	15.6	25.2	114.3
'83	23.6	166.2	144.2	371.0	429.1	373.4	161.9	2.1	52.7	22.8	12.8	32.4	2092.2
'84	22.0	72.6	59.3	38.8	20.6	65.5	5.2	16.0	10.6	3.2	7.7	72.9	394.4
'85	19.8	71.2	16.6	2.3	21.4	13.3	8.6	4.5	6.7	10.9	3.9	34.9	214.1
Mean	68.8	76.5	79.3	41.5	37.5	42.7	16.9	8.7	14.6	9.7	5.4	14.7	416.3

Table 2-1-4(4) Precipitation at Coastal Area (Julcuy)

Year	:mm												Annual
	Jan	Feb	Mar	Apl	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
'70	57.6	26.0	43.8	72.6	48.1	4.9	0.6	0.0	2.5	0.2	0.5	10.5	272.3
'71	5.7	76.8	247.8	11.4	0.0	23.5	0.0	0.1	5.6	1.1	2.6	3.5	378.1
'72	17.2	152.4	82.3	18.3	19.8	36.1	0.2	14.8	13.4	1.5	2.0	16.1	374.1
'73	162.1	119.1	182.5	90.6	42.2	5.2	1.0	0.1	2.9	0.0	0.0	0.5	606.2
'74	10.8	55.5	48.4	31.4	14.6	1.7	0.0	0.0	3.4	3.9	2.5	8.4	180.6
'75	105.2	174.7	323.6	35.9	6.1	6.5	0.0	0.0	0.0	5.1	0.0	4.5	661.6
'76	216.9	151.8	127.7	61.7	63.6	49.8	3.7	2.4	1.4	1.5	0.5	17.4	698.4
'77	41.2	184.3	48.8	58.3	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	337.4
'78	64.0	195.8	55.7	1.2	20.4	2.5	2.0	0.0	1.1	0.3	0.0	2.3	345.3
'79	59.9	23.5	55.9	72.0	2.4	1.0	0.0	0.2	1.4	0.0	1.0	0.0	217.3
'80	13.1	15.0	136.9	41.7	13.0	2.4	0.0	0.0	0.0	0.5	0.0	0.5	223.7
'81	25.9	92.6	109.8	33.6	0.0	0.4	0.2	0.0	0.0	0.0	0.0	2.6	265.1
'82	10.4	6.3	13.4	37.4	12.6	0.0	0.0	0.0	2.3	14.2	58.8	128.2	283.6
'83	143.0	69.0	143.2	51.6	414.5	35.4	186.2	17.0	3.8	1.1	13.0	16.7	1480.2
'84	2.0	188.4	149.9	40.6	6.6	13.0	0.5	0.8	1.3	0.9	0.0	43.5	447.5
'85	88.0	50.9	99.2	15.0	17.9	3.2	0.0	0.0	4.6	0.8	0.0	44.6	324.2
Mean	63.9	98.9	117.1	54.6	42.8	24.2	11.1	2.3	3.0	1.9	5.1	18.7	443.5

Table 2-1-5 Wave Height and Direction at Equatorial Sea

Wave Height (m)	Direction (%)									Total
	N	NE	E	SE	S	SW	W	NW		
0.0-0.5	0.2	1.1	0.7	3.5	4.2	3.5	1.3	1.8	16.3	
0.6-1.0	5.5	4.4	0.9	0.4	17.5	5.0	1.1	2.2	37.0	
1.1-2.0	0.4	4.8	1.3	1.8	12.3	7.0	1.5	7.7	36.8	
2.1-3.0	0.7	1.3	0.7	1.3	0.9	2.2	0.7	1.3	9.1	
3.1-4.0	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.8	
4.1-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	6.8	12.0	3.6	7.0	34.9	18.1	4.6	13.0	100.0	

Table 2-2-1 Ecuador's Population by Area, according to Regions and Provinces - 1990 Census

(Poblacion del Ecuador por areas, segun regiones y provincias)
 Datos Provisionales - Censo 1990

Provincias	Total	%	Urban	%	Rural	%
Total Republica	9,622,608	100	5,305,911	55.1	4,316,697	44.9
Region Sierra	4,416,427	100	2,261,612	51.2	2,154,815	48.8
Azuay	506,546	100	219,407	43.3	287,139	56.7
Bolivar	170,593	100	32,852	19.3	137,741	80.7
Canar	189,102	100	55,541	29.4	133,561	70.6
Carchi	141,992	100	57,322	40.4	84,670	59.6
Chimborazo	360,600	100	117,823	32.7	242,777	67.3
Cotopaxi	283,236	100	66,274	23.4	216,962	76.6
Imbabura	273,261	100	129,770	47.4	143,491	52.5
Loja	389,632	100	156,340	40.1	233,292	59.9
Pichincha	1,734,942	100	1,274,352	73.5	460,590	26.5
Tungurahua	366,523	100	151,931	41.5	214,592	58.5
Region Costa	4,742,596	100	2,937,640	61.9	1,804,956	38.1
El Oro	415,073	100	290,902	70.1	124,171	29.9
Esmeraldas	307,190	100	134,379	43.7	172,811	56.3
Guayas	2,463,423	100	1,878,750	76.3	584,673	23.7
Los Rios	530,844	100	201,999	38.1	328,845	61.9
Manabi	1,026,066	100	431,610	42.1	594,456	57.9
Region Amazonica	383,201	100	98,750	25.8	284,451	74.2
Morona Santiago	95,685	100	23,557	24.6	72,128	75.4
Napo	102,623	100	23,712	23.1	78,911	76.9
Pastaza	40,714	100	14,802	36.4	25,912	63.6
Sucumbios	77,450	100	20,328	26.2	57,122	73.8
Zamora Chinchipe	66,729	100	16,351	24.5	50,378	75.5
Region Insular	9,749	100	7,909	81.1	1,840	18.9
Galapagos	9,749	100	7,909	81.1	1,840	18.9
Zonas no Delimitad.	70,635	100			70,635	100.0

Table 2-2-2

Population Projection of Ecuador

	Por Región y Provincia (1986)			% de Total	Año	Población	Año	Población
	Urbano	Rural	Total					
Sierra	2,162,198	2,309,047	4,471,245	46.30	1950	3,310,080	1976	7,242,908
					1951	3,102,533	1977	7,451,531
Carchi	57,521	85,753	143,274		1952	3,197,602	1978	7,670,843
Imbabura	113,984	167,048	281,032		1953	3,596,060	1979	7,893,296
Pichincha	1,236,736	473,539	1,710,275		1954	3,698,681	1980	8,123,354
Cotopaxi	51,621	261,050	312,671		1955	3,806,210	1981	8,361,285
Tungurahua	146,558	227,764	374,322		1956	3,918,221	1982	8,606,116
Bolívar	29,646	135,095	164,741		1957	4,034,107	1983	8,857,444
Chimborazo	112,725	256,504	369,229		1958	4,154,672	1984	9,114,866
Canar	49,463	148,859	198,322		1959	4,280,692	1985	9,377,980
Azuay	213,354	299,989	513,343		1960	4,412,940	1986	9,647,107
Loja	150,590	253,446	404,036		1961	4,551,483	1987	9,922,514
					1962	4,695,805	1988	10,203,722
Costa	2,846,008	1,918,046	4,764,054	49.10	1963	4,815,805	1989	10,490,219
					1964	5,001,381	1990	10,781,613
Esmeraldas	153,072	145,304	298,376		1965	5,162,440	1991	11,078,397
Manabí	427,243	612,165	1,039,408		1966	5,329,658	1992	11,380,922
Los Ríos	196,012	337,673	533,685		1967	5,503,106	1993	11,688,314
Guayas	1,795,045	690,718	2,485,763		1968	5,681,775	1994	11,999,701
El Oro	274,636	132,186	406,822		1969	5,864,581	1995	12,314,210
					1970	6,050,555	1996	12,632,109
Regiónica	80,479	254,529	335,008	3.50	1971	6,239,533	1997	12,953,981
					1972	6,432,199	1998	13,279,422
Napo	30,474	121,271	151,745		1973	6,628,771	1999	13,608,030
Pastaza	13,843	24,688	38,531		1974	6,829,467	2000	13,939,400
Morona Santiago	21,925	63,694	85,619		1975	7,034,504		
Zamora Chinchipe	14,237	44,876	59,113					
Región Insular	6,302	1,652	7,954					
Galápagos	6,302	1,652	7,954	0.10				
Zonas no delimitadas		69,846	69,846	0.90				
Total Nacional	5,094,987	4,553,120	9,648,107					
Porcentaje de Total	52.8	47.2	100.0					

Fuente: INEC, estimación de población 1950-2000

Table 2-2-3(1)

Economically Active Population by Sector

Ramas de actividad	1983	1984	1985	1986	1987	(% p.a)
Agricultura, Silvicultura, caza y pesca	1,212,304	1,201,447	1,194,256	1,164,998	1,154,941	-1.20
Explotación de minas y canteras	12,110	16,239	20,390	20,628	21,100	14.89
Industrias manufactureras	314,471	324,295	333,469	344,612	353,713	2.98
Electricidad, gas y agua	14,752	15,577	16,383	17,351	18,204	5.40
Construcción	179,155	192,787	206,810	222,527	138,118	-6.30
Comercio al por mayor y menor restaurantes y hoteles	301,200	314,510	326,837	342,705	355,060	4.20
Transporte, almacenamiento y comunicaciones	115,321	124,293	133,412	144,138	154,314	7.56
Establecimientos financieros, seguros, etc	50,375	55,588	61,003	67,880	74,349	10.22
Servicios comunales, sociales y personales	620,501	660,123	699,542	746,051	788,504	6.17
Actividad no bien especificadas	39,445	35,742	32,268	29,389	26,492	-9.48
Trabajos nuevos	96,568	108,950	122,748	138,168	155,323	12.60
Total	2,956,202	3,049,551	3,147,118	3,238,447	3,240,118	3.10

Fuente: Banco Central del Ecuador, BCE-

"Boletín-anuario N. 10, 1987"

Elaboración: ILDIS

Table 2-2-3(2)

Economically Active Population by Sector

Ramas de actividad	1983	1984	1985	1986	1987	(%)
Agricultura, Silvicultura, caza y pesc	41.0	39.4	37.9	36.0	34.6	
Explotación de minas y canteras	0.4	0.5	0.6	0.6	0.6	
Industrias manufactureras	10.6	10.6	10.6	10.6	10.6	
Electricidad, gas y agua	0.5	0.5	0.5	0.5	0.5	
Construcción	6.1	6.3	6.6	6.9	7.1	
Comercio al por mayor y menor restaurantes y hoteles	10.2	10.3	10.4	10.6	10.6	
Transporte, almacenamiento y comunicaciones	3.9	4.1	4.2	4.5	4.6	
Establecimientos financieros, seguros, etc	1.7	1.8	1.9	2.1	2.2	
Servicios comunales, sociales y personales	21.0	21.6	22.2	23.0	23.6	
Actividad no bien especificadas	1.3	1.2	1.0	0.9	0.8	
Trabajos nuevos	3.3	3.6	3.9	4.3	4.7	
Total	100.0	100.0	100.0	100.0	100.0	

Fuente: Tabla 1.3

Table 2-2-4 Gross Domestic Product by Sector
(Oferta y Utilizacion Final de Bienes y Servicios)
(Millones de Suces)

	1985	1986	1987	1988	1989
Prod. Interno Bruto	1,109,940	1,383,232	1,794,501	3,104,339	5,464,613
Importaciones	231,668	312,507	543,702	920,765	1,592,461
Total	1,341,608	1,695,739	2,338,203	4,025,104	7,057,074
Consumo final Total	842,989	1,092,506	1,499,833	2,477,105	4,396,548
Formacion bruta de Cap.fijo total	178,225	260,002	406,598	666,857	1,125,703
Variacion de Existencias	23,442	28,491	234	15,824	52,223
Exportaciones	296,922	314,740	431,538	865,318	1,482,600
Total	1,341,608	1,695,739	2,338,203	4,025,104	7,057,074

Gross Domestic Product by Sector

	1985	1986	1987	1988	1989
Agricultura, Caza y Pesca	147,979	208,743	274,583	468,080	803,047
Petroleo y Otras Minas	189,516	137,969	122,567	347,095	714,160
Industrias Manufactureras	210,259	274,177	350,257	650,362	1,203,499
Electricidad, Gas y Agua	3,401	6,487	7,413	1,639	1,937
Construccion	48,593	67,267	98,981	112,631	194,142
Transporte, Almacén y Comunicaciones	94,931	125,565	169,713	297,335	451,315
Comercio y Finanzas	257,222	357,790	514,563	876,060	1,482,167
Otros Servicios	158,039	211,234	256,424	351,137	614,346
Produc. Interno Bruto	1,109,940	1,383,232	1,794,501	3,104,339	5,464,613

Source: Central Bank of Ecuador
Fuente: Banco Central del Ecuador

Table 2-2-5 Gross Domestic Product by Sector
(Oferta y Utilizacion Final de Bienes y Servicios)
Millones de Sucres de 1975

	1985	1986	1987	1988	1989
Prod. Interno Bruto	164,054	169,136	159,016	176,866	177,144
Importaciones	35,000	34,925	40,286	36,101	37,800
Total	199,054	204,061	199,302	212,967	214,944
Consumo Final Total	131,517	132,301	135,360	137,314	139,260
Formacion Bruta de Cap.Fijo Total	24,618	25,677	26,800	26,162	26,032
Variacion de Existencias	3,357	3,139	1,115	1,877	2,700
Exportaciones	39,562	42,944	36,027	47,614	46,952
TOTAL	199,054	204,061	199,302	212,967	214,944

Gross Domestic Product by Sector

	1985	1986	1987	1988	1989
Agricultura, Caza y Pesca	24,178	26,656	27,323	29,678	30,581
Petroleo y Otras Minas	23,875	24,513	11,107	25,319	23,501
Industrias Manufactureras	28,710	28,241	28,729	29,381	28,272
Electricidad, Gas y Agua	1,833	2,232	2,616	2,789	2,871
Transporte, Almacenamiento y Comunicaciones	11,506	12,571	12,829	13,486	14,175
Comercio y Finanzas	42,430	43,372	46,492	49,234	46,021
Otros Servicios	24,780	24,697	22,909	20,620	25,441
Producto Interno Bruto	164,054	169,136	159,016	176,866	177,144

Source: Central Bank of Ecuador
Fuente: Banco Central del Ecuador

Table 2-2-6 Exports by Principal Product
(Exportaciones por Producto Principal)
Miles de Dolaes FOB

