Chapter 11 MANAGEMENT AND OPERATION

A. Organization of APG

1) Organization

1. The Port Authority of Guayaquil (APG) consists of the following functional structure;

- Director
- Executive (General Manager)
- Counsel Function
- Administration Function

The above is in accordance with organic disposition approved in force by DIGMER.

2. The organization chart is shown in Figure I-11-1. The organization of APG was reformed on Nov. 8, 1993, abolishing 3 departments, 7 sections and integrating 4 sections into 2 sections. At present, modernization plan of APG is being examined by Unity of Coordinator and Executor for Ports Modernization Plan (Unidad Coordinadora y Ejecutora del Plan Modernizacion Puertos, UNCEMP). UNCEMP, under the control of DIGMER, and assists APG. According to the data of UNCEMP, the business of information division will be transferred to a private company/entity and this division will be abolished.

3. The Board of Director supervises the Port Authority and consists of the following members;

- Entity President: appointed by the President of the Republic
- Port Captain: substitutes for the President in case of his absence
- Representative of Ministry of Financial and Public Credits
- Representative of Ministry of Industry, Commerce and Integration and Fishery
- Representative of Ministry of Public Works and Communications
- Two user delegates assigned by Chamber of Commerce and Industry

4. The functions and responsibilities of the Board of Director are as follows;

- To present annual report of activities to DIGMER
- To recommend the ternary candidate of General Manager to DIGMER
- To appoint the Department Chief from candidates nominated by the General Manager
- To approve the balance of accounts and other reports
- To approve the port service regulations presented by the General Manager
- To approve the investments, acquisitions and other acts necessary to complement port operation, authorized by the General Manager

5. The Director holds a meeting at least twice a month (extra ones if the need arises), with at least four members present; resolutions require a majority of votes. The General Manager is present at the meetings. A summary of the meeting is sent to DIGMER no later than fifteen days after the meeting.

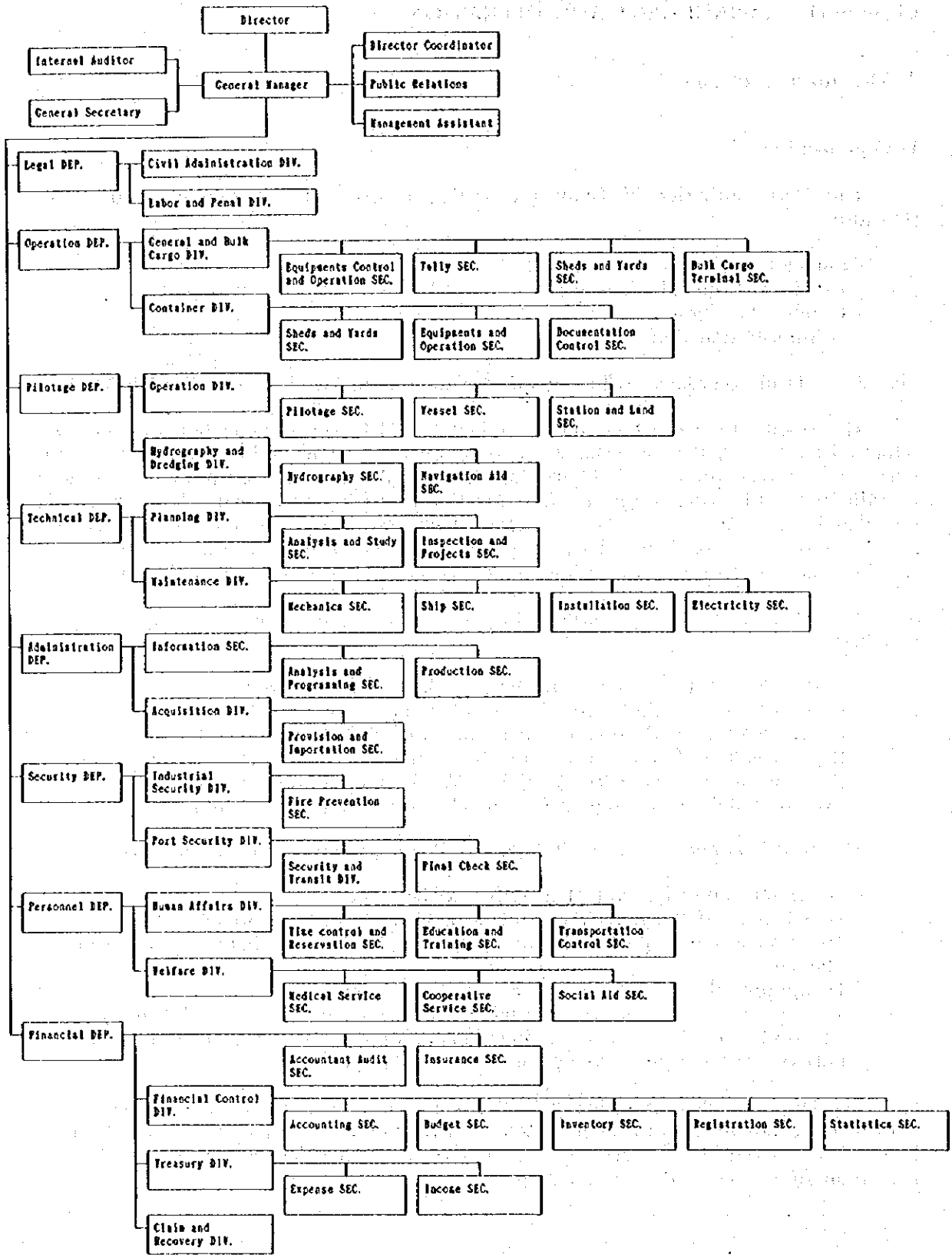


Figure I-11-1 Organization Chart of APG

6. The General Manager, the highest-level executive, is appointed by DIGMER from three candidates nominated by the Board of Directors of APG. He administrates the affairs of APG in accordance with Port Administrative Laws and policies laid down by the Board of Directors. The main functions of the General Manager are as follows:

- Present the data such as budget, trimester activities report, minutes of meeting, agreements, decisions etc. in accordance with laws and regulations or requests of Directors, to the Board of Directors and obtain it's approval.
- Make development plans of the port according to the policy of the Board of Directors.
- Approve studies on port operation and necessary investment to conduct port activities provided the cost is less than 200,000 sucres.
- Approve and transfer of personnel based on the Labor law and other relevant laws.

7. The Counsel Function consists of Internal Auditor and Legal Counsel. The Administration Function consists of General Secretary, Director Coordinator, Management Assistant, Public Relations, eight Departments, and there are Divisions and Sections under the Department.

8. Director Coordinator is in charge of coordinating the relations between the General Manager and Board members.

9. Management Assistant monitors the activities of the port management body using reports of the department chief and makes reports at the request of the General Manager. Also, he maintains good relations and passes on information between the General Manager and department chiefs.

10. The Internal Auditor is a qualified assessor and is nominated by the National Government Inspector. His principal functions are to examine the financial condition and efficiency of port administration, and suggest improvements. He also evaluate the condition of properties and checks the cash flow situation from the monthly report. The Internal Auditor informs the Board of Director of all aspects that affect port development or port interests.

11. The General Secretary is in charge of making a good working environment so that the General Manager can conduct business. When General Manager is present at the meeting of Directors, he is in charge of make the minutes of meeting, reports for Directors and collecting document ordered by the Entity President.

12. The Public Relations Office is responsible for maintaining good relations between the Entity and the public.

13. The Legal Department assists in all legal matters involving the Entity.

14. The Operation Department is in charge of the berth allocation, cargo handling, cargo storage to warehouse or yard, operation of equipment for cargo handling etc..

15. The Pilotage Department is in charge of pilotage for vessels that enter the port area and tug boats to assist in berthing and departing according to the regulations of pilotage and navigation.

16. The Technical Department is responsible for port planning, maintenance, repair and improvement of port facilities and so on.

17. The Administrative Department is responsible for general affairs and information required by management. There is a central computer in this department.

18. The Port Security Department is responsible for employee safety and also deals with cargo theft and fires.

19. The Personnel Department is responsible for personnel affairs, including personnel transfer, labor union and training of employees.

20. The Financial Department is responsible for financial affairs such as income and expenditure, budget, properties and statistics.

B. Personnel Management

1) Number and Wage

21. In APG, personnel is able to classified into two categories, employee and labor. Labor's occupational categories are cargo handling, equipment operators, crews of pilot boats, craft man, messenger and so on. But some employees are in charge of cargo handling, guard etc. so that the classification on occupation is not clear.