	1985	1986	1987
Total Exportaciones	2,904,736	2,185,849	1,927,694
Petroleo (Crude Oil)	1,824,652	912,398	645,773
Banano (Banana)	219,987	263,402	266,935
Cafe (Coffee)	190,802	298,917	192,286
Camaron (Shrimp)	156,486	287,882	383,136
Cacao (Cocoa)	138,412	71,063	82,768
Abaca (Jute)	8,796	8,003	8,949
Madera (Wood)	8,798	236	582
Atun (Tuna)	5,001	16,538	21,304
Pescado (Fish)	4,390	8,948	14,813
Otros (Others)	8,819	10,490	19,782
Derivados del Petroleo (Oil derivatives)	101,905	70,114	78,210
Harina/Pescado (Fishmeal)	59,003	49,254	27,539
Otros/Industrializados (Other industrialized goods)	236,688	237,858	213,156

(continued)

	1988	1989	1990
Total Exportaciones	2,192,898	2,353,881	2,714,328
Petroleo (Crude Oil)	875,175	1,032,715	1,258,401
Banano (Banana)	297,803	369,533	467,938
Cafe (Coffee)	152,358	142,015	104,152
Camaron (Shrimp)	387,047	328,221	340,291
Cacao (Cocoa)	77,637	55,545	74,618
Abaca (Jute)	7,846	8,622	7,773
Madera (Wood)	11,766	12,036	11,584
Atun (Tuna)	18,100	29,540	27,162
Pescado (Fish)	16,716	19,435	24,564
Otros (Others)	16,187	28,656	28,782
Derivados del Petroleo (Oil derivatives)	100,948	114,690	150,695
Harina/Pescado (Fishmeal)	59,515	29,631	8,770
Otros/Industrializados (Other industrialized goods)	171,800	183,242	210,088

Source: Central Bank of Ecuador
Fuente: Banco Central del Ecuador

Table 2-2-7 Imports Done and Registered by Central Bank of Ecuador by Use of Economic Destination
Thousand of Dollars CIF

Importaciones realizadas y registradas por el Banco Central por uso o Destino Economico
Miles de Dolares CIF

	1985	1986	1987
Total	1,766,724	1,810,224	2,158,136
Bienes de Consumo (Consumption Goods)			
No Duraderos (No durable)	94,240	102,096	124,848
Duraderos (Durable)	58,246	67,514	83,552
Combustibles y Lubricantes (Fuel and lubricants)	198,304	113,384	294,499
Materias Primas (Raw materials)			
Agricolas (Agriculture)	71,673	62,852	52,713
Industriales (Industrials)	768,928	726,421	791,718
Materiales de Construccion (Building materials)	49,810	61,966	73,499
Bienes de Capital			
Agricolas (Agriculture)	34,101	35,048	28,821
Industriales (Industrials)	338,694	407,519	500,803
Equipos de Transporte (Transportation equipment)	152,728	229,560	202,397
Otros (Others)	--	3,864	5,286
(continued)			
	1988	1989	1990
Total	1,713,525	1,854,781	1,861,745
Bienes de Consumo (Consumption Goods)			
No Duraderos (No durable)	101,158	136,806	99,463
Duraderos (Durable)	63,412	47,550	79,179
Combustibles y Lubricantes (Oil and Lubricants)	58,732	71,115	91,861
Materias Primas (Raw materials)			
Agricolas (Agriculture)	62,128	90,618	85,187
Industriales (Industrials)	707,497	838,997	810,794
Materiales de Construccion (Building materials)	51,303	52,122	85,691
Bienes de Capital			
Agricolas (Agriculture)	12,332	13,428	25,360
Industriales (Industrials)	404,174	389,312	376,034
Equipos de Transporte (Transportation Equipment)	249,266	205,646	204,468
Otros (Others)	3,523	9,187	3,708

Source: Central Bank of Ecuador

Fuente: Banco Central

Table 2-2-8 Total Amounts of Exports and Imports and Generated Taxes
(thousand of US dollars)

Years	Exports (FOB) A	Exports Charges B	Rate (%) B/A	Imports (CIF) C	Imports Charges D	Rate (%) D/C
1985	2,904,736	14,339	0.49	1,766,724	269,401	15.2
	978,179 (n)	166 (n)			(166,704)	(9.0)
	1,926,557 (o)	14,173 (o)	0.74			
1986	2,185,849	11,082	0.51	1,810,224	293,218	16.2
	1,203,337 (n)	0 (n)			(192,187)	(10.6)
	982,512 (o)	11,082 (o)	1.13			
1987	1,927,694	17,027	0.88	2,158,136	243,981	11.3
	1,203,711 (n)	85 (n)			(155,545)	(7.0)
	723,9893 (o)	16,942 (o)	2.34			
1988	2,193,898	11,779	0.54	1,713,525	216,898	12.7
	1,216,775 (n)	96 (n)			(131,954)	(8.0)
	976,123 (o)	11,683 (o)	1.20			
1989	2,353,881	8,735	0.37	1,854,781	200,358	10.8
	1,206,476 (n)	50 (n)			(122,251)	(7.0)
	1,147,405 (o)	8,685 (o)	0.76			
1990	2,714,328			1,861,745	215,471	11.6
	1,305,732 (n)					
	1,408,596 (o)					

Note: (n) means non-oil.
(o) means oil.
Export charges show charges for non-oil and oil.
Import charges include custom duties and additional charges.
Figures in parenthesis show custom duties only.

Source: Central Bank of Ecuador

Table 2-2-9 Balance of Payments
 (Balanza de Pagos del Ecuador)
 (millions of US dollars)

	1985	1986	1987	1988	1989	1990
I. Saldo en Cuenta Corriente	114	-553	-1131	-505	-472	-136
1. Balanza Comercial	1,294	543	-33	619	661	1,003
Exportaciones	2,905	2,186	2,021	2,202	2,354	2,714
Importaciones	-1,611	-1,643	-2,054	-1,583	-1,693	-1,711
2. Balanza de Servicios y Renta	-1,260	-1,141	-1,230	-1,221	-1,230	-1,239
3. Transferencias	80	45	132	97	97	100
II. Cuenta de Capitales	-66	319	1,043	486	854	538
Balanza de Pagos (I + II)	48	-234	-88	-19	382	402

Source: Central Bank of Ecuador
 Fuente: Banco Central del Ecuador

Table 2-2-10

National Budget

(millions of sucres)

	1973	1975	1980	SD. 1985	EST. 1986
Ingreso Corrientes	12,123	22,959	53,808	267,882	271,839
Ventas de bienes y Servicios	728	2,078	3,249	11,474	16,322
Impuestos	10,632	17,693	45,189	235,066	230,181
Contribución al Seguro Social	0	0	0	0	0
Transferencias	330	888	2,123	4,317	8,368
Otros	433	2,300	3,247	17,025	16,968
Gastos Corrientes	8,310	19,189	54,097	194,537	254,009
Adquisición de bienes y serv	2,075	7,366	17,604	45,681	59,757
Remuneraciones	3,954	8,288	21,440	70,969	89,885
Intereses	557	651	5,747	39,760	53,953
Servicios Sociales	0	0	0	0	0
Transferencias	1,677	2,629	88,679	24,327	28,014
Otros	47	255	437	13,800	22,400
Superávit en Cuenta Corriente	3,813	3,720	(289)	73,345	17,830
Gastos de Capital	2,875	5,097	9,120	29,669	35,747
Formación de capital	2,571	4,733	7,601	28,900	34,938
Formación Financiera netas	48	26	134	72	28
Transferencia de capital net	256	338	1,385	841	837
Deficit o superávit	938	(1,327)	(9,409)	(43,676)	(17,917)

Fuente: Banco Central del Ecuador - Cuentas Nacionales

Table 2-2-11

National Socioeconomic Development Plan

(Milliones de Sucres de 1975)

	1988		1989	1990	1991	1992		Tasa Crec
	Valor	del PI				Valor	del PI	1988-1992
								%(p-a)
Agropecuario	29,687	17.3	30,607	31,770	33,074	34,493	17.9	3.8
Petrolero	18,879	11.1	18,716	30,374	20,194	20,051	10.4	1.9
Otros Minerales	13	0.8	1,362	1,459	1,535	1,579	0.8	5.0
Industrial	27,957	16.4	28,339	28,981	30,095	31,741	16.4	3.2
Electricidad, Gas y Agu	2,658	1.6	2,837	3,005	3,159	3,300	1.7	5.6
Construcción	6,144	3.6	6,217	6,406	6,660	6,994	3.6	3.3
Comercio y Hoteles	26,543	15.5	27,046	27,671	28,389	29,531	15.3	2.7
Transporte y Comunicació	13,527	7.9	13,858	14,145	14,556	15,167	7.8	2.9
Serv. Financieros y Otro	18,781	11.0	19,026	19,457	19,920	20,633	10.7	2.4
Servicios a Hogares	9,649	5.6	9,781	10,091	10,637	11,411	5.9	4.3
Servicio Banco Imp.	-4,091	-2.4	-4,074	-4,219	-4,408	-4,748	-2.5	3.8
Total	149,747	88.4	153,715	169,140	163,811	170,152	88.0	38.9
Servicios de Gobierno	15,456	9.1	15,859	16,361	17,000	17,925	9.3	3.8
Servicios Domésticos	739	0.4	743	751	769	796	0.4	1.9
Impuestos Indirectos	3,576	2.1	3,772	3,947	4,130	4,394	2.3	5.3
Valor Agregado Bruto	170,805	100.0	174,089	180,199	185,710	193,267	100.0	3.1
Tasa de Crecimiento			1.9%	3.5%	3.1%	4.1%		

Fuente: Plan Nacional de Desarrollo Economico y Social, 1989-1992
CONADE, 1989

Table 2-2-12

Investment Plan by Sectors

(Milliones de Sucres de 1975)

Sector	No de Proyecto					Total de Proporción	
		1989	1990	1991	1992	1989-199	(%)
Agropecuario	98	76,066	180,091	201,714	151,806	609,676	17.9
Industrial y pesca	16	14,434	35,228	93,938	105,664	249,264	7.3
Energia	24	176,536	366,398	231,031	195,961	969,927	28.4
Desarrollo regional	61	41,977	55,105	55,352	60,919	213,353	6.3
Transporte y comuni	55	105,510	141,058	171,689	166,591	584,848	17.1
Educación, empleo, ci	32	51,925	48,566	50,145	52,981	203,617	6.0
Salud	47	115,101	105,332	69,410	48,106	337,950	9.9
Bienestar Social	29	33,223	54,377	68,847	87,917	244,365	7.2
Total	362	614,772	986,155	942,126	869,945	3,413,000	100.1

Fuente: CONADE

Table 2-2-13

Population Projection of Manabi Province

No	Ceunta	1988	1990	1995	2000	2005	2010	2015	2020	Crecimi. 1988-2020 (% anual)
1	Cojimes	13,578	13,580	13,586	13,586	13,586	13,586	13,586	13,586	0.00
2	Cuaque	13,579	13,582	13,588	13,588	13,588	13,588	13,588	13,588	0.00
3	Don Juan	3,434	3,434	3,436	3,436	3,436	3,436	3,436	3,436	0.00
4	Jama	35,930	36,360	36,904	37,453	37,747	37,747	37,820	37,820	0.16
5	Canoa	6,230	6,232	6,233	6,233	6,233	6,233	6,233	6,233	0.00
6	Briceno	5,429	5,513	5,619	5,728	5,786	5,786	5,800	5,800	0.21
7	Bahia	27,825	28,265	29,350	30,345	31,219	31,219	32,708	33,447	0.58
8	Carrizal Chone	183,553	190,586	207,210	223,778	240,565	240,565	281,518	300,814	1.56
9	Portoviejo	307,348	323,547	369,928	421,437	480,358	480,358	630,700	728,737	2.71
10	Manta	188,117	202,923	244,283	288,093	338,400	338,400	462,741	479,117	2.96
11	Sancán	1,975	1,975	1,975	1,975	1,975	1,975	1,975	1,975	
12	Cantagallo	2,126	2,126	2,126	2,126	2,126	2,126	2,126	2,126	
13	Jipijapa	41,147	43,429	49,593	55,638	61,920	61,920	75,563	83,385	2.23
14	Salaité	2,735	2,735	2,735	2,735	2,735	2,735	2,735	2,735	
15	Buenavista	6,251	6,251	6,251	6,251	6,251	6,251	6,251	6,251	
16	Ayampe	3,368	3,368	3,368	3,368	3,368	3,368	3,368	3,368	
17	Salango	7,324	7,324	7,324	7,324	7,324	7,324	7,324	7,324	
18	Esmeraldas	37,281	39,180	43,957	50,118	55,505	55,505	68,212	76,181	2.26
19	Daule	91,431	93,278	95,772	100,199	101,020	101,020	101,326	101,395	0.32
20	Puca	52,052	52,224	52,621	52,995	53,094	53,094	53,094	53,094	0.06
21	Colimes	58,336	59,060	61,160	63,544	66,343	66,343	73,556	78,305	0.92
22	Guanábano	3,890	3,890	3,890	3,890	3,890	3,890	3,890	3,890	
Total		1,092,939	1,138,862	1,260,909	1,393,840	1,536,469	1,536,469	1,887,550	2,042,607	1.97
Crecimiento anual promedio			2.08	2.06	2.02	1.97	2.02	2.14	1.59	

Fuente: INEC, Proyecciones de la Población Ecuatoriana, 1982-1995

Table 2-2-14

Economically Active Population by Sectors, by Provinces

CUADRO N. 18A. - Poblacion Economicamente Activa. Por Rama de Actividad

Provincia	Total	Rama de Actividad Economica										Activ. No Bien Especificadas	Trabajador Nuevo
		Agricultura, Silvicultura, Caza y Pesca	Explotacion de Minas y Canteras	Industrias Manufactureras	Electricidad Gas y Agua	Construccion	Comercio	Transportes Almacenamiento y comunic.	Establecimientos Financ. Seguros	Servicios			
Azuay	197,297	71,854	727	34,181	1,667	8,344	14,661	6,588	2,247	39,807	1,884	5,924	
Bolivar	59,071	42,218	34	1,752	130	939	1,750	1,659	201	9,232	185	1,646	
Canar	74,435	41,827	399	9,308	452	2,106	2,706	2,897	244	10,616	235	2,744	
Carchi	52,457	26,928	376	2,645	196	1,455	3,286	3,410	389	11,032	403	1,982	
Cotopaxi	113,867	64,370	234	9,704	405	5,323	4,541	4,460	423	17,823	523	3,523	
Chimborazo	132,993	70,267	439	11,815	482	4,191	7,319	4,682	759	25,493	912	4,306	
Imbabura	101,725	40,725	248	15,662	528	4,300	7,548	4,217	683	19,023	656	4,291	
Loja	141,667	82,478	285	5,975	680	5,010	6,955	4,112	924	30,156	405	3,407	
Pichincha	644,563	89,072	5,432	94,743	6,214	39,336	81,394	33,802	28,439	199,280	7,478	19,097	
Tungurahua	149,346	62,375	316	23,076	895	4,419	11,379	6,877	1,456	28,103	1,322	3,878	
Eldorado	139,209	52,276	2,759	6,918	485	4,709	17,977	7,270	1,844	35,880	961	6,538	
Esmeraldas	94,142	44,063	624	5,914	421	2,029	8,161	2,799	469	21,034	706	7,906	
Guayas	856,171	156,119	3,785	105,689	4,276	39,548	141,720	50,887	32,171	225,707	8,030	50,372	
Los Rios	171,894	105,794	26	5,835	337	3,541	14,082	5,328	988	26,643	741	9,456	
Manabi	295,905	139,002	399	16,512	746	8,790	27,204	12,207	2,643	59,365	1,648	26,999	
Morona Santiago	29,946	19,531	225	1,078	73	1,043	825	604	121	5,645	57	741	
Napo	47,628	27,378	3,246	1,511	142	1,600	2,219	1,276	162	9,532	244	1,545	
Z. Chinchipe	19,674	12,075	1,260	495	21	595	546	272	49	4,472	56	389	
Pastaza	14,546	5,913	288	767	39	601	557	585	101	5,137	34	385	
Galapagos	3,581	678	0	135	15	241	229	382	35	1,524	12	195	
Total	3,340,117	1,154,943	21,102	353,715	18,204	138,120	355,059	154,314	74,348	785,504	26,492	155,324	

Table 2-2-15

Numbers of Economically Active Population employed in
Fishery Sector by Province

	Population	EAP*	Agriculture, Hunting & Fishery	Industrial Fishery*	Artisanal Fishery*
	1990	1987*	1987*	1988	1989
Total	9,622,608	3,340,114	1,154,943	247,862	5,903
Sierra	4,416,427	1,667,421	592,114		
Azuay	506,546	197,297	71,854		
Bolivar	170,593	59,071	42,218		
Canar	189,102	74,435	41,827		
Carch	141,992	52,457	26,928		
Cotopax	360,600	113,867	64,370		
Chiborazo	283,236	132,993	70,267		
Imbabura	273,261	101,725	40,725		
Loja	389,632	141,667	82,478		
Pichincha	1,734,942	644,563	89,072		
Tungurahua	366,523	149,346	62,375		
Costa	4,742,596	1,557,318	497,254	(4,626)	5,763
El Oro	415,073	139,206	52,276		372
Esmeraldas	307,190	94,142	44,063	(404)	652
Guayas	2,463,423	856,171	156,119	(2,215)	3,031
Los Rios	530,844	171,894	105,794		182
Manabi	1,026,066	295,905	139,002	(2,007)	1,526
Amazonia	383,201	111,794	64,897		
M. Santiago	95,685	29,946	19,531		
Napo	102,623	47,628	27,378		
Pastaza	40,714	14,546	5,913		
Sucumbios	77,450				
Z. Chinchipe	66,729	19,674	12,075		
Insular	9,749	3,581	678		140
Galapagos	9,749	3,581	678		140
Zonas de Delimitadas	70,635				

Note:

EAP*: Economically Active Population more than 12 years.

1987*: Figures for 1987 include the Team's estimates.

Industrial Fishery* : Total figure includes employees, labor workers, crew members and also temporary workers employed by companies.

: Figures in parentheses show the crew members employed companies.

Artisanal Fishery* : Figures mean numbers of registered artisanal fishermen.

Source: INEC.

Inspectorías de Pesca,

Table 2-2-16

Labor Worker Estimate by Year, by Type of Fishing
Company According to Basis of Production

(Mano de Obra Estimada Por año y tipo de empresa pesquera, según base productiva)

Year and Type of Company	Total Persons	Fish Catches	Processing	Marketing
(Año y Tipo Cia.)	Total Persons	Extracción	Procesamiento	Comercializ.
<u>YEAR 1,988</u>	247,862	196,775	6,802	44,285
Processing (Proces.)	12,722	2,000	6,802	3,920
Culture (Cultivador.)	111,500	71,500		40,000
Ship Company (Armador.)	3,265	3,000		265
Larvae Laboratory	375	275		100
Part-time personnel for laborat. shrimp (Personal Temporal para cultivadoras)	120,000	120,000		
<u>YEAR 1,988</u>	147,768	129,565	6,268	11,935
Processing	10,658	1,890	6,268	2,500
Culture	49,135	40,000		9,135
Ship Company	2,675	2,450		225
Larvae Laboratory	300	225		75
Part time personnel	85,000	85,000		
<u>YEAR 1,988</u>	91,835	78,951	5,094	6,980
Processing	9,108	1,700	5,094	1,504
Culture	30,348	25,000		5,348
Ship Company	2,304	2,180		124
Larvae Laboratory	75	71		4
Part time personnel	50,000	50,000		
<u>YEAR 1,988</u>	90,928	80,016	6,855	4,057
Processing	9,868	1,678	6,855	1,335
Culture	20,676	18,000	0	2,676
Ship Company	384	338		46
Larvae Laboratory				
Part time personnel	60,000	60,000		

Source: Companies in operation (Empresas en Operación).

Table 2-2-17

Numbers of Crew Members of Industrial Fishery,
by Year, by Province, by Inspector's office
(1981-1988)

(Pescadores Industriales: 1981-1988.
Por años, según Provincias e Inspectorías de Pesca)

Provincias y Inspect. Pesca	Year (Años)							
	1981	1982	1983	1984	1985	1986	1987	1988
Total	3,152	3,435	3,253	3,266	3,279	4,513	4,247	4,626
ESMERALDAS	275	257	251	268	303	380	401	404
Esmeraldas	275	257	251	268	303	365	401	0
Limonas	0	0	0	0	0	15	0	404
MANABI	1,014	1,620	1,312	1,455	1,576	1,616	1,521	2,007
Cojimies	0	0	0	0	0	0	0	0
B. de Caráquez	0	0	0	0	0	0	0	0
Pto. Lopez	0	191	125	81	0	0	0	413
Manta	1,014	1,429	1,187	1,374	1,576	1,616	1,521	1,594
GUAYAS	1,863	1,501	1,658	1,512	1,341	2,483	2,319	2,215
Salinas	624	833	594	328	355	882	824	661
Chanduy	0	0	0	0	0	0	0	0
Playas	153	166	141	140	5	156	142	174
Posorja	529	405	519	522	433	438	404	494
Guayaquil	557	97	404	522	548	1,007	949	886
Puna								
ELORO	0	57	18	15	20	15	6	0
Pto. Bolívar	0	0	18	15	20	15	6	0
Puerto Jeli	0	57	0	0	0	0	0	0
GALAPAGOS (Pto. Baquerizo)	0	0	14	16	39	19	0	0

SOURCE: FISHERIES INSPECTORATE (FISHING LICENCES LIST)
Fuente: Inspectorías de Pesca (Listado de Permisos de Pesca)

Table 2-2-18

Registered Number of Artisanal Fishermen by Year,
by Province, by Inspector's office
(1981-1988)

(Pescadores Industriales: 1981-1988.
Por años, según Provincias e Inspectorías de Pesca)

Provincias y Inspect. Pesca	Year (Años)								
	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	2,258	3,300	3,797	2,852	3,300	6,602	5,467	3,941	5,903
ESMERALDAS	385	567	934	409	415	567	522	665	652
Esmeraldas	316	393	836	229	389	400	457	617	472
Limonas	69	174	98	180	26	167	65	48	180
MANABI	651	970	770	833	641	1,849	1,553	873	1,526
Cojimies	0	0	0	20	19	48	15	0	38
B. de Caráquez	109	222	0	250	277	843	325	184	243
Pto. Lopez	0	201	179	13	0	406	470	229	465
Manta	542	547	591	550	345	552	743	460	780
GUAYAS	1,044	1,282	1,687	1,252	1,808	3,554	2,240	1,970	3,031
Salinas	211	457	770	100	411	406	631	622	737
Chanduy	43	162	86	26	2	252	276	262	194
Playas	85	49	49	232	608	1,038	309	340	625
Posorja	166	213	531	118	375	867	208	218	502
Guayaguil	292	20	66	590	412	991	816	528	850
Puna	247	381	185	186	0	0	0	0	123
LOS RIOS (Babahoyo)	178	0	98	110	54	98	306	219	182
ELORO	0	360	272	146	266	397	600	72	372
Pto. Bolívar	0	310	230	109	246	364	600	72	327
Puerto Jeli	0	50	42	37	20	33	0	0	45
GALAPAGOS (Pto. Baquerizo)	0	121	36	102	116	137	246	142	140

SOURCE: FISHERIES INSPECTORATE (FISHING LICENCES LIST)

Fuente: Inspectorías de Pesca (Listado de Permisos de Pesca)

Table 2-2-19

Gross Regional Products of Manabi Province

Campos de la Industria	(A)		(B)		(C)	
	PIB (1978)		PRB (1978)		PRB (1987)	
	(s./mill.)	%	(s./mill.)	%	(s./mill.)	%
Agricultura, casa pesca	28,499	15.7	4,469	37.5	53,261	44.9
Minería	13,657	7.5	558	4.7	630	0.5
Manufactura	36,334	19.9	1,553	13.0	16,265	13.7
Electricidad y agua	1,491	0.8	82	0.7	256	0.2
Construcción	14,591	8.0	499	4.2	4,270	3.6
Comercio	29,415	16.1	2,022	17.0	17,265	14.5
Transportación	15,563	8.5	740	6.2	9,297	7.8
Finanzas	*		521	4.4	2,187	1.9
Servicios	42,714	23.5	896	7.5	14,996	12.6
Otros	**		578	4.8	378	0.3
Total	182,264	100.0	11,918	100.0	118,805	100.0

Fuente: (A) Ecuador: Memorandum Económico del País, Banco Mundial

(B) Junapla, Manabi, Indicadores Regionales, Documento

N. 4, Banco Central del Ecuador, Cuentas Nacionales

(C) Manabi en Cifras #3, 1989

Nota: GDP y GRP en precios corrientes.

* Incluido en Transportación

** Incluido en Servicios

Table 2-3-16 Exports of Fishery Products

(unit: MT)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total	145,841	148,011	162,443	69,781	155,042	308,102	268,952	200,128	219,791
Food	63,304	58,602	60,340	45,297	56,833	65,139	85,228	110,684	96,805
Canned	34,817	36,247	31,529	9,654	10,254	14,696	13,648	21,959	14,131
Tuna	3,055	4,028	3,873	2,508	2,816	3,238	3,224	5,179	6,186
Sardine	29,764	28,845	25,588	6,258	7,264	10,865	10,006	16,532	7,480
Mackerel	1,991	3,374	2,068	888	170	586	412	238	460
Bivalve	7	-	-	-	4	7	6	10	5
Frozen	28,364	22,178	28,712	35,577	46,432	50,070	69,261	83,060	76,662
Shrimp	9,643	12,133	16,966	23,535	19,073	20,172	30,683	48,912	49,746
Tuna	11,111	6,400	5,473	8,215	21,748	25,710	30,609	26,871	18,561
Sardine	423	525	-	-	575	-	1,175	1,117	2,916
Mackerel	5,827	2,154	5,239	3,300	2,980	2,450	5,269	4,026	3,937
White fish	1,314	924	1,004	497	1,966	1,641	1,401	1,971	1,219
Lobster	31	34	30	28	90	94	81	84	13
Squid	14	8	-	2	-	-	41	37	14
Others	0.5	-	-	-	-	2.96	2.05	42	256
Fresh	-	-	-	-	58	251	2,117	5,510	5,839
Tuna	-	-	-	-	5	26	70	400	518
White Fish	-	-	-	-	53	225	2,041	5,110	5,321
Lobster	-	-	-	-	-	-	6	-	-
Others	-	-	-	-	-	0	1	-	-
Dried & Salted	120	176	98	66	83	104	192	152	159
Shark Fin	57	52	70	51	62	63	61	74	93
Others	63	124	28	15	21	41	131	78	66
Living	3	1	1	-	6	18	10	3	14
Lobster	2	-	-	-	5	5	10	3	2
Others	1	1	1	-	1	13	-	-	12
Fish Meal	82,537	89,409	102,103	24,484	98,209	232,924	176,506	89,444	122,986
Fish Oil	-	-	-	-	-	10,039	7,218	-	-

Source: Institute Nacional de Pesca.

Table 2-3-17 Exports Amount of fishery Products

(unit: MT)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total	165,466	189,507	219,560	219,372	216,067	260,964	383,946	480,588	449,395
Food	132,309	150,138	184,197	208,936	180,274	200,478	332,538	451,749	397,309
Canned	48,458	54,737	44,316	14,749	16,157	21,010	19,378	29,066	23,170
Tuna	9,938	14,771	12,634	7,574	6,868	7,592	7,374	11,628	14,726
Sardine	35,578	36,165	29,417	6,497	8,943	12,711	11,258	16,975	7,749
Mackerel	2,908	3,801	2,265	678	328	672	715	417	673
Bivalve	34				18	35	31	46	22
Frozen	82,697	93,745	138,914	193,842	163,545	178,427	308,550	410,260	361,633
Shrimp	66,237	83,890	129,727	185,652	146,670	158,900	284,729	385,731	341,324
Tuna	11,922	7,009	4,799	6,105	12,962	15,580	19,120	19,224	16,461
Sardine	158	205			129		300	287	804
Mackerel	2,167	727	2,455	1,219	1,297	904	1,606	1,438	1,361
White fish	1,828	1,445	1,504	450	1,128	1,631	1,542	1,911	1,330
Lobster	359	456	429	412	1,359	1,406	1,184	1,608	261
Squid	23	13		4			64	51	21
Others	3	-	-	-	-	6	5	10	71
Fresh	-	-	-	-	102	371	3,605	11,454	11,645
Fish									
Tuna					15	40	113	1,045	1,154
White					87	331	3,441	10,409	10,491
Lobster							46		
Others	-	-	-	-	-	-	5	-	-
Dried & Salted	1,134	1,654	965	345	431	608	941	939	818
Shark Fin	641	716	715	261	320	403	322	557	538
Others	493	938	250	84	111	205	619	382	280
Living	20	2	2	-	39	62	64	30	43
Lobster	16				38	45	64	30	27
Others	4	2	2		1	17			16
Fish Meal	33,157	39,369	35,363	10,436	35,793	58,050	49,560	28,839	52,086
Fish Oil						2,436	1,848		

Source: Institute Nacional de Pesca.