22. Table I-11-1 shows the number of personnel of APG by Department as of Dec. 31 from 1990 to 1993 and Apr. 30, 1994.

Table I-11-1 Manpower of APG by Department

	1990	1991	1992	1993	1994
General Manager Office	4	5	4	3	3
Internal Auditor	11	10	8	5	5
Director Coordinator	4	3	4	3	3
Public Relations	2	3	3	1	1
Secretary General	8	6	6	3	3
Management Assistant	2	2	2	1	1
Files & Microfilm	2				
Legal DEP.	8	8	9	5	5
Operation DEP.	377	346	349	220	217
	463	425	419	296	296
Pilotage DEP.	52	50	48	44	45
	79	73	71	64	63
Technical DEP.	87	90	87	55	55
	156	181	195	145	145
Administration DEP.	61	60	59	32	32
	2	2	2		
Security DEP.	207	225	239	167	166
	6	12	12	10	9
Personnel DEP.	75	88	100	67	68
	66	97	108	80	80
Financial DEP.	103	100	102	57	58
TOTAL	1,003	996	1,020	663	662
	772	790	807	595	593
	1,775	1,786	1,827	1,258	1,255

Note: Upper rows are employees, lower rows are labors
Source: APG

23. The number of employees and labors gradually increased up to 1992. But in 1993 the number suddenly decreased (employees are 357, labors are 212) because of many dismissals, both of employees and labors under the modernization plan of APG.

24. Table I-11-2 shows the base wages and average monthly wages of employees by category and labors. Wages are paid every two weeks for employees and every week for labors.

Table I-11-2 Average Wages per Personnel per Month

(Unit: sucres)

Wage Rank		1990		1991		1992		1993	
Category	Post	Wage	Number	Wage	Number	Wage	Number	Wage	Number
10	Director General	386,830	1	502,879	1	580,000	1	1,522,500	1
		557,635		974,687		1,229,466		3,335,782	
9	Chief of DEP.	200,692	9	261,947	8	331,733	6	660,660	7
	or Equivalent	388,064		607,130		1,311,138		2,065,668	
8	Chief of DIV.	137,547	19	182,335	20	255,162	19	315,251	16
	or Equivalent	374,507		505,191		865,853		1,483,672	
7	Chief of SEC.	110,601	56	146,723	56	213,846	60	284,413	34
	or Equivalent	325,540		440,764		716,605		1,370,239	
6	Officer	92,387	38	122,296	40	179,111	42	229,069	24
	or Equivalent	244,467		321,344		563,410		943,223	
5	Ditto	89,419	63	122,215	62	176,758	60	227,074	36
		289,423		393,678		642,682		1,163,032	
4	Ditto	87,572	189	118,825	187	174,317	188	223,818	123
		282,977		398,021		670,283		1,150,001	
3	Ditto	85,911	166	117,490	164	172,825	167	222,786	117
		264,458		365,900		600,192		1,052,167	
2	Ditto	83,686	336	116,345	347	170,491	358	221,290	247
		245,513		325,335		551,265		967,245	
1	Ditto	82,849	88	114,628	95	169,595	103	219,391	46
		224,148		292,373		489,987		933,791	
0	Ditto	82,605	2		0	169,120	2		0
		188,702				286,045			
	Pilot	166,350	18	275,418	16	341,950	16	655,371	16
		610,170		1,121,653		1,687,554		2,304,492	
	Labor	86,106	764	118,017	795	172,999	805	222,934	596
		293,740		411,798		695,072		1,223,228	
Average Wages and		88,799	1749	121,670	1,791	177,115	1,827	234,548	1,263
Total Number of Manpower		281,474		389,900		652,403		1,159,907	
Growth Rate (%)				37	2	46	2	32	-31
				39		67		78	

Note: Upper rows are basic wages, lower rows are average wages
Source: APG

25. The growth rate of basic wages has exceeded 30% since 1990. In 1992, the growth rate exceeded 40%. The actual average monthly wages including the various benefits reached 1,159,907 sucres in 1993, which is about 4.9 times as much as basic wages.

26. There is no regular recruitment system of personnel in APG. The mandatory retirement age is 65, but it applies to laborers only, not employees.

2) Working Conditions

27. The main rules concerning labor conditions are stipulated in the First Principal Labor Union Contract Between APG and Personnel (Primer Contrato Colectivo Unico de Trabajo Entre A.P.G. de Guayaquil y Sus Trabajadores). Employees and labors have formed separate unions, namely respectively Association of Employee Syndicate (Asociacion Sindical de Empleados, ASEAPG) and Institution of Labor Syndicate (Sindicato de Obreros de la Institucion, SOAPG)

28. According to the above contract, working hours and shifts are as follows;

1st	1:00	-	8:00	(Meal hour	7:00	-	8:00)
2nd	8:00	-	17:00	(Meal hour	12:00	-	13:00)
3rd	17:00	-	1:00	(Meal hour	17:00	-	18:00)

29. Some personnel who occupy business concern to organization management are work on 2nd shift in principle, and holiday is Saturday, Sunday and National holiday. Another Personnel and labors who occupy business concern to port services are work on three shift system and have holidays by turns.

30. Concerning the overtime work allowance, payment increases by 50% of basic hourly salary from 17:00 to 24:00 and 100% from 19:00 to 6:00. If employees work on holidays, they will get twice as much as ordinary payment. This allowance is paid only for employees ranked lower than the category number 8th in the Table I-11-2.

31. For massive equipment, such as forklift, tractor head and mobile crane, a special license for operator is required. However, APG does not provide subsidies for obtaining the license, as APG employs only persons already licensed.

32. As mentioned above, there are two labor unions in APG, namely ASEAPG and SOAPG. ASEAPG was established on Aug. 11, 1979 and SOAPG was established on Feb. 25, 1959. Employees except managerial class are free to join the labor union and about 62% of all employees are members of the ASEAPG and about 97% of all labors are members of SOAPG in 1993 as of Nov. 8, 1993. In APG, the Personnel Department is in charge of labor issues. There are no regular meetings between the Department and the labor union, and in case of need for negotiation, General Manager, Chief of Financial Department, Chief of Personnel Department, Chief of Administration Department and Chief of relation department attend a meeting. The most important issue of the unions is Labor Union Contract Between APG and Personnel which stipulates working conditions, working hours, benefits, welfare for personnel and so on, and is revised every two years.

33. Similar unions are established in the other three commercial ports in Ecuador, Esmeraldas, Manta and Bolivar. And these four unions form National Federation of Workers in Ecuador Portareas (Federacion Nacional de Trabajadres Portuarios Ecuatrianos), but it does not control the union of each port.

3) Training System

34. There is a training center in APG run by the Personnel Department for the purpose of developing personnel's administrative and operative faculties. In 1993, the training center prepared 13 training courses, and it was held 15 times in all, as a result 370 persons participated it. APG's personnel is able to participate in other training courses that are held by Chamber of Commerce and Industry of Guayaquil, Port of Esmeraldas, General Auditor of State; 25 people participated in 1993. The main courses held by training center and other centers are as follows.

Training center:	Header, Port Security, Crane Operation, Concerned with Warehouse and Yards, Tally Technic, Truck and Fork-Lift Operation, Secretary Technic, etc.
Other centers:	Security Seminar, English, International Commerce, Public Contract, Financial Administration and Modern Control, Apply Computer for Programming and Construction Control etc.

35. There is no criterion for selection to participate in the training, and each department, division and section select appropriate persons. There were no participants in training course, seminars and meetings held in foreign countries in 1993.

C. Tariff System

36. APG has a tariff table which is used at all ports in Ecuador. The present tariff which came into effect Jun. 1, 1993 is classified into three categories, namely tariff for ships, tariff on cargo and tariff for service. The tariff for ship is paid in dollars, tariff for service is paid in sucres and tariff on cargo is paid in dollars or sucres. Table I-11-3 shows the main rate of port tariff.

37. Pilotage and tugboat are compulsory for every ship. The renting tariff in tariff for service includes the equipment operators, in any case the mechanical equipment is always worked by the Port Authority's personnel. The time unit, hour, day or month, is fixed according to the item and every period of fraction is considered as a whole unit.

38. At present, Port Authority is able to set the port tariff itself with approval of DIGMER, and a new tariff system has been studied by UNCEMP form a part of modernization. According to the data of UNCEMP, the new tariff will be classified into three categories, tariff for ships include the charge of enter port,tariff for concession, tariff for use the port facilities or equipment.

Table I-11-3(a) Tariff for Ship

Tariff Item and Description				Unit	Normal	Addition	Minimum
Pilotage			draft is up to 7.6m	US$/GRT	0.05		
			draft is more than 7.6m	%		20	
			speed is more than 8knots	%		50	
		minimum charge		US$			188.70
Tug boat				US$/GRT	0.05		
		minimum charge		US$			127.50
Berth & Buoy				US$/GRT/24h	6.63		
		minimum charge		US$			811.00
Anchorage			up to 5days		free		
			more than 6days	US$/m/24h	3.315		
Wharfage on Cargo							
	Import	general Ca.		US$/(MT or m³)	5.86		
		on pallet		US$/(MT or m³)	5.35		
		bulk Ca.		US$/(MT or m³)	3.77		
		container	up to 20ftr	US$/CNTR	117.30		
			more than 21ftr	US$/CNTR	204.00		
		minimum charge for B/L		US$/ B/L			12.75
	Export	general Ca.		US$/(MT or m³)	3.83		
		on pallet		US$/(MT or m³)	3.26		
		bulk Ca.		US$/(MT or m³)	2.49		
		container	up to 20ftr	US$/CNTR	49.73		
			more than 21ftr	US$/CNTR	66.83		
		minimum charge for B/L		US$/ B/L			9.56
	Transit	other than container		US$/(MT or m³)	7.65		
			load & discharge(2moves)	US$/(MT or m³)	8.67		
		container	up to 20ftr	US$/CNTR	80.00		
			more than 21ftr	US$/CNTR	90.00		
		empty container & chassis	up to 20ftr	US$/CNTR	35.00		
			more than 21ftr	US$/CNTR	45.00		
Facility Maintenance Charge				US$/TRB	0.10		