Table 2-5-1(1) Population at the Study Area
(1990 Census)
(Poblacion en las Areas de Studio - Censo Anos: 1990)

Area	Item	Total	Rural		Annual Rate 1982-1990 (%)	
			Urban	Concen. Dispersed		
Jaramijo		8,207	--	7,905	302	3.1
Manta		122,426	122,426	--	--	2.5
San Mateo*		1,382	--	--	--	--
Manta Rural		4,049	--	--	4,049	2.7
(Santa Marianita)		--	--	--	--	--
(Liguique)		--	--	--	--	--
(Others)		--	--	--	--	--
San Lorenzo		3,114	--	715	2,399	1.5
Santa Rosa		--	--	--	--	--
Pto.Cayo		2,624	--	1,300	1,324	-5.0
Machalilla		3,285	--	2,720	565	3.1
Pto.Lopez		9,876	--	5,465	4,411	2.2
Total		154,963	122,426	18,105	13,050	2.3

Source: Inec and Ceplaes
Fuente: Inev y Ceplaes

Table 2-5-1(2) Artisanal Fishermen at the Study Area

Area	Population	No of Activity	Artisanal Fishermen	%
Jaramijo	8,207	2,188	500	22.9
Manta	122,426	32,027	700	2.2
San Mateo*	1,382	834	750	89.9
Manta Rural	4,049	1,601		
Santa Marianita	--	--	250	
(Liguique)	--	--	15	
(Others)	--	--		
San Lorenzo	3,114	710	40	5.6
Santa Rosa	--	--	40	
Pto.Cayo	2,624	639	150	23.5
Machalilla	3,285	764	400	52.4
Pto.Lopez	9,876	2,390	500	20.9
Total	154,963	41,153	3,345	

Data Notes:

No of activity is estimated based on the census "1982".
Percent represents ratio of fishermen to No of activity.

Table 2-5-2 Population Projection at the Study Area

Year	1982	1985	1995	2005
Areas				
Jaramijo	6,430	6,774	7,807	8,590
Manta	100,338	116,685	183,475	253,851
San Mateo*		1,382		
Manta Rural	3,271	const	const	const
(Santa Marianita)				
(Liquique)				
(Others)				
San Lorenzo	2,755	const	const	const
Santa Rosa				
Pto. Cayo	3,928	const	const	const
Machalilla	2,571	const	const	const
Pto. Lopez	8,311	const	const	const

Table 2-5-3 Distance between Fishing Villages and Market

(Km)

Areas	Consumer Market					
	Manta	Montecristi	Portoviejo	Jipi Japa	Guayaquil*	Quito
Jaramijo	10	25	45	58	206	400
Manta	---	15	35	48	196	390
San Mateo	12	27	47	60	208	402
Santa Marianita	18	43	53	66	214	408
Liquique	48	73	83	96	244	438
San Lorenzo	53	78	88	101	249	443
Santa Rosa	60	85	95	108	356	550
Pto. Cayo	75	67	87	27	175	442
Machalilla	94	85	105	45	193	460
Pto. Lopez	105	96	116	56	204	471

Table 2-5-4 Present Conditions of CPAs in the Study Area

Areas	Name of CPA	Members of CPA	Activity
Jaramijo	Alajuela	35	good
Manta	Los Esteros	23	good
San Mateo	San Mateo	42	excellent
Santa Marianita	Santa Marianita	78	not-working
Liquique	-	-	-
San Lorenzo	-	-	-
Santa Rosa	-	-	-
Pto. Cayo	Pto. Cayo	25	excellent
Machalilla	-	-	-
Pto. Lopez	Progreso	18	excellent
	Daniel Lopez	28	excellent
	Tulio Campozano	18	excellent
Salango *	20 de Enero	17	excellent

Note:

CPA at Santa Marianita is not working, and administrative concerned are trying to motivate for activity. Road conditions at Santa Marianita are very poor. They often deliver the fish catches using marine transport. Salango is 5km. apart from Puerto Lopez. 4 CPAs (Progreso, Daniel Lopez, Tulio Campozano, 20 de Enero) are now under negotiation to unite.

CHAPTER 3 FORMULATION OF THE MASTER PLAN

CHAPTER 3 FORMULATION OF THE MASTER PLAN

3.1 Basic Concept of Small-Scale Fishing Port

3.1.1 Present Situation of Artisanal Fishery

(1) Development Plan of Fishery Sector by the Ecuadorian Government

The development plan of the fishery sector is prescribed in the national development plan as follows.

1) National Socioeconomic Development Plan

The national socioeconomic development plan for the period 1989-1992 has targets for the fishery development such as:

- Annual growth rate of GDP by agriculture and fishery sector at a rate of 3.8%
- To improve the access to natural resources and to promote the fishery products for exports
- To increase the domestic consumption of the fishery products

2) Development Plan of the Fishery Sector in the National Development Plan

In order to achieve the national development goal, strategic outline for the development of the fishery sector is set as follows.

- To increase the size of fishing boats and modernize the fishing boats
- To construct the fishing port and center of the culture to give the fishermen the necessary services in for their catching activities, processing and commercialization.
- To intensify the investigation to obtain a rational evaluation, capture and efficient utilization of the bioquatic resources.
- To promote the fishing technology, based on the investigation and the training of the personal who work in the fishery sector.
- To seek the balance of the installed capacity of the industrial plants, in relation to the availability of the bioquatic resources.
- To benefit the installation of repairing berths for maintenance and repair of fishing boats.
- To promote the domestic consumption of the fishery products and to increase the exports of the fishery products.
- To revise the legislation and strengthen the organization of management, coordination and control of the fishing activities.

(2) Main Indices of Artisanal Fishery

Main indices of the artisanal fishery in Ecuador and Manabi are shown as follows.

1) Main indices of the artisanal fishery in Ecuador(1987)

GDP	:	159,016*10 ⁶	(in 1975 constant prices)
Population	:	9,920*10 ³	
GDP per capita	:	16,030 s/.	
GDP by sectors	:	Agriculture & Fishery	17%
		Agriculture	13%
		Fishery	4%
EAP	:	Total	3,340*10 ³ (100%)
		Agriculture & Fishery	1,150*10 ³ (34%)
		Agriculture	880*10 ³ (26%)
		Fishery	270*10 ³ (8%)
		Industrial Fishery	250*10 ³ (93%)
		Artisanal Fishery	20*10 ³ (7%)
Fish Catches	:	Total	679*10 ³ tons
		Industrial Fishery	591*10 ³ tons
		Artisanal Fishery	88*10 ³ tons
Exports(FOB)	:	Total	1,928*10 ⁶ US\$
		Fishery Products	419*10 ⁶ US\$
Domestic Consumption of Fish Products	:		82,826 tons
Per Capita Consumption of Fish Products	:		8.3 Kg

2) Main indices of the artisanal fishery in Manabi(1987)

GDP	:	10,514*10 ⁶	(in 1975 constant prices)
Population	:	1,040*10 ³	
GDP per capita	:	10,110 s/.	
GDP by sectors	:	Agriculture & Fishery	45%
		Agriculture	29%
		Fishery	17%
EAP	:	Total	300*10 ³ (100%)
		Agriculture & Fishery	140*10 ³ (47%)
		Agriculture	63*10 ³ (21%)
		Fishery	77*10 ³ (26%)
		Industrial Fishery	72*10 ³ (94%)
		Artisanal Fishery	5*10 ³ (6%)
Fish Catches	:	Total	251*10 ³ tons
		Industrial Fishery	228*10 ³ tons
		Artisanal Fishery	23*10 ³ tons*

* This figure shows the estimate at 1990.

3.1.2 Subjects and Solutions on the Development of Artisanal Fishery

(1) Development Goal of the Artisanal Fishery

Under the Socioeconomic Development Plan, an economic growth rate of 3.1% is set to be achieved, and the fishery industry is expected to play an important part to achieve this target. As mentioned in the preceding pages, a large increase in the amount of the fishery products is practically difficult under the present situation. The only way to achieve this is to plan the fishery development by solving the existing various problems facing the artisanal fishery together with fishery resources management. Considering the problems of the artisanal fishery in the study area as well as the national development policy, the development goal is set as;

-the stable and lasting development of the artisanal fishery

To realize the higher quality of the fish products rather than the increase of the fish catch volume, and to introduce the policy for improvement of the circumstances surrounding the artisanal fishery are urgently needed for the achievement of the above goal.

(2) Subjects in Achievement of the Development Goal

The followings are the subjects to be addressed for the achievement of the development goal:

-Improvement of the productivity efficiency, the products quality and the stable supply of fishery products.

-Establishment of the economic independent fishermen.

1) Improvement of the productivity efficiency, the products quality and the stable supply of fishery products

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 (an average increase rate 2.7% by the year 2000) 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 of fresh and frozen fish. Therefore, the higher quality and the supply increase by the artisanal fishery are expected to meet the demand. But, it is difficult to increase the supply sharply owing to the limitation of the fishery resources. Hence, the following policies should be taken into account to the artisanal fishery.

-To reduce the costs by improvement of the productivity efficiency

-To realize the higher quality and the stable supply of fishery products establishing the consistent system of fish landing, preservation and distribution

Such policies would make the artisanal fishery products more competitive in the domestic and exports markets, and as a result the stable and lasting development of the artisanal fishery would be realized.

2) Establishment of the independent artisanal fishermen
-Increasing the income of the artisanal fishermen

The average income level of the artisanal fishermen including non-boat owners estimated to be lower than the national average. In Manabi, the fishery industry shares 17% of the GRP. To establish the economic independent fishermen aiming the increase of income contributes to the stable development of the artisanal fishery as well as the economic activation of the fishery villages where the artisanal fishery is the main industry.

At present, the following factors are obstacles for the increasing income.

- Fish landing facilities for the artisanal fishery are non-existing.
- Joint cold storage facilities are non-existing.
- The fish catch volume by the individual fishermen is generally small.
- Many artisanal fishermen depend on the merchants to provide production capital, production materials and operation funds.

Under these disadvantageous situation, the incomes of the fishermen are fixed at a low level by their dealings through a merchant. Therefore, a new system of marketing the fish catches as well as the construction of facilities to improve productivity should be introduced. CPAs have been already organized at some villages in the study area. Sometimes, CPAs carried out the joint shipments to the markets, but such actions don't continue due to the lack of facilities.

Around 20% of the artisanal fishermen in the area join the CPAs, MICIP promotes to organize CPAs and gives CPAs various assistance such as administrative seminars and other activities. By having the CPA's participate actively in monitoring the usage of the fishing port facilities, it will be possible to continue the joint shipments. Such participations will also strengthen the feeling of solidarity among the artisanal fishermen.

At present, each fisherman deals with a specified merchant individually. There are many merchants visiting the villages, so after the introduction of the joint shipment system it will still be desirable to work with the merchants and make use of their networks and connections.

In the second stage, the CPAs (or the fishing port manager) would establish the fish market within the fishing port and sell the fish catches in place of the artisanal fishermen by adopting the joint sale system. Such measures would serve to increase the income levels of the fishermen as well as to establish the financial foundations of CPAs providing the commission sale fees for the CPAs. This in turn would enable the CPAs to carry out the educational programs for the promotion of the artisanal fishery.

(3) Solutions for the artisanal fishery development

The proposed solutions for the artisanal fishery development are as follows:

Subject	Solution
Improvement of the productivity efficiency, the products quality and the stable supply of the fishery products	Construction of the fishing port, Stable supply using storage facilities, Upgrade of the quality by the quality control, and increase of the demand of fishery products for food, Improvement of the fishing boats in the long term, Introduction of the fish resources management,
Establishment of the economic independent artisanal fishermen	Promotion of CPAs, Development of fishery product distribution, Establishment of fishermen's financing system, Improvement of fishery households, Development of fishing technology and training,

Above solutions (or measures) for the subjects are classified to the solutions by the administration side, the solutions by the fishermen themselves and the solutions by both sides. And above solutions are also divided into ones for the long term target and for the short term target. The construction of the fishing ports should be carried out as public works because the planned ports are infrastructures for the artisanal fishermen. The target year for the Master plan is 2005 and 1995 for the Priority plan.

The stable supply, quality upgrading and the increase of the demand for the fishing products should be addressed by the country in the view point of effective usage of the resources

and the national economy, and by the fishermen in the view point of the increase of incomes. Although there are differences between both view points, above measures can be achieved through the usage by the fishermen of the fishing port constructed officially. The measures are adopted when the fishing port is constructed. At first stage, the joint shipment system is adopted as the short term target, and at the second stage, the joint sale system is adopted as the long term target. It is necessary to implement the fish resources management for maintaining the stable development. These measures should be continued adding the existing survey by the cooperation of both sides.

Improvement of the fishing boats are carried out by the fishermen themselves, but this measure can be promoted by the administrative support especially by the construction of the fishing port. This measure is aiming for the improvement of the productivity efficiency in long term. The measures for the establishment of the economic independent fishermen should be implemented with the short term target.

3.1.3 Expected Role of the Small-Scale Fishing Port

The small scale fishing port is the most important infrastructure solving the subjects of the artisanal fishery, and the stable development of the artisanal fishery would be realized by solving the subjects through the administration and operation of the fishing port facilities including the main and functional facilities.

1) Production aiding functions

- Fish landing, outfitting and idling for the fishing boats, improvement of the operational stability,
- Reduction of the laboring works for landing and fish handling, improvement of the productivity efficiency,
- Easiness of refueling, ice loading and water supply,
- Provision of the safe anchorage and the boats storage area,
- Promotion of the inboard engine mounting on the small fishing boats,

2) Distribution aiding functions

- Installation of the storage, refrigerator and freezer neighboring the landing wharves,
- Provision of the storage facilities for a small amount of fish catches,
- Promotion of ice usage,
- Provision of the roofed processing area within the handling space,

As a result, these functions contribute to the improvement in the freshness and the quality of the fish catches.

- Achievement of the stable supply through the supply control.
As a result, this function increases the income of the fishermen.