Source: APG

Table I-11-3(b) Tariffs on Cargo

Tariff Item and Description				Unit	Rate
Cargo handling					
	Import	general Ca.		Su./(MT or m^3)	700
		on pallet		Su./(MT or m^3)	600
		bulk Ca.		Su./(MT or m^3)	450
		container	up to 20ftr	Su./CNTR	15,000
			more than 21ftr	Su./CNTR	20,000
		dangerous/hazardous	explosion	Su./(MT or m^3)	6,500
			except explosion	Su./(MT or m^3)	3,100
		minimum charge for B/L		Su./ B/L	6,500
		food,fertilizer etc.		Su./MT	330
	export	general Ca.		Su./MT	240
		on pallet		Su./MT	220
		bulk Ca.		Su./MT	210
		banana,fruit		Su./MT	190
		container	up to 20ftr	Su./CNTR	1,600
			more than 21ftr	Su./CNTR	2,130
		dangerous/hazardous		Su./MT	1,910
Storage					
	Import	general Ca. & on pallet	up to 10days	Su./(MT or m3)/day	free
			more than 11days	Su./(MT or m3)/day	52
		bulk Ca. (warehouse)	up to 7days	Su./(MT or m3)/day	20
			8 to 15days	Su./(MT or m3)/day	40
			more than 16days	Su./(MT or m3)/day	60
		(silo)		Su./silo/day	50,000
		(tank)		Su./tank/day	15,000
		container (up to 20ftr)	up to 10days	Su./CNTR/day	free
			more than 11days	Su./CNTR/day	1,200
		(more than 21ftr)	up to 10days	Su./CNTR/day	free
			more than 11day	Su./CNTR/day	12,950
		transit Ca. (domestic)		Su./(MT or m3)/day	52
	export	general Ca. & on pallet	up to 10days	Su./(MT or m3)/day	free
			more than 11days	Su./(MT or m3)/day	20
		bulk Ca. (warehouse)		Su./(MT or m3)/day	20
		(silo)		Su./silo/day	33,000
		(tank)		Su./tank/day	13,040
		container (up to 20ftr)	up to 10days	Su./CNTR/day	free
			more than 11days	Su./CNTR/day	200
		(more than 21ftr)	up to 10days	Su./CNTR/day	free
			more than 11days	Su./CNTR/day	300
	transit	general Ca.	up to 15days	US$/(MT or m3)/day	free
			more than 16days	US$/(MT or m3)/day	0.62
		container (up to 20ftr)	up to 30days	US$/CNTR/day	2.06
			31 to 90days	US$/CNTR/day	5.00
			more than 91days	US$/CNTR/day	8.00
		(more than 21ftr)	up to 30days	US$/CNTR/day	2.58
			31 to 90days	US$/CNTR/day	6.00
			more than 91days	US$/CNTR/day	9.00
		chassis	up to 30days	US$/CHASSIS/day	2.78
			31 to 90days	US$/CHASSIS/day	7.00
			more than 91days	US$/CHASSIS/day	10.00
	empty container & chassis	container (up to 20ftr)	up to 30days	US$/CNTR/day	2.06
			31 to 90days	US$/CNTR/day	5.00
			more than 91days	US$/CNTR/day	8.00
		(more than 21ftr)	up to 30days	US$/CNTR/day	2.58
			31 to 90days	US$/CNTR/day	6.00
			more than 91days	US$/CNTR/day	9.00
		chassis	up to 30days	US$/CHASSIS/day	2.78
			31 to 90days	US$/CHASSIS/day	7.00
			more than 91days	US$/CHASSIS/day	10.00

Source: APG

Table I-11-3(c) Service

Tariff Item and Description			Unit	Rate
Lease of Equipment	crane	up to 15t	Su./hr	50,000
		16 to 30t	Su./hr	70,000
		more than 31t	Su./hr	90,000
	fixed crane 75t		Su./hr	150,000
	container crane		Su./hr	110,000
	DEMAG crane		Su./hr	150,000
	gantry crane		Su./hr	300,000
	top lifter	up to 15t	Su./hr	25,000
		16 to 30t	Su./hr	50,000
		more than 31t	Su./hr	100,000
	truck		Su./hr	20,000
	platform	10t	Su./hr	12,000
		11 to 30t	Su./hr	18,000
		more than 31t	Su./hr	25,000
	tug bort	up to 1200HP	Su./hr	200,000
		more than 1200HP	Su./hr	350,000
	HITACHI unloader		Su./hr	45,000
	pilot boat		Su./hr	50,000
	chassis		Su./hr	15,000
	tractor head		Su./hr	15,000
Special Service	unstuffing	up to 20ftr	Su./CNTR	40,000
		more than 21ftr	Su./CNTR	60,000
Service of Equipment	lift-on empty container		Su./CNTR	4,000
Weighing	user's request		Su./MT	50
	heavy vehicle for export(except banana)		Su./MT	130
Water Supply			Su./m^3	current price x 1.3
Electric Service			Su./KWH	7,000
Telephone Service			Su./day	5,000
Labor Service	foreman,worker(3),tally man		Su./hr	22,600
	forklift operator		Su./hr	5,800
	crane operator		Su./hr	4,600
	general labor		Su./hr	4,100
Pallets Lease			Su./day	1,000
Lease for other Attachment			Su./day	3,000

Source: APG

D. Financial Situation

1) Financial Condition

39. APG is financially independent from Central Government getting no subsidy. Conversely, APG contributes to DIGMER, General Auditor and Culture House. This contribution have been calculated by certain rate on revenue, the items of revenue are not same, and ratio are respectively 2%, 0.5% and 2%.

40. Table I-11-4 shows the Profit and Loss Statement of APG in recent four years and as of Apr. 30, 1994, and includes working ratio, operating ratio of port operation and personnel expenses. Working ratio means the proportion of operation expense excluding depreciation versus operating income, operating ratio means the proportion of operation expense versus operating income, and personnel expenses ratio means the proportion of operation expense excluding depreciation versus personnel expenses.

41. In 1993, APG has shown a loss on net income before contribution, be caused by low increase of operation revenue and suddenly increase of personnel expense. The increase of personnel expense are, as a result of difference payment retroactive to 1992, by collective contract which has been concluded every two years. On Apr. 30, 1994, the personnel expense was about 30 billion Sucres as a result of payment of dismissal allowance for personnel who was dismissed in 1993.

42. Concerning the working ratio, the value decreased from 1990 and in 1992 almost 60%, but in 1993 it suddenly increased and reached 85%. It was mainly caused by increase of personnel expense. Concerning operating ratio and personnel expense ratio, the tendency is similar to the working ratio, and was respectively 88%, 76% in 1993.

43. Table I-11-5 shows the Balance Sheet of APG in recent four years and as of Apr. 30, 1994. Assets of APG was gradually increased from 1990 to 1992, but in 1993 it decreased to 81 billion Sucres. Long term loans are on loan from International Reconstruction & Development Bank (IDB) and New Scotland International Bank (BANS). The borrowed year and amount of loan, ID and BANS are respectively, 1976, 33,500 thousand dollars and 1977, 10,000 thousand dollars. Both of these loans are used for fill the port expansion project cost, development of the all institution for container and bulk cargo.

Table I-11-4 Profit and Loss Statement of APG

(Unit: Thousand sucres)

	1990	1991	1992	1993	1994(Apr.)
Operation Revenue	22,511,719	38,551,389	56,366,584	62,704,562	29,186,016
Ships Charge	20,101,504	34,783,772	51,457,904	58,364,164	25,777,289
Cargo Charge (Import)	574,374	938,727	1,150,649	1,344,158	561,999
(Export)	117,939	187,633	214,291	264,953	119,210
(Storage)	1,164,399	1,804,426	1,877,846	1,320,569	1,840,643
Service	383,334	676,765	1,372,165	1,060,622	724,782
Lease	170,169	160,066	293,726	350,096	162,093
Fixed Asset	70,882	64,942	70,148	94,166	48,995
Equipment	99,288	95,124	223,578	255,930	113,098
Operating Expenses	16,389,242	25,760,089	35,169,549	54,895,968	33,533,707
Personnel	12,546,844	18,701,367	23,278,996	40,435,142	30,035,628
Base Wages	2,260,135	3,117,139	4,159,228	6,157,467	1,433,647
Benefit	10,231,486	15,399,154	18,806,160	33,886,998	28,385,001
Dismissal Allowance	23,403	160,823	0	3,495,819	17,016,351
Others	10,208,083	15,238,331	18,806,160	30,391,179	11,368,650
Pension	55,223	185,074	313,608	390,677	216,980
Administration	1,709,670	4,394,419	8,156,451	9,354,064	1,903,312
Maintenance and Repair	1,702,098	4,394,419	8,156,438	9,354,064	1,903,312
Hydrographical Survey	7,572	-	13	-	-
Articles of consumption	1,496,902	2,146,665	2,126,125	2,719,486	819,205
Other expenditure	300,651	1,118	9,678	20,659	0
Depreciation costs	335,175	516,520	880,169	1,648,487	536,185
Dredging of Rio Guayas			718,130	718,130	239,377
Net Operating Income	6,122,477	12,791,300	21,197,035	7,808,594	-4,347,691
Non-Operation Revenue	784,002	1,088,976	837,293	1,123,150	471,967
Financed Interest	549,884	539,564	17,017	135	0
Forfeit etc.	195,336	471,242	779,887	1,028,567	433,593
Others	38,011	75,684	34,020	14,180	7,384
Assets Sale	771	2,486	6,369	80,268	30,990
Non-operating Expenses	4,175,392	7,032,475	10,947,197	9,879,197	4,753,410
Commissions & Interest on loans	2,138,502	4,009,819	6,498,939	2,897,725	2,333,226
Adjustment of Exchange Rate	2,036,890	3,022,656	4,448,258	6,981,472	2,420,184
Non-operating Income	-3,391,390	-5,943,499	-10,109,904	-8,756,047	-4,281,443
Net Income Before Contribution	2,731,087	6,847,801	11,087,131	-947,453	-8,629,134
Contribution	556,757	3,109,464	2,241,023	2,538,004	784,620
General Auditor	99,730	162,787	208,133	261,353	97,898
DIGMER	411,090	642,021	881,786	1,044,000	75,000
Culture House	45,937	618,974	994,435	1,057,649	611,722
Others		1,685,682	156,669	175,002	0
Net Income After Contribution	2,174,330	3,738,337	8,846,108	-3,485,457	-9,413,754
Working Ratio (%)	71	65	61	85	113
Operation Ratio (%)	73	67	62	88	115
Personnel Expenses Ratio (%)	78	74	68	76	91