3) Expected functions on management and operation

- Joining to the management and operation of the fishing port facilities by the artisanal fishermen,
And as a result, this function contribute to the followings.
- Activation of the existing CPAs,
- Increase of the fishermen joining CPAs,
- Promotion of the CPAs' activities such as joint shipment,
- Establishment of the economic independent fishermen,

- Provision of the opportunity for the fishery technology training,
- Promotion of the knowledge and technology concerning the fish handling and freshness improvement,
- Promotion of the knowledge of the marine security, such as the countermeasure for accidents,
- Promotion of the knowledge of the fishery households management,
- Implementation of the effective administration concerning the fishery and the marine security,
- Promotion of the fish resources management,

4) Indirect effect by the fishing port construction

- Enforcement of the fishery administration,
The fishing port and CPAs' organization are effective for implementing the fishery administration.
- Establishment of the distribution system for the fishery products,
The total distribution system from landing to consumption is to be improved through the usage of the fishing port directly and indirectly.
- Promotion of the fishermen's financing system,
The construction of the artisanal fishing port would promote the fishermen's financing system as the finance needs the secure and stable fishing activities.

3.1.4 Principles of Fishing Port Planning

The following are the basic aims of the Manabi fishing port construction plan. They are the result of consideration of the present state and future trends of the fishery, and the present fish landing methods used.

1) The master plans will be made harmonizing with the present and future fishing activities as well as the present conditions of infrastructures at the sites.

2) The target year of master plans is 2005.

3) Site of priority development is selected from master plans. The target year for construction of priority plan is 1995.

4) The priority plan should form the stage plan of the master plan. The priority plan should be limited to the facilities of which construction is urgently needed.

5) The fishing port built under the priority plan will be expected as model fishing port for artisanal fishery. The model fishing port will be planned in such a way that it plays the leading role in improving the production environment of the artisanal fishery as well as the present storage and distribution systems.

6) The planned port facilities will supply the needs of fishing boats under five tons considering the present conditions of the artisanal fishery.

7) Considering the trends of increased off shore fishing operations, the planned port facilities will be designed to cater for middle scale boats. Such provisions will also ensure the efficient employment of public capital. However, the facilities will be open only to middle boat operators who are independent in accordance with the original aims of the plan. (to support the small scale fishery)

8) In the master plan, port facility layout in Manabi will be arranged to supply the needs of middle scale boats.

9) All planned port facilities will be coordinated with adjacent infrastructures as well as land usage of surrounding areas.

10) Necessary facilities for the improvement of product quality and distribution rationalization will be planned. Functional facilities should also be adjusted with the existing private facilities.

11) Planned Facilities

The following are basic facilities to be constructed; handling space, icemaking plant, cold storage, fresh water tank, fuel oil tank, workshop, fishing gear handling space, administration building and others (warehouse, electrical facilities, road, greenbelt, etc.)

3.2 Site Selection

(1) Evaluation Criteria

A survey to evaluate the potential of developing fishing ports in the area between Jaramijo and Puerto Lopez was carried out over ten(10) existing villages selected in Manabi province. None of the fishing villages had any of the facilities necessary for small scale fishing villages except Manta site. Each village has been in need of fishing port facilities. Due to the high construction cost of such facilities, however, it is essential that investment capital shall be used as much efficiently as possible. It is imperative that all plans take into account the state of the fishing industries and social infrastructure in the areas under consideration and be adjusted appropriately.

In evaluating the present states of the existing physical elements, the following items were taken into consideration.

-Natural and Locational Conditions

- (a) Sea Conditions
- (b) Fishing Port Site

-Status of Adjacent Infrastructure

- (c) State of Roads
- (d) Existence of Public Facilities

-Fishing Industry Status

- (e) Artisanal Fishermen
- (f) Fishing Boats
- (g) Markets
- (h) Activities of Fisherman's Cooperative Associations

-Factors Related to Construction

- (i) Construction Cost
 - (j) Maintenance Management
-

(a) Natural and Locational Conditions

Conclusively, the evaluation criteria from the viewpoint of the natural conditions is decided as follows.

(A) Natural Conditions

Protective Structures

for Siltation Not Required Not Required Required Required

Sheltered Area Available Not Available Available Not Available

Evaluation

A

B

B

C

(b) Landside Conditions

(B) Land Availability

Land Constrains	No	No	Yes
Land Reclamation	Unnecessary	Necessary	Necessary
Evaluation	A	B	C

(c) Road Conditions

(C) Road Access

Paved Road	Yes	-	-
Temporary Paved Road	-	Yes	Yes
Traffic Restrictions	No	No	Yes
Evaluation	A	B	C

(d) Availability of Utilities

(D) Availability of Utilities

Water Supply	Available	Available	Not Available
Adequacy	Available	Not Available	Not Available
New Construction	Not Required	Required	Required
Evaluation	A	B	C

(e) Artisanal Fishermen

In evaluating artisanal fishermen statistics, A is given to villages where the fishermen population exceeds 500 or makes up more than 50% of the working population. B is given to villages where the fisherman population is below 500 or makes up less than 50% of the working population.

(E) Fishermen

Number of Fishermen	>500	-	100-500	<100
Fishermen/Workers	-	>50%	<50%	<50%
Evaluation	A	A	B	C

(f) Fishing Boat

This item is evaluated based on either criteria f1) or f2).

f1) Small Scale Fishing Boats

The small fishing boats are evaluated according to total number. When making evaluations, A is given to areas with more than 100 boats, B is given to areas with 30-100 boats and C is given to areas with less than 30 boats.

(F1) Small Scale Boats

Number of Small Boats	>100	30-100	<30
Evaluation	A	B	C

f2) Middle Scale Fishing Boats

When making evaluations, A is given to areas with 30 or more boats; B is given to areas with less than 30 boats and C is given to areas with no boats at all.

(F2) Middle Scale Fishing Boats

Number of Middle Boats	>30	<30	0
Evaluation	A	B	C

(g) Market

This item is evaluated based on either criteria f1) or f2).

g1) Consumption Market

(G1) Consumption Market

Access to Market	Good	Good	Good	Not-Good
Fisheries Companies	Yes	No	No	-
Number of Brokers	>30	>30	<30	-
Evaluation	A	B	C	C

g2) Export Base

(G2) Export Base

Access to Export Center	Good	Good	Good	Not-Good
Existence of Export Base	Yes	No	No	-
Number of Brokers	>30	>30	<30	-
Evaluation	A	B	C	C

(h) Activities of Fishing Cooperative Organizations

(H) Fishermen's Cooperative

Existence of CPA	Yes	Yes	Yes	Yes
CPA Activity	Active	Average	Not-Active	-
Evaluation	A	B	C	C

(i) Construction Cost

(I) Construction Cost

Unit Construction Cost	<50	50-80	>80
Evaluation	A	B	C

* Unit: thousand US\$

(j) Maintenance Management

(J) Maintenance

Repair Facilities	Available	No	No
Access to Facilities	-	Good	Not Good
Evaluation	A	B	C

(2) Site evaluation and selection

(a) Natural and Locational Conditions

There has hardly been any difference in the year-round climate for the area surveyed. The average temperature remains between 24 and 25 degrees centigrade all year round approximately. The mean rainfall is about 300 to 500mm per year. In 1983, however, the annual rainfall reached 1,500 to 2,500mm for the year due to the influence of El Nino. (see 2.5.2)

The wind speed of the area surveyed is not fast. The mean monthly wind speed is less than 3m/sec. (see 2.5.2)

Past meteorological records for the Manta area indicate the prevailing winds are westerly in the rainy season January to June and southerly in the dry season, July to December.

During the survey period, December to January 1990, average wave height for the Jaramijo, Manta, San Mateo, Machalilla and Puerto Lopez has been below one(1) meter. The relative calmness of these sites is attributable to the natural and artificial break-water at Manta commercial port in the northern villages. In the southern villages facing the Pacific, however, (Santa Marianita, Lingique, San Lorenzo Puerto Cayo) wave height often exceeds one meter. (see 2.5.2) Tidal range for the southern villages of Puerto Cayo, Machalilla, and Puerto Lopez corresponds to about 2.6 to 3 meters.

Small to medium sized rivers flowed through every village except Santa Rosa. The rivers flowing through Manta, Puerto Cayo and Puerto Lopez each put out a more than 10,000 cubic meters of silt per year but the rivers flowing through the other villages pose no particular problems. (see 2.5.2)

The rivers flowing through Puerto Cayo and Manta in particular put carry a lot of silt and will require some additional measures to cope with this during port construction. The river that runs into the sea near Puerto Lopez is about the same size as the river in Manta. Although the river current direction opposes the sea sand drift direction at the mouth of the river, this should not pose any problem to the port facility being constructed in front of the village due to the large distance between the two points.

(b) Landside Conditions

The shore is narrow in Jaramijo, San Mateo, Santa Marianita, Lingique and San Lorenzo. The beach extensions in Jaramijo, San Mateo, and Lingique especially are very short, resulting in fishing operations taking up most of the beach space.

Located 10 kilometers away from Manta, is the fishing village Jaramijo which has developed as an outer suburb of Manta. For this reason, the space available for fish landing is extremely limited due to the close proximity of fisherman's and ordinary citizen's housing. The beach area around Jaramijo is also relatively congested due to the presence of a ship building yard on the land behind the beach area. This makes it rather difficult to be able to use the area for fishing port purposes only. The villages San Mateo, Santa Marianita, Lingique and San Lorenzo are all true fishing villages and would pose no problems when constructing port facilities provided the necessary land can be secured.

(c) Road Conditions

The 200 km of main trunk roads that link Manta, Montecristi, Jipijapa and Guayaquil are all sealed and carry a large volume of traffic. The roads leading from Manta to the northern villages of San Mateo (12 km) and Jaramijo (10km) are also sealed and in good condition. From Manta the roads to Santa Marianita, Lingique, San Lorenzo and Santa Rosa are 18km, 30km, 35km and 42km respectively. From San Mateo the roads are unsealed and sometimes become impassable during the rainy season. Each of the towns has its own private road that connects with the main road between Santa Rosa and San Mateo.

The villages of Puerto Cayo, Machalilla and Puerto Lopez lie on the coastal road that runs off Jipijapa and leads to Guayaquil. The road between Jipijapa and Puerto Lopez is sealed and was completed recently (1990) but the road from Puerto Lopez and Guayaquil is unsealed in places. For this reason, the road between Puerto Lopez and Jipijapa is mainly used for transporting goods to the central cities.

(d) Availability of Utilities

Of the area surveyed, only Jaramijo, Manta and Puerto Lopez had water supply pipes running up to the shore area. In all three of these areas however, commercial large volume water users found the water supply inadequate and used tanker trucks to carry water to their own private storage tanks. This problem will be solved by 1995 however when the presently in progress water supply upgrading operations are completed. The four central fishing villages are connected to the interior with a communal pipe line due to the non existence of proper roads. The villages of San Mateo, Puerto Cayo and Machalilla rely on a pipe lines and water tanker trucks for their water supply.

(e) Artisanal Fishermen

Villages with populations of over 500 fishermen include San Mateo, Manta, Jaramijo and Puerto Lopez. Those with fewer than 50 fishermen include Lingique, San Lorenzo and Santa Rosa. As the percentage of the working population engaged in the fishing industry decreases with the size of the village, the percentages for Manta, Puerto Lopez Jaramijo and Puerto Cayo are relatively low but are high in San Mateo, 90%, and Machalilla, 60%.

(f) Fishing Boat

This item is evaluated based on either criteria(f1) or (f2).

f1) Small Scale Fishing Boats

The number of small fishing boats is usually directly proportional to the fishing industry populations of the various villages. The average fishermen/boat ratio is 3.6 fishermen per boat for the area as a whole and 2 fishermen per boat in Manta.

(Table 2-4-1)

f2) Middle Scale Fishing Boats

Middle scale fishing boat number predictions for the present (1990) 1995 and 2005 are as indicated in Figure 3-4-2. At present, only the statistics for Manta, Machalilla and Puerto Lopez have been estimated but estimations for Jaramijo, San Mateo will be carried out in the near future.

(g) Market

This item is evaluated based on either criteria(g1) or (g2).

g1) Consumption Market

The catch of the area surveyed is sent through broker to Quito, Guayaquil Portoviejo. (see Table 2-5-4(11)) Catches from the three northern and three southern fishing villages all reach the consumption markets with about the same degree of ease owing to the good conditions of the roads used for forwarding and the relatively high number of brokers. Manta itself is in a very accessible position as it already functions as a collection consumption point for catches taken from three northern and four southern villages. Catches taken from the four central villages of Santa Marianita, Lingique, San Lorenzo and Santa Rosa are forwarded irregularly due to the poor road conditions, the low number of brokers and the quality of the catches.

g2) Export Base

The catches of the area surveyed are mainly collected in Manta (the exporting capital of Ecuador) where they are frozen and canned before being exported. Manta usually receives catches from three northern villages and 4 southern villages. Catches from 3 southern villages are sent to either Manta or Guayaquil.(see Table 2-5-4(11))

(h) Activities of Fishermen's Cooperative

As was mentioned previously, the function of the CPAs is to manage catch distribution and to obtain finance from the various financing institutions. The Ministry of Fisheries is also planning to manage with the cooperatives the joint management of freezing, storage and other facilities. For this reason, an evaluation of the cooperatives activities is also necessary. Within the area surveyed, the villages of Santa Marianita, Lingique, San Lorenzo and Santa Rosa still do not have their own CPA (or they do but it doesn't function properly).

(i) Construction Costs

Construction costs for each port is assessed by the unit construction cost, dividing the total estimated construction costs by the estimated number of boats that will be accommodated by a

proposed port in 2005.

(j) Maintenance Management

Manta and Guayaquil are the only places in the Manabi and Guayas provinces with the equipments available for maintaining the facilities and facility buildings. For this reason, the three northern villages are in an advantageous position.

Evaluation of ten(10) villages are summarized as follows:
As a result, Manta, San Mateo, Machalilla and Pto.Lopez were selected for the sights for Master Plans.

Evaluation Items Jaramiyo, Manta, San Mateo

(a) Oceanography	B	B	B
(b) Available Space	C	A	B
(c) Accessibility	A	A	A
(d) Utilities	B	A	B
(e) Artisanal Fisherman	A	A	A
(f) Fishing Boat	A	A	A
(g) Market	B	A	B
(h) Activity of Cooperatives	B	B	A
(i) Construction Cost	A	B	A
(j) Maintenance	B	A	B

Evaluation Items	Santa Marianita,	Liguique,	San Lorenzo,	Santa Rosa
(a) Oceanography	B	B	B	B
(b) Available Space	B	B	B	A
(c) Accessibility	C	C	C	C
(d) Utilities	C	C	C	C
(e) Artisanal Fisherman	B	C	C	C
(f) Fishing Boat	B	C	C	C
(g) Market	C	C	C	C
(h) Activity of Cooperatives	C	C	C	C
(i) Construction Cost	B	C	C	C
(j) Maintenance	C	C	C	C

Evaluation Items	Pto.Cayo,	Macha-	Pto.Lopez
		lilla	
(a) Oceanography	C	A	A
(b) Available Space	A	A	A
(c) Accessibility	A	A	A
(d) Utilities	B	B	B
(e) Artisanal Fisherman	B	A	A
(f) Fishing Boat	B	A	A
(g) Market	B	B	B
(h) Activity of Cooperatives	A	C	A
(i) Construction Cost	C	B	B
(j) Maintenance	B	B	B

3.3 Fishing Boats for Project

(1) Planning Bases

Some planning bases are examined for the project engineering in the master plan. Planning bases provided here are numbers and sizes of fishing boats to be incorporated at each stage of the project, and also are production volumes that are estimated from these numbers of boats. Following conditions are assumed to establish planning bases.

1) Fishing boats to be incorporated in the project are those that are, or are possible to be, given the fishing permit of the artisanal sector under the present Fishery Law.

As mentioned before, the fishing boats of the individual management bodies by the industrial permit that are operated at landing spots without any port facilities are incorporated in the project so much as possible.

For avoiding overlap of the fishing port facilities, the boats of the individual management bodies by the industrial permit that are operated in Manta are classified into ones to be incorporated in the project and others. Same classification is applied to Jaramijo and San Mateo where these substantially belong to Manta from the aspect of the movement of the barcos of medium or large size.

2) Number and distribution of the fishing boats of the artisanal fishing permit (hereinafter 'small scale fishing boat') are based on the study results by Fallows et al. (1990). In order to keep the equilibrium fishery production and also to assist the fishermen's households in their fishery management, it is considered that some resource management will, in the course of time, be necessary to keep the fishing effort by the lanchas in the existing coastal fishing grounds as the present level. In this project, the number of vessels of the artisanal fishing permit is considered to be kept at the present level and neither increased nor decreased during the period of the project life.

3) Number of the fishing boats of the individual bodies by the industrial permit (hereinafter 'middle scale fishing boat') is based on the fishing permit records. Their locations are estimated from the registration records by the office of capitania in Manta. These fishing boats total 70 boats in the project area. The distribution is estimated as 43 in Manta, 2 in Jaramijo, 18 in Machalilla, and 7 in Puerto López. These boats are considered to increase by 15 boats in every year. The present 70 boats are presumed to terminate its life after 15 years.

4) The main particulars of the target boats are based on the fishing permit records. The landing volume per vessel is based on the INP landing statistics for the small scale fishing boats, and on the results of the socioeconomic survey and the site investigation for the middle scale fishing boats.

(2) Planned Numbers of Fishing Boats

1) Small Scale Fishing Boats

The assumptions in the previous section directly give the following planned numbers of the small scale fishing boats at the selected project sites in 1990 (present), 1995 and 2005.

Table 3-3-1 Planned Numbers of the Small-Scale Fishing Boats

	Manta	San Mateo	Machalilla	Pto.López
1990:	341	183	53	71
2005:	341	183	53	71

Note: Numbers in 1990 are based on the study by Fallows and Contreras (1990).

2) Middle Scale Fishing Boats

a) Classification of the Boats in Manta

Following figure shows the histogram of the gross tonnage of the middle scale fishing boats in south Manabi Province. When comparing the scales of boats in Manta with those in other districts by this figure, it is noted that the maximum frequency in Manta is observed at the class interval from 80 to 100GT, and in other districts from 20 to 40Gt, and also that these two groups can be divided at the class interval from 60 to 80GT.

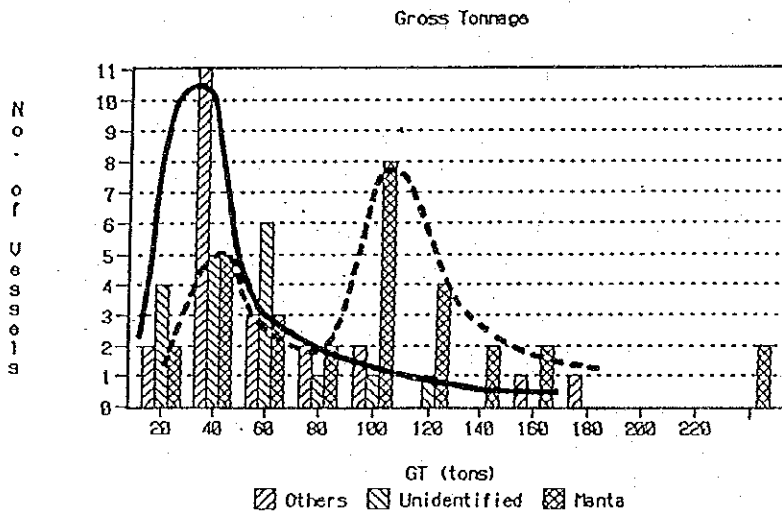


Fig. 3-3-1 Histogram of Gross Tonnage

b) Target Boats

Among the middle scale fishing boats, if the boats with no more than 80GT at Manta, Jaramijo, and San Mateo, and all the boats at other project sites, are planned to be incorporated in the project, number of the target boats by the project sites is shown in the following table. The sites that are not

shown in this table do not hold, as of 1990, the middle scale fishing boats. The boats that are excluded total 22 boats, that is to say, 48 boats, around 70% of the total, are planned to be incorporated in the project. Regarding the future increase of the boats in Manta, Jaramijo, and San Mateo, around 30% of the new boats are presumed to exceed 80GT and are excluded from the increase.

Table 3-3-2 Planned Numbers of the Middle Scale Fishing Boats

	Manta	San Mateo	Machalilla	Pto.López
1990 1):	23 (0)	0	16	8
Increment 2)	5 (2)	4	3	3
2005:	50(20)	40	45	45

- Remarks: 1) Boats of unidentified location are shared in proportion to the present numbers.
 2) Manta includes Jaramijo.
 3) Increment is shared in proportion to the present numbers of fishermen in the sites, after divided to 9:6 in northern 3 sites and southern 2 sites respectively by the present distribution of the boats.

(3) Catch per Boats

1) Boats of the Artisanal Fishing Permit

Average catch per boat..... 24 tons/year
 Operation 3 times/week, 150 times/yr.
 Catch: Large pelagic fish, white fish

2) Boats of the Individual Body by the Industrial Permit; Purse Seiner

Average catch per vessel.....1,100 tons/year
 (Machalilla: by interview)
 Operation 220 times/year
 Catch: Small pelagic fish

3) Boats of the Individual Body by the Industrial Permit; Long Liner

Average catch per vessel..... 50 to 70 tons/year
 (Estimation by the team)
 Operation 2 times/week, 70 times/yr.
 Catch: Large pelagic fish

(4) Planned Landing Volumes

Regarding the target year of 2005 for the Master Plan, the planned landing volumes are examined for the selected project sites under the following conditions.

a) If based on the fishing permits and the boats registration records, the present ratio of the numbers of purse seiner and long liner differs by the sites, and the average ratio in the project area is estimated as around 3:2. In this report, however, the numbers of these boats are planned to be equal in order to avoid fractionalizing the planning bases and then to keep flexibility of the plan.

b) Annual operation days of the planned port facilities are 280 days. All of the boats land catch everyday during this term.

For the examination of the Master Plan, annual and daily production volumes in 2005 that are planned under the above assumptions are shown in the following table.

Table 3-3-3 Planned Landing Volumes (2005)

Descriptions	Manta	San Mateo	Machalilla	Pto.López
Annual Landing : Mt/year				
Artisanal fishing permit.....1)	8200	4400	1300	1700
Industrial fishing permit				
Purse seiner.2)	27500	22000	24200	24200
Long liner...3)	1800	1400	1600	1600
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

Daily landing volumes in the above table are based on the assumption of the same arrival frequency in port for all the boats. The landing volumes at the peak day, in case that half of the lanchas (1) in the above) and long liners 3) land their catch on the same day, are estimated as 39.8 Mt/day for example of Manta, which does not differ so much with 35.7 Mt/day shown in the above.

Table 3-3-4 Present Landing Volume (average year) and Planned Volume

(A) Demersal Fish, Large Pelagic Fish

District	Present(1)	2005(2)	$((2)-(1))/(1)$
Manta/Jaramijo	9,100 tons	10,000 tons	10 %
San Mateo	4,000	5,800	45
Pto.Lopez	1,700	3,300	94
Machalilla	470	2,900	514
Total	15,270	22,000	44

(B) Small Pelagic Fish

District	Present(1)	2005(2)	$((2)-(1))/(1)$
Manta/Jaramijo	11,000 tons	27,500 tons	150 %
San Mateo	0	22,000	-
Pto.Lopez	6,600	24,200	267
Machalilla	17,600	24,200	38
Total	35,200	97,900	178

Based on the statistics of UNEPE and the results of the site survey, the total production capacity of small pelagic fish canned at Manta is estimated as around 30 thousands tons per year in raw material bases at least, together with the fish meal production capacity of around 43 thousands tons.

It is estimated that these facilities have the production capacity of around 5 thousands tons/year for small pelagic fish canned and around 72 thousands tons for fish meal. It can be considered therefore, that total around processing capacity of small pelagic fish in Manabi Province is more than 150 thousands tons at present.

3.4 Site Selection and Fishing Port Scale

3.4.1 Site Selection of fishing Port

Site selection for construction has been carried out for port of Manta, San Mateo, Machalilla, and Puerto Lopez.

It is necessary to consider the most suitable site for the fishing port construction after careful study of the social and natural conditions. The following items should be noted:

1) Ease of fishing boat operation and calmness of the mooring basin are essential. Each port except Manta is sheltered behind a cape on its south side. Each fishing port should also be located in the southern part of the town.

2) Littoral drift or sedimentation should be avoided, especially sedimentation transported from rivers.

3) The site should be located in the neighborhood of fishermen's house or fishery enterprises.

4) For the construction of the offshore facilities, especially rocky shores should be avoided.

5) The influence of a fishing port on existing towns and the neighboring landscape should also be taken into account. It should not be far away from the consumption market.

6) Site selection must match with urban planning or concept of coastal use of the government of Ecuador.

(1) Manta

To select the most suitable site, the shoreline of Manta was divided into following six areas:

- West side area
- Commercial port area
- Fishing port area
- Seaside resort area
- East side area
- Sea front area of airport

These six areas are shown in Fig.3-4-1.

1) West side area

- a) Rough waves attack the shoreline directly and reflected waves make complex waves in front of the existing breakwater.
- b) This area is a seaside resort for tourists and neighboring citizens.
- c) Fishermen's houses are located nearby, but few or no fishery enterprises are located in this area.
- d) Rock fields appear to be located on the sea bottom at about 500m from the shoreline.
- e) A beneficial feature to be considered is the absence of littoral drift, because there is no river in this area.

f) Currently, there is no fishing boat moor and land here.

2) Commercial port area

This area is utilized as a commercial port, and no sea area exists for the fishing port site.

3) Fishing port/La Poza area

- a) The existing fishing port(La Poza) was constructed about 20 years ago, and shoaling has occurred due to the flow of the Manta river and the El Nino phenomenon, 1983-1984. Water depth is around 0.00m
- b) The sea is calm due to the protection of the existing break water.
- c) Beautiful scenery is located by sealines.
- d) Since the center of Manta is located nearby, it does not take long time to transport fish catches to the consumer market, but it is far from the residential area for fishermen and processing factories.
- e) Currently, the highway along the shore has been congested. Manta city has been planning the expansion of existing road and another highway construction along the existing road.
- f) In the past, many alternative fishing port plans have been considered utilizing the existing port in this area.
- g) APM can easily administer and operate the fishing port facilities.
- h) There is a plan to utilize La Poza as a recreation zone in future.
- i) APM seems to be planning a fishing port in this area.

4) Seaside resort area

- a) This area is used as seaside resort area for Manta citizens at all seasons, and many hotels are located here.
- b) Water pollution has increased by sedimentation and sewage effluent.

5) East side area

- a) This area is called Tarqui. Fish landing is carried out by small boats throughout the day on this shoreline, and fish can be bought and sold.
- b) Many fishermen's house and fishery enterprises and factories, including EPNA, are located in this area.
- c) This area is an outside of protection from the existing breakwater.
- d) Sedimentation due to the Bravo river should be taken into consideration.
- e) There are two oil pipelines on the sea bottom which are hazards for boats anchoring, but they will be moved away.
- f) This area is far from the center of Manta.

6) Sea front area of airport

- a) This area is an outside of protection of the existing break-water, and rough waves attack the shoreline. The beach is under eroding conditions, so that existing roads are destroyed by erosion of the shoreline.
- b) Less sedimentation occurs in this area than at the other sites.
- c) There is only the airport behind this area, and there are no existing towns or houses in this area.
- d) The roundabout region is under the administration of the Air-Force.

Of the six areas mentioned above, the following four areas were rejected from the sites proposed for the reasons mentioned below.

West side area: being a recreational site for the west side of Manta.

Commercial port area: no room for fishing port planning

Seaside resort area: being a recreational site for the east side of Manta.

East side area: according to its location, it is difficult to administrate for APM as the commercial port.

Sea front of airport: difficulty to obtain land necessary for port due to the administration of Ecuador Air-Force

As the result, the fishing port area and the east side area were selected as alternatives.

(2) San Mateo, Machalilla and Puerto Lopez

At each port, the south-west part of the town is suitable for this project because the capes which are situated to the south east shelter the sites from waves.

The selected site of each port is shown in Fig. 3-4-2.

3.4.2 Fishing Port Scale

(1) Planned Fishing Boats

The fishing port scale has to be determined and based on the number and scale of planned fishing boats and the amount of planned fish catches.

The number of fishing boats in the master plan (2005) is described in Section 3.3, and shown for each port in Table 3-4-1.