Source: APG

Table I-11-5 Balance Sheet of APG

(Unit: Thousand sucres)

	1990	1991	1992	1993	1994(Apr)
(Assets)	48,994,870	62,268,436	87,858,283	81,468,276	76,320,876
Current Assets	18,932,010	15,419,834	29,163,715	31,123,644	29,232,599
Cash & Deposit	11,974,870	4,250,252	10,116,629	4,347,225	4,512,452
Other Current Assets	6,957,140	11,169,582	19,047,086	26,776,419	24,720,147
Fixed Assets	11,116,410	17,298,765	17,654,047	17,003,713	16,406,889
Land	195,192	195,192	195,192	195,192	195,192
Buildings	324,558	378,065	386,841	386,841	388,626
Equipment	11,594,204	18,234,807	19,455,298	20,384,447	20,315,880
Equipment	2,449,716	4,383,493	12,773,397	13,090,906	13,269,694
Equipment in Transit	9,144,488	13,851,314	6,681,901	7,293,541	7,046,186
Revaluation of Assets	1,368,229	1,367,850	1,367,624	1,366,107	1,365,820
Accumulated depreciation	-2,365,773	-2,877,149	-3,750,908	-5,328,874	-5,858,629
Other Assets	18,946,450	29,549,837	41,040,521	33,340,919	30,681,388
(Liabilities and capital)	48,994,870	62,268,436	87,858,283	81,468,276	76,320,876
Liabilities	28,614,189	38,689,512	57,198,276	55,406,052	60,048,987
Current Liabilities	6,651,606	9,183,248	15,048,276	17,436,052	15,078,987
Short-term Loans	5,870,556	7,529,507	11,127,601	16,207,783	11,478,594
Other Current Liabilities	781,050	1,653,741	3,920,675	1,228,269	3,600,393
Fixed Liabilities	21,959,396	29,506,264	42,150,000	37,970,000	44,970,000
International Institution Loans	21,959,396	29,506,264	34,550,000	30,370,000	37,370,000
Commercial loans	0	0	7,600,000	7,600,000	7,600,000
Other Credits	3,187	0	0	0	0
Capital	20,380,681	23,578,924	30,660,007	26,062,224	16,271,889
Available	12,280,404	6,236,586	14,115,439	13,687,592	14,153,612
No Available	8,100,277	17,342,338	16,544,568	12,374,632	2,118,277

Source: APG

2) Method for Depreciation of Assets

44. The policy of depreciation of fixed asset is based on the straight-line method. This method is more suitable than the fixed-percentage method, for ports which require an enormous amount of initial investment, because the depreciation of assets can be calculated on even bases annually over a comparatively long term. Durable years of APG assets are shown in Table I-11-6.

Table I-11-6 Durable Years of APG Assets for Depreciation

Item	Durable Years
1. Building, Wharf and Dredger	20
2. Floating Equipment (Tugboat - Buoy)	10
3. Wheeled Equipment (Folk Lift, Crane)	10
4. Wheeled Equipment (Vehicle)	5
5. Furniture and Implement	10
6. Computer Equipment	5

Source: APG

E. Port Operation

1) Management of Ship Entering and Departure

45. The Port Authority renders services to vessels every day of the year without any interruption 24 hours a day, with the exception of Dec. 24, from 17:00 till 8:00 of Dec. 26 and Dec. 31 from 17:00 till 8:00 of Jan. 2, with 1 hour interruption in each shift for meal time.

46. Ecuadorian or foreign ships navigating or maneuvering within the maritime Port Authority jurisdiction zone are under the established norms in the Republic's Regulations of Pilotage and Harbor Piloting.

47. The priority of pilot service is given by the ship's arrival day and time at the sea buoy, informed through Guayaquil Coastal Station. The priority for docks, berths and other facilities given by the Port Authority, are provided in order of arrival to the quarantine area in the port of Guayaquil. But the banana vessels are given priority over the general cargo, when going to load fruits.

48. Table I-11-7 shows the boarding members and business for procedure of ship's import, at Guayaquil Coastal Station in DATA, at Quarantine Anchorage or Wharf. In case of the full berth or depth of berth is less than ship's draft, ships have to wait at quarantine anchorage and follow above steps. If the berth is vacant and ship's draft is less than 26 feet, the ship directly comes alongside the berth.

Table I-11-7 The procedure of ship's import

PLACE	BOARDING MEMBER	BUSINESS
DATA	Pilot	Navigation Aid
QUARANTINE ANCHORAGE or WHARF	Pilot	Navigation Aid
	Customer	Receive the Cargo Manifest
		Receive the List of Personal Effects
	Port Captain Officer	Receive the Cargo Manifest
		Receive the List of Crews
		Receive the List of Personal Effects
		Receive the Entry Permit of Last Port
	Doctor of International Health	Receive the Health Certification
	Immigration Control Officer	Receive the List of Crews
		Passport Check
		Issue the Entry Permit

Source: APG

49. The shipping agency requesting the services to the vessels must present to the Port Authority the following documents:

- An advanced notice of arrival and estimation of the ship's departure with 72 hours prior to arrival in the waiting zone for the pilot.
- General cargo manifest.
  Import: 24 hours before the unloading operation begins.
  Export: 48 working hours after the ship's departure.

- Bill of Loading, according to the cargo manifest.
  Import: at the beginning of the unloading operations.
  Export: within 48 working hours after the ship's departure.
- Export documents required at the shipment date.
- Import Cargo unloading plan and roll by hatchway: 24 hours before starting the unloading operations.
- Tally book: 6 hours before the loading or unloading operations.
- Confirmation of weighing anchor: 2 hours before the berthing.
- List of dangerous cargo of previous ship's arrival at the pilot's waiting zone.
- In the case of containers, a list identifying them individually, and also specifying the ones that are FCL, LCL and empty, both for import or export: 24 hours before the operations started.

2) Service for ship

50. The service for ship includes the pilot service, use of tugboat, mooring buoy, anchoring, berth, navigation channel and any other facilities or installation in the jurisdiction of APG.

51. Pilot service is offered by the harbor pilot to assist the shipmaster regarding all the operations. Pilot leads a ship from/to Guayaquil Coastal Station at the mouth of Estero Salado to/from berth. At present, there are eight pilot boats, but only two of these are working.

52. Tug service is obligatory to maneuver the vessel from/to the quarantine or anchorage to/from the berth or to maneuver in the port.

53. APG is equipped with water service supply, electricity service and telephone service for ships.

3) Service for merchandise

54. The delivery service of merchandise to the user normally takes place from Monday to Friday, from 8:00 to 12:00 and from 13:00 to 17:00. The import cargo is delivered only with the presentation of the Delivery Order. The export cargo is delivered to the vessels through the Tally Report that must be signed by the shipping agency tallymen and the Port Authority's, recording the export policy number.

55. The service for merchandise includes handling, operation and cargo movement in and out of the terminal, as well as storage service in warehouse and open shed. This service includes all the operations made by APG in their facilities or installations.

56. Period of free storage for import and export general cargos is 10 days, counted from the date the cargos enter storage. All transshipment and international transit cargos can be stored 15 days free of payment. All transit national cargos unloaded in the Port Authority of Guayaquil have 10 free storage days. Containers or empty vans in transit are charged for the storage from the first day they enter the terminal until the day of leaving the terminal.

4) Cargo Handling

57. In the port of Guayaquil, unloading/loading cargos from/to vessels to landside/from waterside is carried by syndicate prepared by the ships operator or agent. APG is in charge of shore handling, transferring cargos between quay side and sheds/warehouses/open storage by folk-lifts, trucks. The shore handling tariff includes labor, port equipment and supervision, until the delivery of the merchandise to the consignee/apron in the terminal area.

58. In case of ships operator/agent require the APG's equipment such as fixed crane, gantry crane, container-ship crane for loading/unloading. Ships operator/agent have to be rent the equipment with the operators who is on the list of APG.

59. Shore handling is under the control of operation department, and 270 employees and 304 labors belong to the department. As of Dec. 14, 1992, occupation by employee number is as follows: supervisor of container area (7), container handling (51), crane operator (12), container operator (7), tractor head operator (6), folk lift operator (49), truck operator (11), tally (51), wharf gang (147), shed/yard of general cargo(82/24), balk cargo terminal (16). The shift system of them is shown as Chapter 9.

60. Now UNCEMP studying the modernization of cargo handling except bulk terminal. If the modernization will be done whole responsibility of cargo handling, unloading /loading of cargo from/to ship side to/from land side at port, is belong to private companies or entities which make a concession contract with APG.

5) Computer System

61. At the moment the topology of central computer is trade-mark BURROUGHS model A4 FX based in a central process unit (CPU), and it is dispose in Information Division. The CPU has a principal memory of 12 MB, and it is connected with two 280 MB unit discs and four 170 MB capacity disc (Secondary Memory). At present there are approximately 22 terminals which are connected to A4, some of them are located in the Information Division as equipment of A4, the rest of them are remote and connected by the Modems. The other hand, APG dispose different kind of micro computers distributed to several departments. All of these computer equipments are rented.

62. The main usage/system of computers is, FIXED ASSETS SYSTEM (register the use of the goods), SYSTEMS OF CONTAINERS (register and control of the containers), BOOK KEEPING SYSTEM (register the Company financial transaction), PAYROLLS AND NAME LIST (salary payments of the Staff), CONTROL OF STOCK (register the stock, necessary material for the maintaining of the Port Equipment, and the fuel utilization), CONTROL OF PURVEYOR' OFFICE (keep the control of purveyor and the purchase), CONTROL BUDGETARY (register of the institutional list budgetary certificate), PORT RIGHT (processing information to issue the handling invoicing), IMPORT INVOICE (processing information to issue the invoicing according with the import rate), EXPORT INVOICE (processing information to issue the invoicing according to the export rate), RECEIVING (support for the procedures and the continuation of the receiving), SHIPS (register the ship master and keep a historic of ship movements), COLLECTION (support for the procedures of receiving rate and the storage of import cargo), PAYMENT (support the paymaster's office procedures specially with the purchases orders), PORT INTEGRATED STATISTIC SYSTEM (include and treat the information about the movement cargo of the ports in the proper form designed by DIGMER), EXPENSES (expenses statement), STATISTICS (import and export reports).

PART II

MASTER PLAN

OF

THE PORT OF GUAYAQUIL

Chapter 1 DEVELOPMENT CONCEPT OF THE PORT OF GUAYAQUIL

A. Modernization Policy

1) Port Modernization in Ecuador

1. In Ecuador, at present, the government aims at launching an economic takeoff through introduction of the competitive principle; functions and business formerly conducted by the public sector will be entrusted to the private sector.

2. Already, some government enterprises have been privatized such as airline business, sugar, cement and so on. This policy of privatization is based on the Modernization Law (Ley de Modernizacion) and General Regulations of National Modernization Law (Reglamento General de la Ley de Modernizacion del Estado) enacted on Dec. 31, 1993. The modernization of port is also based on this law.

3. Since the economy of the country is greatly influenced by port activities, the port service business will be operated under the competitive principal as far as possible. For example, a uniform tariff system had been applied at 4 commercial ports; however, since Jun. 1994, all national ports have begun competing with one another.

4. The following laws related to port privatization have been established: Regime for Port Operation by Appointment to the Private Sector (Regimen para la Operation Portuaria por Delegacion a la Iniciativa Privada) and Complement to Regime for Port Operation by Appointment to the Private Sector (Complemento al Regimen para la Operacion Portuaria por Delegacion a la Iniciativo Privada).

5. According to these laws and regulations, almost all port services will be conducted by private entities while a system in which these private entities take responsibility for cargo transport is being studied. By means of this method, Port Authorities will solve usual problems, such as inefficient cargo handling, congestion in the port area, unsafe labor conditions, security of cargo and so on.

6. To put it concretely, port service will be conducted by Port Operator (Operador Portuario, OP) who registers with the General Direction of Merchant Marine and the Littoral (Direccion de la Marina Mercante y del Litoral, DIGMER) and enters a contract with the Port Authority. The contract is classified into three categories: concession contract, permission contract or storage contract.

7. Concession contract is entered into when the use period will be more than 3 years or OP wants to erect buildings or install facilities. Permission contract carries an occupation term of less than 1 year and OP cannot erect buildings. Storage contract is applied when it is necessary to temporarily store cargo (this is the same as a commercial lease).

8. Typical port facilities and equipment for which contracts can be entered are as shown in Table II-1-1. Main facilities such as berth, apron and gantry crane etc. may not be included.

Table II-1-1 Relation between Port Facilities/Equipment and Contract

Facilities or Equipment	exclude	Concession	Permission	Storage	Sell
Water Facilities Channel, Quarantine Area, Anchorage Area, Basin etc.	+				
Protective Facilities Break Water etc.	+				
Mooring Facilities Berths, Dolphins etc.	+				
Ships for Port Service Tug Bort and Pilot Bort		+	+		
Cargo handling Facilities or Equipments					
Apron, Gantry Crane etc.	+				
Transtainer, Mobil Crane, Forklift, Tractor, Chassis etc.		+	+		+
Shed, Yard, CFS etc.		+	+	+	
Others					
Green Areas, Road etc.	+				

9. Concerning the port modernization process, it is first being applied to Guayaquil Port, which is the biggest port in Ecuador, as the model case. It will then be extended to other commercial ports.

2) Modernization of APG

(a) General

10. Modernization plan of APG has been studied by Unity of Coordinator and Executor for Ports Modernization Plan (Unidad Coordinadora y Ejecutora del Plan Modernizacion Puertos, UNCEMP). It was established under the decision by Marine Merchant and Port National Council (Consejo Nacional de Marina Mercante y Puertos, CNMMP) in Apr. 1993. UNCEMP is under control of Council of National Modernization (Consejo Nacional de Modernizacion, CONAM) and it gives advice to APG.

11. APG should make final decisions by itself, but in case of high level decision making, the approval by CNMMP is needed. According to the Law above, all modernization procedures should be approved by CONAM. Therefore it is necessary for APG to get the approval for any contents related to modernization, contract, regulation and so on, of CONAM.

12. UNCEMP consists of the following members.

- Representative of CNMMP
- Representative of Ecuador Navy
- Representative of CONAM
- Representative of APG
- Representative of Federation of Production Chamber

13. UNCEMP has the responsibility not only for the modernization of APG but also that of other port authorities. UNCEMP has initiated the study on APG because of its

big problems in dealing with the large cargo handling volume and the amount of workers.

14. From the viewpoint of a new model of port described by UNCEMP, two major problems are found in APG as a result of the study of UNCEMP. One is low efficiency in cargo handling and the other is frequent cargo loss.

15. To solve these two major problems, UNCEMP is mainly studying the following two main means.

- Administration, maintenance and improvement of facilities
- Participation of private sector in port service

16. UNCEMP's study items with the work schedule are shown in Table II-1-2.

3) Participation of the Private Sector in Port Service

17. According to the present result of the study by UNCEMP, the responsibility of APG should entail the following.

- Administration
- Maintenance
- Financial Issues
- Improvement of Infrastructure

18. The work related to the port service should be shifted to the private sectors to increase quality and reduce cost through competition. At least the following services should be privatized.

- Cargo handling
- Tug boat service
- Operation of crane
- Security
- Garbage disposal

19. In case of cargo handling, private companies or private entities should be established and the whole responsibility for cargo handling, from unloading of cargo to transportation to shippers and/or from shippers to loading on the port of Guayaquil will belong to each company or each entity.

20. Basic concept of port of Guayaquil after concession is as follows.

- Berth is owned and managed by APG for all users.
- Apron is owned and managed by APG for all users.
- Storage area is divided into some sections and each private company has its concession area through tender.

21. UNCEMP is also studying reform of organization of APG on the assumption that the private sector will participate through concession.

22. Hence UNCEMP is studying a new tariff on the basis of above study, costs of improvement of facilities, dismissal allowance and labor costs, concession cost and income, decrease of cargo handling income. The framework of the new tariff is now prepared on the assumption that improvement work will be completed by 1995.