Table 3-4-1 Planned Fishing Boats
(unit:boats)

	Manta	San Mateo	Machalilla	Puerto Lopez
Small Boats	341	183	53	71
Middle Boats	50*	40	45	45

* include Jaramijo

(2) Dimensions of Fishing Boats

Small boats:

Regarding the number of existing boats which are registered in Manta port, the relationship between gross tonnage and overall length, and breadth are shown in Fig. 3-4-2 and Fig. 3-4-4. Judging from these figures, the average dimensions of small boats are estimated as follows:

Overall length	8.35 m	
Breadth	1.87 m	
Depth	0.85 m	
Draft	0.70 m	(Depth x 0.84) (see Appendix 4.4.1(1))

Middle boats:

The histograms of ship size such as overall length, breadth and height of fishing boats, which are existing at Manta and other ports (Jaramijo, Machililla, and Puerto Lopez), are shown in Fig. 3-4-5. From the histogram of overall length, it is considered that there are two patterns, as 14-16m and 24m long boats.

With regard to Manta, this project is for middle boats which are less than 22m in length, because large boats are moored at commercial port area in Manta.

The average length and breadth of the middle boats which are more than 10m and less than 22m in length are 17.40m and 5.00m, respectively.

The maximum depth of middle boats except those which are more than 24m in length, is 3.00m, and the depth of the objective boats is estimated as 3.00m.

The dimensions of middle boats in the target year are summarized as follows:

Overall length	17.40 m	
Breadth	5.00 m	
Height	3.00 m	
Draft	2.52 m	(Depth x 0.84)

(3) Dimensions of Berth

The berth dimensions (water area for one boat) is determined as follows:

Berth length = Length overall of boat + surplus
 Berth width = Maximum breadth of boat + surplus
 Berth depth = Full load draft of the largest fishing boat mooring at the wharf + keel clearance

Standard surplus length and surplus width are as follows:

Surplus length = $0.15 \times L$ (L: overall length)
 Surplus width = $0.50 \times B$ (B: maximum breadth), or
 1.00m each at both sides of a vessel

Keel clearance is usually taken as 0.5m.

Therefore, the dimensions of berth for small boats and middle boats are determined as follows:

(unit:m)

	Length	Width	Depth
Small Boat	9.00	2.00	1.00
Middle Boat	20.00	7.00	3.00

(4) Required Length of Wharf

Wharves are classified as follows according to the purpose of use:

- 1) Landing wharf
- 2) Outfitting wharf
- 3) Idling wharf

Landing wharf is a wharf used mainly for landing fish catches from fishing boats, and the fishing boats are usually moored alongside the wharf.

Outfitting wharf is a wharf used mainly for supplying water, fuel, oil, etc., to fishing boats, for loading them by using appropriate facilities, and fishing boats are usually moored alongside the wharf.

Idling berthing wharf is a wharf used mainly for mooring fishing boats (including loading of fishing gear, food, etc.) and fishing boats are usually moored fore and aft along the wharf.

The required length of each wharf is calculated according to draft by the following expression.

-Landing wharf and outfitting wharf

$$\text{Required length} = N \times L/r$$

where,

L: length of berth = overall +surplus

N: number of fishing boats using port/day

r: number of rotations of the berth

$$= (\text{Hours allowed for using the berth}) / (\text{Landing or outfitting time for boat})$$

-Idling wharf

$$\text{Required length} = N \times B$$

where,

N: number of mooring boat/day

B: required length of berth of fore and aft mooring(breath + surplus)

The calculation was made for small boats and for middle boats separately. Required wharf length is calculated under the following preconditions.

-Precondition (1)

Landing, outfitting and idle berth wharves are provided for small scale and middle scale fishing boats.

-Precondition (2)

The mooring of small boats and middle boats should be as follows:

Table 3-4-2 The Mooring Method of Boat

	Small Boat	Middle Boat
Landing	alongside	
Outfitting	alongside (double)	fore and aft
Idling	fore and aft	fore and aft

-Precondition (3)

Under the expression of required wharf length, "r" may be calculated as shown in Table 3-4-3.

Table 3-4-3 "r" Value

	Hours allowed for mooring	Mooring hours per boat	"r"
Small boat: Landing	10	0.5	20
Outfitting	10	1.0	10
Middle boat: Landing	10	1.0	10
Outfitting	12	1.5	8

The required wharf length of each port may be calculated based on above value.

-Calculation (1)

The required length of each wharf at the four sites may be calculated based on the above values as shown in the following table.

Boats/Wharf	Item	Manta	San Mateo	Machalilla	Pto.Lopez
Small boats	No.	341	183	53	71
Landing	L	9	9	9	9
	r	20	20	20	20
	Length	154	83	24	32
Outfitting	L/2	9/2	9/2	9/2	9/2
	r	10	10	10	10
	Length	154	83	24	32
Idling	B	2	2	2	2
	Length	682	366	106	142
Middle boat	No.	50	40	45	45
Landing	L	20	20	20	20
	r	10	10	10	10
	Length	100	80	90	90
Outfitting	L	7	7	7	7
	r	8	8	8	8
	Length	44	35	40	40
Idling	B	7	7	7	7
	Length	350	280	315	315

-Calculation (2) (estimation by field survey at Manta)

During the 3 days, Dec. 26, 27, 28, 1990, the number of small boats entering and sailing were counted every fourth hours with the following results:

Table 3-4-4 Result of Field Survey (Manta)

Date	Time	Period (hour)	Boats (entering or sailing)	Boats/hour
Dec 26	13H-17H	4	278	70
Dec 27	07H-11H	4	114	30
Dec 27	13H-17H	4	76	20
Dec 28	07H-11H	4	124	31
Average		4	148	37

a) From the field survey, the average number of boats was about 40 per hour, and the required wharf length of landing for small boats is as follows:

$$\text{Required length} = N \times L/r = 40 \text{ boats/hour} \times 10 \text{ hours} \times 9/20 = 180\text{m}$$

- b) Regarding the difference at peak period, the number was 70 and the required length is as follows:
 Required length=70 x 9/6=105m
 where, landing time was estimated as 10 minutes per boat, and
 r=1 hour/10 minute=6
 From the results for landing wharf for small boats at Manta, the required length should be 150m.

(5) Conclusion

Accordingly, the required wharf length for each port should be as shown in Table 3-4-5. (in this Table, the minimum wharf length is calculated not less than 50m.)

Table 3-4-5 Required Berth Length at Each Port(2005)

Boat	Wharf	Manta	San Mateo	Machalilla	Pto.Lopez
Small boat	Landing	150	90	50	50
	Outfitting	150	90	50	50
	Idling	700	370	100	150
Middle boat	Landing	110	80	90	90
	Outfitting	50	50	50	50
	Idling	350	280	320	320
Total		1,510	960	660	710

3.4.3 Scale of the Shore Facilities

(1) Components of the Planned Facilities

The shore facilities in a fishing port for supporting the fishery production generally include fish conservation facilities, supply facilities, auxiliary facilities, administration building and others. For the examination of the Master Plan, following shore facilities are considered.

Table 3-4-6 Components of the Planned Shore Facilities

Purposes	Planned Facilities	Remarks
Fish handling	Fish Handling Space Transportation Equipment and Materials inside the port	Handling, cleaning, packing for landed catch
Conservation of fish	Cold Storage Freezer Ice Making Plant Ice Storage Fish Containers	For Manta
Supply for fishing vessels	Fuel Oil Tank Freshwater Tank Piping Arrangement	Gasoline and diesel oil
Maintenance for fishing vessels	Workshop of fishing vessels Fishing Nets Repairing Space	Maintenance for the engine Maintenance of fishing nets
Administration Bld. and others	Warehouse Electrical and Machinery Facilities Road inside the port Green Belt Parking Space Administration Building	Auxiliary facilities

As the domestic market for the frozen fish are underdeveloped at present, at three project sites other than Manta, freezer and cold storage of a lower temperature are not included in the Master Plan. In case of Manta where the export market for frozen fish is very active, a freezing plant is examined.

(2) Scale of the Planned Facilities

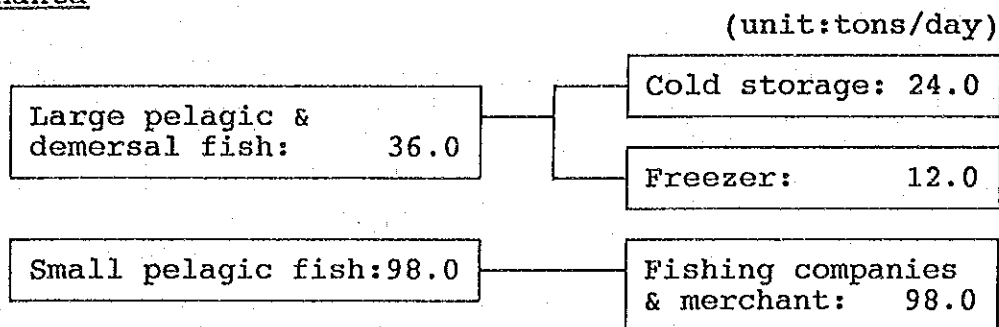
1) Assumed Conditions

For the examination of the scale of the planned facilities, following conditions are assumed.

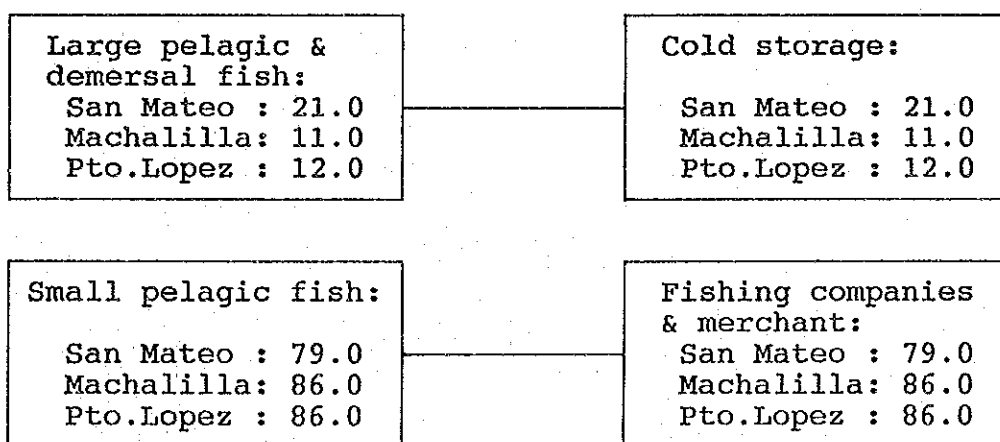
- a) Landing volumes
Landing volumes are planned based on Table 3.4-3. Landing volume in Manta includes those by the middle fishing boats in Jaramijo where the port facilities are not planned in the Master Plan.
- b) Distribution of the Fish
Considering the present distribution of the fish at each site, fish catches by planned facility are allocated as follows.

Allocation of fish Catches by planned Facility

Manta



San Mateo, Machalilla, Pto.Lopez



- c) Catch Conservation
Among the catch landed in the port, the cold storage conserves the demersal fish and large pelagic fish, and excludes from its conservation the small pelagic fish which are directly transported at present to the processing plants or the fish meal plants managed by the private sector.
- d) Conservation Temperature and Period
Conservation temperature is planned at approximately 0 Centigrade. Conservation period is planned as three days. Conservation period or turnover rate should be examined furthermore at the feasibility study to be made in order to obtain the optimum design to meet the distribution conditions.

at the project sites.

At Manta where the freezing plant is included, the ratio of frozen and fresh fish is planned as 1:2.

- e) Ice
The type of ice is planned as block type ice which is widely used in the project area at present.
- f) Administration Building
The administration building that is used by the management organization for the planned fishing port and by the fishermen's cooperative is examined to include in the plan. The office for the management organization is planned together with the room for the cooperative, if required, that is organized at the project site. It is also examined to include the service space for the governmental organization for the administration on fishing permit, boat registration and financial support. The meeting room is included in the administration building to facilitate the fishery training and extension services for the artisanal fishermen.
- g) Others
Fuel oil tank and freshwater tank are planned to cover all of the target fishing vessels. Regarding workshop, fishing gear repairing space, store, parking space and administration building, these facilities and space are provided at this stage with the approximate scale.

2) Planned Scale

- a) Cold Storage
The capacity of the storage is planned as to hold three days stock of catch with conservation temperature of 0 Centigrade. The stacking ratio is planned as 0.6 to enable the storage of fish contained in iced boxes. The ratio of fish and ice is planned as 1:1.

Manta	:	24 tons x 3 days ÷ 0.5 ÷ 0.6 = 240 cu.m
Pto.López	:	12 tons x 3 days ÷ 0.5 ÷ 0.6 = 120 cu.m
Machalilla	:	11 tons x 3 days ÷ 0.5 ÷ 0.6 = 110 cu.m
San Mateo	:	21 tons x 3 days ÷ 0.5 ÷ 0.6 = 210 cu.m

- b) Freezer
The capacity of the storage is planned as to hold 20 days stock of catch with conservation temperature of minus 30 Centigrade. The storage is made contained in pallet, carton or fish box. Blast freezer is planned to treat both of block and fillet of large fish.

Manta Storage	:	12 tons x 20 days ÷ 0.7 = 340 cu.m
Freezer	:	12 tons / day

c) Ice Making Plant

Generally, if including those required for the transportation of fish, ice of the same to twice quantity of the landed volume of fresh fish is desirable. It is necessary, however, to take also into consideration the operation costs of the ice plant which may sometimes give a burden to the management of the planned facilities, and then to plan the optimum production capacity. In this segment of the study, following production capacities are outlined;

Manta : 70 tons /day
Pto.López : 20 tons /day
Machalilla : 20 tons /day
San Mateo : 40 tons /day

d) Fish Handling Space

In this space, fish selection, washing and preliminary processing are made. The floor space approximately of a 200 to 400 sq.m is required for these works.

e) Fishing Gear Repairing Space

This space is used for the maintenance and repair of long-line, purse seine and gill net. The space is paved, but does not have erected structures. The reclamation of the area of around 1000 sq.m is examined.

f) Warehouse

The warehouse is planned to store fishery equipment and materials including various kind of fishing gear. The floor space of around 100 sq.m is examined.

g) Workshop

For the maintenance of outboard engine, the space to place around 10 engines is examined. In addition to this, work benches and tools are installed. The floor space of around 100 sq.m is examined.

h) Fuel Oil Tank

The fuel oil tank and piping facilities are planned for fishing boats. The capacity of the tank is planned for the provisions of 5 operation days. For an example of Manta, the capacities are examined by following way;

Manta:

Gasoline 200 ltr.x 150 boats(depart./day) x 5 days
= 150 Kltr.

Diesel oil 230 cc/hr/PS x 24 hr x 5 days x 140 PS
= 3900 ltr.