Table II-1-2 Item and Schedule of UNCEMP (amendment on Feb. 1995)

No	Work Item <present situation>		1994				1995							
			1	2	3	4	1	2	3	4	1	2	3	4
1	Preparation of Economic Model	<done>												
2	Calibration of Economic Model	<done>												
3	Preparation of Tariff	<done>												
4	Publication of Tariff	<in process>					*							
5	Study of Necessary Occupation	<done>		***										
6	Reduction of Person	<in process>			***	***	***	***	***	***				
7	Training for Person to be Retired	<in process>			*	*	*	*						
8	Training for Personnel Executive	<in process>		***	***	***	***	**	**	**				
9	Preparation of Legal Framework	<done>												
10	New Port Law	<future>					*	***						
11	Transfer of Warehouse 2 - 4	<future>					*	***						
12	Transfer of Warehouse 5 and 6	<future>							***					
13	Study on Civil Work of Site 1 - 6	<future>							***	***				
14	Implementation of Civil Work of Site 1 - 6	<future>									***	***	***	
15	Purchase and Installment of Gantry Crane		Changed to concession											
16	Consultation on Reorganizing Operation	<done>	**	**										
17	Contract of Hard and Software	<in process>	***	***	**	***	***	**						
18	Construction of Application Software	<in process>		*	***	*	***		**					
19	Installment of Software	<in process>			**	**			**					
20	Consultation on SIG (MIS) and SC	<late>		*	***	***	***	***	***	**				
21	Creation of Position "Technical Executive"	<none>			***	***	***	***	***	***				
22	Creation of Relate Organization Division	<none>			***	***	***	***	***	***				
23	Preparation of Documents for Concession	<in process>	*											
24	Preparation of Documents	<in process>	*	*										
25	Approval of Documents	<none>					*							
26	Evaluation, Layout Plan, Inventory etc.	<none>						**						
27	Editing of Documents	<none>						*						
	<Invitation>	<none>						*						
28	Preparation of Offer	<none>							**					
29	Analysis of Offer	<none>							*					
30	Technical Assistance for Analysis of Offer	<none>							***					
	<Tender>	<none>							*					
31	Negotiation on Contract	<none>							*					
	<Transfer Concession>	<none>								*				
32	Technical Assistance to UNCEMP Phase A	<none>	***	***										
33	Technical Assistance to UNCEMP Phase B	<in process>			***	***	***	***	***	***	***	***		

Source: UNCEMP

B. Function of Each Commercial Port

23. The present situation of the four commercial ports is summarized as follows.

1) The Port of Esmeraldas

24. The port is located in the Province of Esmeraldas in the northern part of Ecuador. The capital city of the province is Esmeraldas city which has a population of 120000.

25. Construction of the port began in 1971 and was completed in 1979. The port directly faces the Pacific Ocean and the water area is protected by a breakwater. The depth in front of the port is more than 30 m and the Esmeraldas River mouth is positioned east-west from the port.

26. There is a 350 m marginal wharf with 11.5 m depth and at the end of the wharf a platform for R/R ship has been constructed. At the mouth of this port maintenance dredging is required because of the material sedimentation from the Esmeraldas River. One more problem of the port is the lack of the handling equipment for petroleum industry plants which is the most important industry in the region.

27. In 1991 an area of 22 ha in the port was designated as a Free Zone and a chip making factory is under operation. Chip produced at the free zone are loaded to the vessel and exported.

28. Total cargo volume is 395000 tons, the share in four commercial ports is 6.7% in 1993. Average annual growth rate is 18% between 1989 and 1993.

29. Major commodities of import are iron and steel, vehicles and metal product with respective shares of 61%, 18% and 13%. With the reduction in import tax in the 1990s, imported vehicles increased rapidly. The cargo of cotton and metal production, which was not handled prior to 1986 in this port, had a 12% in 1993. Major export commodities are banana(84%) and wood(12%).

30. Major trading countries for import are the USA(57%), Brazil(11%), Japan(9%) and for export are Japan(28%), Turkey(20%) and the USA(13%).

31. Almost all cargo(99%) through the port of Esmeraldas is transported to Pichincha Provinc.

32. In 1993, 239 vessels called at the port of Esmeraldas. The main calling vessels are 140-149 m in length and more than 11 m in depth.

2) The Port of Manta

33. The port is located in the province of Manabi between the province of Esmeraldas and Guayas. The capital city of the province is Portoviejo city about 4 km from the port. A fishery port is located next to the port.

34. The port facilities including the basin are protected by a jetty projected to the Pacific Ocean. The depth of the ocean in front of the port is about 11.0 m. The mouth of the Manta River is east from the port. There are finger jetty piers and marginal wharves whose maximum depth is 10 m. The platforms for R/R ship are attached to one of the finger jetty piers.

35. There are some problems to be solved at the port. The installment of a new fender is strongly required at this port. One of the piers is not fully used by ocean-going vessels. There is a security problem concerning the loss of cargo in the port because port activities and fishery activities.

36. Total cargo volume through the port of Manta in 1993 is 170000 tons, that is, only 2.9% of the cargo through the commercial ports. Average annual growth rate of handling cargo is 2% between 1989 and 1993.

37. Major commodities of import are vehicles and machinery, chemical product and paper and paper product with respective shares of 16%, 11% and 6%. The volume of vehicles and machinery cargo increased 6 times and chemical product 3 times from 1989 to 1993. Major commodities of export are fish(31%), coffee(14%) and wood(9%).

38. Major trade partners of imported cargo are the USA(27%), Argentina(11%) and England(6%), while for of exported cargo the USA(48%), Japan(12%) and Spain(12%).

39. The number of calling vessels in 1993 is 301. The size of main vessels is less than 119 m and 160-169 m in length and 9.0-10.9 m in depth.

3) The Port of Guayaquil

40. The port is located in the Province of Guayas. The capital city, Guayaquil city, has the largest population in Ecuador, about 2 million inhabitants. Along the access channel to the port of Guayaquil, there are mangrove forests and many pools for shrimp breeding.

41. The port was originally located at an inner part of the Guayas River but was transferred to its present site in 1958. The expansion project was executed in 1980 when the present facilities were completed. The port has a 50-mile access channel with design depth of 9.45 m and ships with draft over the depth enter the port on benefit of high tide.

42. The port consists of a conventional port, container terminal and bulk terminal. There are a 925 m wharf with depth of 10.0 m, 555 m container berth and 150 m bulk berth. The necessity of the maintenance dredging of the channel, the pavement work in the container yard and the improvement of the fender at the container berth are pointed out as the problems to be solved immediately. The shortage of capacity for container handling is also identified. In addition security of the cargo in port area is a big problem.

43. Total cargo volume through the port of Guayaquil in 1993 is 3936000 tons, or 67% of total cargo volume through the four commercial ports. Average annual growth rate is 8% from 1989 and 1993.

44. Major import commodities are wheat(21%), chemical products(18%) and iron and steel(12%). Fertilizer and chemical product showed a big increase from 1986 to 1993. Major export commodities are banana(75%), fish(6%),and coffee(3%), the share of which have remained quite stable from 1986 to 1993.

45. Container cargo has increased during this period, reaching 126577 boxes in 1993, 78,501 boxes of full containers and 48076 boxes of empty containers. Of full container 37,208 boxes are imported and 41,293 boxes are exported.

46. Major trading countries for import are the USA(43%), Canada(7%) and Brazil(6%)

in 1993 and in case of export the USA(39%), Belgium(15%) and Chile(9%).

47. The import cargo through the port of Guayaquil is mainly transported to Guayas and Pichincha province. The share to the Guayas province is 74% and to Pichincha is 22%. The cargo to Bolivar province increase from 1986 to 1993.

48. In 1993, 1579 vessels called at the port of Guayaquil. The main calling vessels are 150-159 m in length and 7.0-8.9m in depth.

4) The Port of Bolivar

49. The port is located in the Province of El Oro in the southern part of the costal area of Ecuador. The capital city Machara is positioned about 5 km from the port. The port is at the inner part of Estero Santa Rosa, approximately 7 km from the Pacific Ocean.

50. There is a 378-m marginal wharf with 10.0 m depth and a finger pier along Estero Santa Rosa. Almost all cargo through the port is banana and the shortage of berth for banana handling is one of the biggest problems of this port. The expansion of a wharf is planned by the Port Authority of Bolivar. A new banana berth with a crane has been designed.

51. Total cargo volume through the port of Bolivar in 1993 is 1,384,794 tons or 24% of the cargo volume through the commercial ports. Average annual growth rate is 7% from 1989 and 1993.

52. Major import commodities are metal products(44%), paper products(43%) and iron and steel(4%). In 1992, major commodities were paper products(79%), and iron and steel and fertilizer. Almost all of the export cargo is banana(99%), which is why this port is known as the port for banana.

53. Major trading countries for import cargo are the USA(57%), Italy(10%) and Belgium(5%) and for export the USA(28%), Italy(25%) and Germany(15%).

54. The import cargo was only transported to El Oro province in 1993. But the shares of cargo through the port of Bolivar among total cargo transported to El Oro province slightly decreased in 1993.

55. The number of calling vessels in 1993 is 557. The size of main vessels is 140-149 m in length and 7.0-8.9 m in depth.

5) Function of each port

56. According to the above mentioned, the present function of each commercial port is summarized as follows.

(1) The Port of Esmeraldas
* foreign trade core in the northern part of Ecuador
* core of regional development and vitalization of economy in Esmeraldas Province

(2) The Port of Manta
* foreign trade core in Manabi Province
* core of development of Manabi Province especially fishery activity

(3) The Port of Guayaquil
* foreign trade core of Ecuador
* port leading the promotion of export from Ecuador
* core of regional development and vitalization of economy in Guayas Province

(4) The Port of Bolivar
* banana export terminal from El Oro Province and southern part of Guayas Province
* foreign trade core of southern part of Ecuador

57. There are many factors that influence the functional allotment among ports. By an examination of the main factors affecting the function among commercial ports in Ecuador the circumstance up to the target year are envisaged as follows.

(1) Nation-wide Plan
National development plan and/or new economic policy, to radically change the economic structure has not been established.

(2) Regional Structure
De-centralization is one of the important policies of Ecuador but the regional structure will not be affected.

(3) Inter-regional Transportation Network
Road development projects are under construction and/or planning but inter-regional road network will not largely change.

(4) International Shipping Structure
Movement of international shipping structure related to ports in Ecuador will require some change such as coping with containerization but as all ports must undergo same, the functional allotment among ports will remain the same.

(5) Development and Improvement of port facilities
Some improvement projects such as port facilities construction of new berth at the port of Esmeraldas and Bolivar, are on-going, already authorized and/or planned. After completion of these projects capacity of those ports will increase but this will not affect the present function among the ports.

58. As a result, the function of each port in the target year of the Master Plan will remain, therefore the Port of Guayaquil should play the followings roles.

* foreign trade core of Ecuador
* promoting export from Ecuador
* leading the regional development vitalization of economy in Guayas Province

C. Relationship between Regional Development and Port Development

1) Potential for Regional Development

59. Population is one of the most basic indicators when considering regional development. In 1990, almost 26% of the national population reside in the Province of Guayas, where the Port of Guayaquil is found (See Table I-1-16). Moreover the number of inhabitants in the urban area increased at 4.02% per year from 1982 to 1990. The large population produces the vitality of the various kinds of activities in the region at the stage of upgrowth. A trend toward urbanization can be seen in Figure II-1-1.

60. Another important indicator of regional development is production activity. In Guayas Province, the manufacturing sector has the highest gross product, while the gross product of tertiary industry such as commerce, finance, and service is also high (See Figure II-1-2). This suggests that the hinterland of the Port of Guayaquil has the potential for development in future.

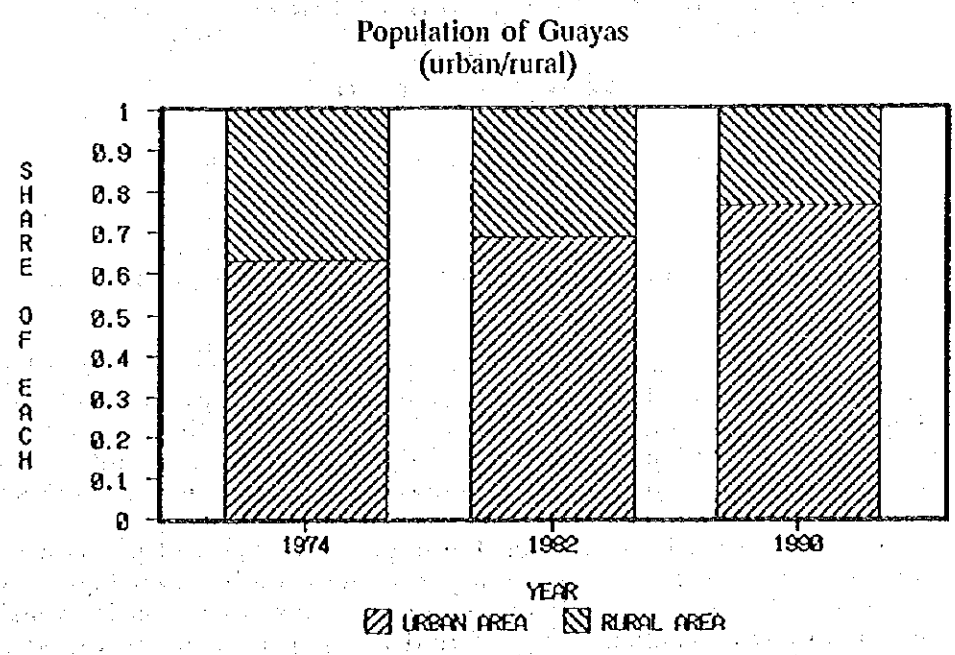


Figure II-1-1 The Population in the Urban/Rural Area in Guayas Province

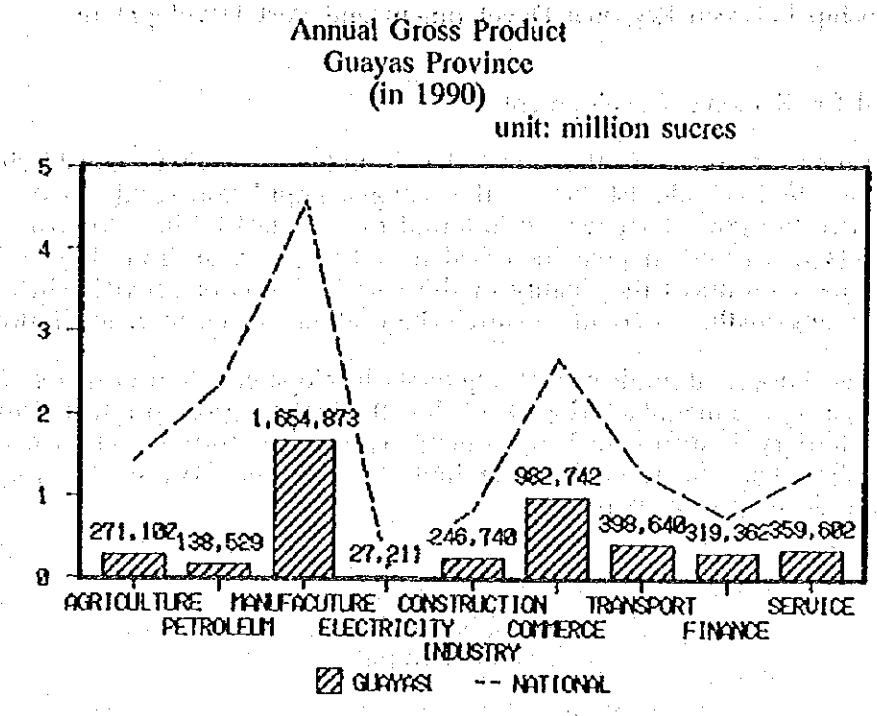


Figure II-1-2 Gross Products in Guayas Province

2) Relationship between the Regional Development and the Development of the Port of Guayaquil

61. Socio-economic regional development is closely related to port development. Usually, regional development plan is made by national or local governments with the purpose of improving social, cultural and economic conditions of the region concerned. As a result of economic development or to develop the regional economy, it becomes necessary to export the produced goods or to import goods necessary for domestic use.

62. In maritime countries such as Ecuador, the import and export of goods have been carried out mostly through marine ports. Transportation by sea has a far bigger capacity than by air or land. Therefore, even if the import or export of goods is available by land, transportation by sea has often been preferred in order to import or export a large volume of goods.

63. As to Ecuador, almost 90% of total volume of the import and export have been transported by sea (See Table II-1-3). Among the four commercial ports of Ecuador, the Port of Guayaquil has a share of almost 70% of total volume of imports and exports excluding petroleum (See Table II-1-4). Under these circumstances, in accordance with the economic development of the hinterland of the Port of Guayaquil through regional development plans such as CEDEGE plan, Zona Franca, Maquila and others (industrial park, national banana program, national cacao program, national coffee program etc.), it becomes necessary to improve and expand the facilities of this port in order to meet the export of the produced or processed goods and the import of goods necessary for processing or domestic use, both of which will further increase.

Table II-1-3 Cargo Volume by Sea/Total

A. Total Volume unit: ton

Year	Export	Import	Total
1990	12,852,798	2,884,745	15,737,543
1991	13,803,221	2,770,782	16,574,003
1992	14,696,566	2,870,261	17,566,827

Source: Central Bank

B. By Sea

Year	Export	Import	Total	Share (B/A)
1990	11,511,055	1,942,758	13,453,813	85.49%
1991	12,343,369	2,362,502	14,705,871	88.73%
1992	13,473,105	2,620,564	16,093,669	91.61%

Source: DIGMER

64. On the other hand, port development is also closely related to regional development. When a port is developed, generally other social infrastructures related to the port such as road, transportation, communications, power etc. are developed at the same time in the port-related area. The developed port attracts not only local investors but also foreign investors. They will show an interest in investing in the hinterland of the port, because the developed port may facilitate international transportation of goods to/from abroad.

65. If the Port of Guayaquil is developed (modernization and expansion), local and foreign investors will show a strong interest in the regional development plans such as CEDEGE plan, Zona Franca, Maquila and others related to foreign trade, which will serve the economic development including employment of the region. The number of Maquilas in Ecuador has increased from 34 in June 1992 to 53 in November 1994. In particular, the number has more than doubled in Guayaquil (page I-2-11). As shown in Table I-2-1, 24 maquilas have already been established in Guayaquil as of November 1994, only after 4 years from the day of enactment of Maquila Regime Law. Their number will further increase in the future in accordance with the development of the Port of Guayaquil.