3900 ltr x 50 boats = 190 Kltr.

i) Freshwater Tank

The tank for freshwater to supply the fishing boats is examined. 5 ltr./day is considered as a planned supplying volume for a person.

j) Administration Building and Others

Approximately 150 sq.m is considered for the administration building. The reclamation of the parking area for 20 to 40 vehicles is examined.

Scale outlines of the planned shore facilities that are examined under the above conditions are shown in Table 3-4-7, together with the outlines of building area that are estimated from those of similar facilities in order to obtain the approximate reclamation area required for the planned construction site.

Food fish products are influenced by the future demand for food fish. Thus, fish consumption trends should be monitored in the future and the scale of the planned facilities should be reviewed and modified if necessary.

3.5 Fishing Port Layout Plan of Each Port

3.5.1 Layout Plan of Offshore Facilities

The fishing port layout of the master plan (2005) for each of the four (4) ports - Manta, San Mateo, Machalilla, and Puerto Lopez - was studied. To study the layout, the following items had to be considered:

- Security of fishing boat operation in the mooring basin.
- Considerations of wind, waves, tidal currents, sedimentation, erosion, sea depth, sea bottom, etc.
- The wharf for small boats will require a depth of 1.0m and for middle boats more than 3m.
- The calmness at the mooring basin should require as follows:

Landing wharf/Outfitting wharf	less than 0.30m
Idling wharf	less than 0.40m
Entrance of the port	less than 0.90m

(with the target of 90% yearly)

Accordingly, the landing wharf and outfitting wharf should be located at the back of the port, and the idling wharf outside of the port.

(1) Layout of main facilities

1) Manta (Ref. Fig. 3-5-1 (1) (2))

Required wharf length for master plan are followings:

Small boats	Landing	150m
	Outfitting	150m
	Idling	700m
Middle boats	Landing	110m
	Outfitting	50m
	Idling	350m
Total		1,510m

In Chapter 3.4.1, two alternative sites were selected for the fishing port in Manta - the Fishing port area and the East side area.

-Alternative (1) (Fishing port area)

- a) The calmness in the basin makes this preferable for maneuvering of the boats.
- b) As the counter measures for sedimentation or sand drift especially from Manta river, a training wall with -5.5m in depth is needed.

- c) For the use of landing and outfitting by the small boats, marginal type wharf will be planned on reclaimed land.
- d) Fishing port facilities will be constructed at reclaimed land, along its shoreline landing and outfitting wharf for small boats are arranged.
- e) For the use of idling wharf by the small boats, marginal type wharf will be planned including jetty and reclamation.
- f) Loading wharf (110m) for the middle boats will be marginal type wharf constructed by reclamation. Outfitting wharf (50m) and idling wharf (350m) will be constructed along the training wall.
- g) Water depth of mooring basin for the middle boats is planned as -3.0m.

-Alternative (2) (East side area)

- a) Calmness is less than alternative (1), and it will be needed to backfill the west side of the wharves as a breakwater to get the necessary calmness.
- b) Sedimentation discharges from the river Bravo should be taken into account, and a training jetty, which will be used as an idling wharf, is planned on the left side of the river.

The fishing port layouts were studied taking the above into consideration. The layout of each plan is shown in Fig. 3-5-1(1) (Fishing port area), and Fig. 3-5-2(2) (East side area).

Comparison between two alternatives is tabulated the followings. So, alternative (1) is recommended.

2) San Mateo (Ref. Fig. 3-5-2)

In master plan the required length of wharves will be as follows:

Small boats	Landing	90 m
	Outfitting	90 m
	Idling	370 m
Middle boats	Landing	80 m
	Outfitting	50 m
	Idling	280 m
Total		960 m

As rock fields are located on the sea bottom in the west area, this should be taken into consideration.

Comparison of Alternatives of Manta Fishing Port

Item	Alternative(1)	Alternative(2)
Calmness	Breakwater is not necessary	Breakwater is necessary
Sand Drift	Little Direction:from east Countermeasure are not necessary	Little Direction:from east Countermeasure are not necessary
Sedimentation Discharge	Supplied from Rio Manta Rio Manta:46,000m3/year Training jetty is necessary (-5.5m)	Supplied from Rio Bravo Rio Bravo:8,000m3/yaer Training jetty is necessary (-4.0m)
City Planning	It is possible to use the coastal area efficiently balancing the recreation zone. Road improvement will be planned from fishing port to airport.	This zone is used for fishery activities and recreation. Since the recreation zone is located between commercial port and fishing port, the future expansion of recreation zone will not be possible.
Fishery Activities	Far from existing fishery processing plant and fishing villages. Close to the central area of Manta and fish market.	Avilable for the usage of the planned fishing port since the proximity of fishing villages and fishing processing plant.
Construction Cost	Main Facilities About 3.5 billion yen	Main Facilities About 4.9 billion yen

As the beach width is narrow, large amount of reclamation will be required. To keep calmness in the harbour, breakwater has to be constructed.

3) Machalilla (Ref. Fig. 3-5-3)

In the master plan, the required extension of wharves will be as follows:

Small boats	Landing	50 m
	Outfitting	50 m
	Idling	100 m
Middle boats	Landing	90 m
	Outfitting	50 m
	Idling	320 m
Total		660 m

To prevent from shoaling by the sedimentation discharges from the Manta river and sand drift, middle scale groin will be required. Breakwater which keeps calmness will be also needed.

4) Puerto Lopez (Ref. Fig. 3-5-4)

In the master plan, the following length of wharves will be required:

Small boats	Landing	50 m
	Outfitting	50 m
	Idling	150 m
Middle boats	Landing	90 m
	Outfitting	50 m
	Idling	320 m
Total		710 m

Breakwater which keeps calmness in the harbour will be required owing to waves at Puerto Lopez which is higher than other three fishing ports.

Small scale groin will be required to prevent from sand drift in the harbour since right side of the breakwater is easy to deposit sand.

(2) Study of Calmness

The calmness was studied under the following conditions:

- 1) The critical height of waves for possible fish landing and outfitting is generally taken as 0.3m, and its frequency is less than 90%. Therefore, the above mentioned height of waves was studied in front of the fish landing wharf and

outfitting wharf. As for the idling wharf and the entrance of the port, it was taken as 0.4m and 0.9m respectively.

- 2) From the results of study at Manta and Puerto Lopez, the height of wave with a frequency of less than 90% not-exceeding is estimated to be 1.0m. At Pto.Lopez, the height of waves is estimated to be 1.8m from the results of above height. The appearances of waves in each port were studied applying the above height of waves to the port entrance at each site proposed.
- 3) The period of waves was taken as 15 sec. from the results of observations of waves, because the waves from the open sea have much influence on it.
- 4) As the direction of waves is also influenced by rollers from the open sea, the direction was presumed by making a diagram of the refraction from offshore to a pertinent point.

Under such wave conditions, calmness at each fishing port for master plan are shown in Fig. 3-5-5,- 8.

For Manta alternative (1), landing and outfitting wharf keeps calmness under 0.3m and 0.6m for idling wharf. (90% non-exceeding) (Ref.Fig.3-5-5(1))

But, under stormy condition, the water area is categorized into two parts. One has the calmness under 0.5m, the other between 0.5-1.0m. (Ref.Appendix 3.5.1(1)) In this case, stormy condition is defined such as; deep water wave direction:NW, deep waterwave height:3.0m(provability of occurrence:1.3%).

Sometimes, anchoring of small boats is difficult at the area where wave heights are between 0.5-1.0m. So, it is necessary to make countermeasures for small boats taking into account of the future improvement of the existing breakwater from the view point of long term development.

For Manta alternative (2), required calmness will be kept by development of existing breakwater (720m).

For San Mateo, Machalilla and Puerto Lopez, the planned breakwaters can keep the required calmness.

(3) Assessment of Beach Deformation

Simulation on the beach deformation in Manta and Pto.Lopez, where the beaches have been deformed by the past El Nino events has been conducted for the period of 50 years.

1) Manta

The results of the simulation study on two alternatives are presented in Fig.3-5-9,-12. In alternative (1), an circular current in the right bank is detected, being caused by a training jetty. In the site outside of the influential area of the

training jetty, which is located 2 km east from the proposed port area, the westward circular coastal current is observed with velocity of 0.1 m/sec. Shoaling is found at the specific site only. The possibility of loss of a port function due to shoaling is hardly conceivable. In alternative (2), the wave direction is changed by the effect of the construction of the proposed port. A circular current is observed in both sides of the port. Shoaling would be more or less 30 cm only for 50 years. No serious problem on shoaling is anticipated.

2) Pto.Lopez

The results of simulation study are shown in Fig.3-5-13,14. Assumption employed is that $H_0=2.0$ m and a wave direction is WNW. The rocky point is slightly projecting in the west side of Pto.Lopez coast. The proposed breakwater will not substantially change a wave direction and current. The coast has a steep slope seabed and the little discharges from the beach. Hence, the littoral drift is slight. Shoaling problem will be scarce.

3.5.2 Layout Plans of Functional Facilities

Considering the movement of the fish catches, the layout plans of onshore and offshore facilities are adjusted together. As for Manta, the landing berth will be planned along the reclaimed land northwards of La Poza breakwater at parallel to the shore as well as San Mateo, Machalilla and Puerto Lopez. So, each site has functional facilities behind the landing berth appropriately. The movement of landed fish catches is such as: landing berth-fish handling space-storage facilities-transport (outside of fishing port area). In order to realize this movement smoothly, onshore facilities are planned based on the model layout plan shown in Fig. 3-5-15. Layout plans of functional facilities of Manta, San Mateo, Machalilla and Puerto Lopez are shown in Fig.3-5-16 based on the required scale of functional facilities defined in 3-4.

3.6 Construction Schedule

3.6.1 Basic Facilities of Fishing Port

(1) General

Basic facilities of fishing port are as follows: breakwater, training jetty, water basin, landing wharf, outfitting wharf, idling wharf, slipway, revetment.

1) Breakwater

Major factors will be wave conditions for basic design of the breakwater and wave loads to be estimated on the basis of records of winds and waves. The design wave height will be that with a recurrence period of 50 years.

With respect to the structure of the breakwater, a rubble mound type, concrete block type and composite concrete block type will be recommended due to good availability of materials supply such as rocks and cobble as well as good foundation soils in the locality. Fig.3-6-1 shows the alternative breakwater types. (Ref. Table 3-6-1)

2) Landing wharf, outfitting wharf and idling wharf

The design depth in front of wharf will be determined in accordance with the draft of the maximum fishing boat and depth allowance for the purpose as -3.0m (D.L).

The surface elevation of wharf will be determined on basis of the tidal range, and the deck height of the boat for use of ship's gear during the full tidal cycle and handling methods, etc.

The surface elevation of the wharves will be varied in accordance with the objective fishing boat to avoid the difficulty of landing from boat on to the berthing apron due to a higher crest level than the required elevation.

Slip way type wharf is recommended as landing wharf for small boats. But, there are few cases of this type for landing, it is desirable to reconfirm of this type from the user's view point.

3) Slipway

The slipway will be used for repair of boats, temporary laying up and it will be divided two types, inclined type and lifting type. In this project, inclined type is adopted.

-Inclined type

The slipway will be designed on the basis of the boat size and type, and soil conditions for its foundation.

(2) Principle of Fishing Port Design

Fishing port design covers the design of the basic facilities required for the fishing port. Therefore, it is important to assess requirements for the fishing port properly. The following matters must be considered;

- 1) Local conditions in the Republic of Ecuador for safe operation and maintenance in development of the fishing port.
- 2) Ease of maintenance and management during and after construction. Selection of structures must allow for the importance and lifetime of the facilities.
- 3) Influence on the neighboring environment of hinterland (noise, bad smell, accident of oil storage tank in fishing port, etc. and influence on neighboring landscape, sea water, sand drift, tidal current, waves, etc.).
- 4) Ease of adjustment to the wishes of inhabitants, existing public works and future plans.
- 5) Selection of structures and types of quaywall according to conditions such as the method of use, type and size of fishing boat using the quaywall, construction methods and costs, accumulated construction experience, procurement of construction materials and construction equipment and reliability of construction.

Basic types of quaywall are classified as follows;

- Gravity type quaywall
- Sheet pile type quaywall
- Stair type
- Floating pier type quaywall
- Open type quaywall

In this project, open type quaywall is adopted for -3.0m depth and gravity type quaywall for more than -3.0m depth from the economical reason.

(3) Design Conditions

1) Basic principle of design

In Ecuador, there seems to be no established design criteria and methodology for port and harbor facilities. For this reason, the Technical Standards and Commentaries for fishing port and facilities, published by the Nationwide Fishing Port Association, Japan, will be used as the design criteria.

2) Design conditions for berth

This project is based on a long-term plan targeted for the year 2005 and a short-term plan targeted for 1995.

Depending on the extent to which the proposed fishing port will be expected to perform distributive functions in fishing activities, it is conceivable that the ship size considered in the present design will show an increasing tendency.

3) Design parameters for quays
Principal particulars of design ship

Based on analysis of the operation plan of ships considered in the study, the ship characteristics given in Table 3-6-3 have been selected for design purposes.

Table 3-6-3 Dimensions of Planned Fishing Boats

Vessel Type	Length (m)	Breadth (m)	Molded depth (m)	Displacement tonnage (ton)
Small scale fishing boat	8.35	1.87	0.85	less than 5GT
Middle scale fishing boats	17.40	5.00	2.52	

Note: Figures in brackets indicate light-load drafts.

The design depth alongside the berth will be -3.0m (DL) for a purse seiner, the same value as the planned depth and -1.0m (DL) for small boats respectively.

4) Crown level of quay
Determination of the crown level for the proposed berth takes into account of the maximum tide level, the ground level of adjacent highways, investment efficiency of the proposed fishing port, and other relevant factors.

In the present design, the crown level of 3.5m may be adopted on the basis of an analysis of tidal observation data for 1989 and the ground level of nearby highways.

The 1982/1983 El Nino (ENSO) was the worst in Ecuador in recent years. In Manta Port, the all time high sea level of 3.456m was recorded at the beginning of 1983.

The existing ground level of highways running near Manta Port was estimated to be +3.40 -+4.10m. (D.L.)

5) Berthing speed
The speed of a ship immediately before it comes alongside the berth varies depending on the maneuvering technique used. In the case of design vessels with an overall length of 16m, however, it seems that the berthing speed is generally 40cm/sec, or more, in most cases.

In the present design, it is assumed that the design speed of 50cm/sec for the fishing vessels will be adopted in accordance with the Technical Standard.