Table II-1-4 Total Cargo Volume in Major Ports

unit: ton

Year	1989	1990	1991	1992	1993
Esmeraldas					
Import	158,459	113,195	195,296	264,424	292,920
Export	47,963	50,583	71,705	144,556	102,316
Total	206,422	163,778	267,001	408,980	395,236
Manta					
Import	99,780	50,378	63,782	132,044	114,103
Export	58,391	64,125	53,493	49,009	55,921
Total	158,171	114,503	117,275	181,053	170,024
Guayaquil					
Import	1,735,696	1,683,432	2,030,579	2,153,102	2,142,959
Export	1,009,892	1,319,287	1,737,169	1,657,068	1,793,038
Total	2,835,588	3,002,719	3,767,748	3,810,170	3,935,997
Bolivar					
Import	58,976	95,753	72,845	70,994	94,130
Export	1,009,518	1,359,007	1,405,709	1,261,826	1,290,664
Total	1,068,494	1,454,760	1,478,554	1,332,820	1,384,794
Four Ports					
Import	2,052,911	1,942,758	2,362,502	2,620,564	2,644,112
Export	2,215,764	2,793,002	3,268,076	3,112,459	3,241,939
Total	4,268,675	4,735,760	5,630,578	5,733,023	5,886,051
Guayaquil/Total					
Share	66.43%	63.41%	66.92%	66.46%	66.87%

Source: DIGMER "Estadistica Portuaria Ecuador"

66. As shown in Table II-1-5, four major industries of the manufacturing sector of Ecuador are: 1. "foods, drinks and tobacco", 2. "textile, clothes and leather industry", 3. "chemical industry" and 4. "metal products, machinery and equipment". In keeping with the labor-intensive nature of Zona Franca and Maquila, main industries thereof will be those of apparel/textile and food processing. Actually, most of the Maquila industries which are operating now in Ecuador are those type. According to the Table I-2-1, 26 companies (49.1%) are industries of apparel/textile and 14 companies (26.4%) are of food processing, out of the total number of 53 Maquilas as of November 1994. As to 24 Maquilas which are in operation in Guayaquil, 11 companies (45.8%) are industries of apparel/textile and 9 companies (37.5%) are of food processing.

67. As shown in Table II-1-5, the share of the production of "textile, clothes and leather industry" of the Province of Guayas is only 1.6% of the provincial total and 9.3% at the national level, which is the smallest share among sectors. On the other hand, though the share of the total production of "textile, clothes and leather industry" in Ecuador is only 6.6%, this sector employs 17.8% of the total workforce, which suggests that apparel/textile industry is labor-intensive.

68. The establishment of a Zona Franca and Maquilas in the Province of Guayas, accordingly, leads to the socioeconomic development of the region through an increase of the total production and employment.
The increase of production volume and value of a Zona Franca and Maquilas in the Province of Guayas, on the other hand, leads to the development of the Port of Guayaquil, because most of the import and export/re-export thereof will take place through this port. Moreover, as aforementioned, the import and re-export of goods through the Zona Franca of the city of Riobamba and the Maquilas which are located in other cities than Guayaquil such as Cuenca, Latacunga, Azogues, Ambato, Sta. Elena, Quevedo and Daule will also be carried out mainly via this port because of its location. Both the industries of the Zona Franca and Maquilas must export or re-export all their products abroad, under the respective Laws and Regulations.

69. According to the Plan of the Zona Franca of Esmeraldas (Figure I-2-2), what follows is a forecast at completion of the project;

(1)	Labor force:	3,000 workers
(2)	Maximum export capacity:	US$ 54,000,000-
(3)	Total business income:	US$ 13,500,000-

70. The total area of the above Zona Franca is 22 ha. and the proposed area of a Zona Franca in the Port of Guayaquil is 40 ha. as described later in the land use plan of the Port of Guayaquil. Therefore, on the basis of the above figures, the forecast at completion of the Zona Franca project of the Port of Guayaquil will be as follows;

(1)	Labor force:	around	5,400 workers
(2)	Maximum export capacity:	around	US$ 97,000,000-
(3)	Total business income:	around	US$ 24,000,000-

71. These figures suggest that the Zona Franca project will have a huge effect not only on the socioeconomic development of the region but also on that of the country.

Table II-1-5 Activities of Manufacturing Industries (in 1992)

Value: 1,000 sucres

Economic Activity	Number of Establishment					Personnel Engaged					Total Production				
	Ecuador		Prov. of Guayas			Ecuador		Prov. of Guayas			Ecuador		Prov. of Guayas		
	A	(%)	B	(%)	B/A (%)	C	(%)	D	(%)	D/C (%)	E	(%)	F	(%)	F/E (%)
Foods, Drinks and Tobacco	460	26.3	178	34.2	38.7	45,454	36.0	21,967	49.2	48.3	2,842,472,494	36.5	1,529,069,676	50.5	53.8
Textiles, Clothes and Leather Industry	337	19.2	34	6.5	10.1	22,471	17.8	2,028	4.6	9.0	515,242,301	6.6	47,968,464	1.6	9.3
Wood Industry and Wood Products including Furniture	133	7.6	25	4.8	18.8	5,774	4.5	881	2.0	15.3	111,281,525	1.4	15,859,232	0.5	14.3
Paper Manufacture and Paper Products, Printing and Publishing	113	6.5	46	8.9	40.7	9,064	7.2	4,148	9.3	45.8	574,819,802	7.4	335,975,376	11.1	58.4
Manufacture of Chemical Substances and Chemical Products derived from Petroleum, Coal, Rubber and Plastics	258	14.7	118	22.7	45.7	18,050	14.3	8,229	18.4	45.6	2,209,234,091	28.4	502,000,682	16.6	22.7
Manufacture of Non-metallic Mineral Products excepting By-products of Petroleum and Coal	108	6.2	21	4.0	19.4	6,183	4.9	1,340	3.0	21.7	398,428,468	5.1	215,520,766	7.1	54.1
Basic Metal Industry	22	1.3	12	2.3	54.5	2,013	1.6	849	1.9	42.2	229,219,661	2.9	100,470,513	3.3	43.8
Manufacture of Metallic Products, Machinery and Equipment	288	16.4	83	16.0	28.8	16,007	12.7	5,053	11.3	31.6	884,756,915	11.4	276,515,793	9.1	31.3
Other Manufacturing Industries	32	1.8	3	0.6	9.4	1,315	1.0	136	0.3	10.3	19,290,426	0.3	5,559,957	0.2	28.8
Total	1,751	(%) 100	520	(%) 100	(%) 29.7	126,331	(%) 100	44,631	(%) 100	(%) 35.3	7,784,745,683	(%) 100	3,028,940,459	(%) 100	(%) 38.9

Source: Instituto Nacional de Estadistica y Censos (INEC)

72. The Municipality of Guayaquil has a land use plan of its area. (Figure II-1-3) The area consists of :

(1) Residential use
(2) Commerce-Service-Residential use
(3) Commerce and Service use
(4) Special use (military reservation, protection strip, prohibition zone, etc.)
(5) High Impact Industry use (gas plant, thermal plant, combustibles, etc.)
(6) Urban Equipment use (marine port, airport, bus terminal, education, recreation, cemetery, etc.)
(7) Industrial use
(8) Urban Development use
(9) Green Ecological Protection area

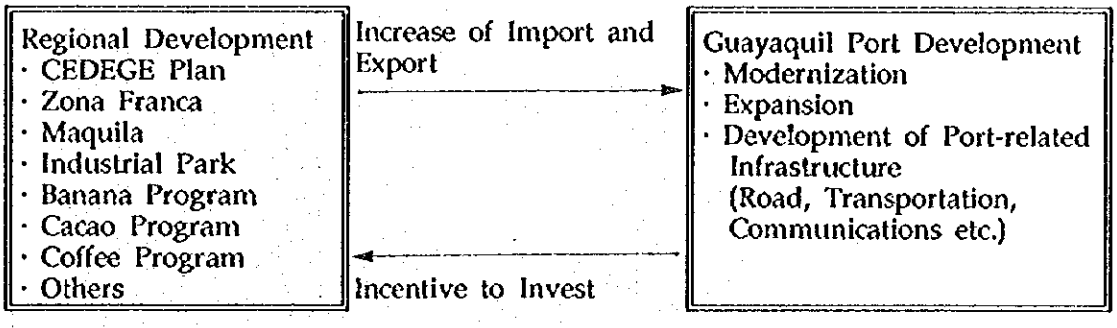
73. What follows are the kinds and numbers of industries located in the areas of Industrial Use as of February 1995;

(1) Primary (agriculture, fishery, etc.)	15
(2) Processing (factory, laboratory, etc.)	449
(3) Distribution (storage and shop)	203
(4) Service (maintenance)	121
Total	788

74. As shown in the Table II-1-5, the Province of Guayas has the biggest share of almost 40% of the total production of manufacturing industries of Ecuador. Predominant among the cities of the Province is Guayaquil, the biggest industrial city of the country as seen in the above figures where the Port of Guayaquil is found.

75. Although the products of the manufacturing sector in Ecuador are almost all for domestic use and the share of its exports is very small at present, an increase of its exports will be expected in the future in accordance with the development of the manufacturing industries as the numbers of Maquila companies are increasing. Especially Guayaquil will play an important role in the export of the products of manufacturing sector as the biggest industrial city of the country, which also leads to the development of the Port of Guayaquil.

76. The relationship between the regional development and the development of Guayaquil Port is illustrated as follows.



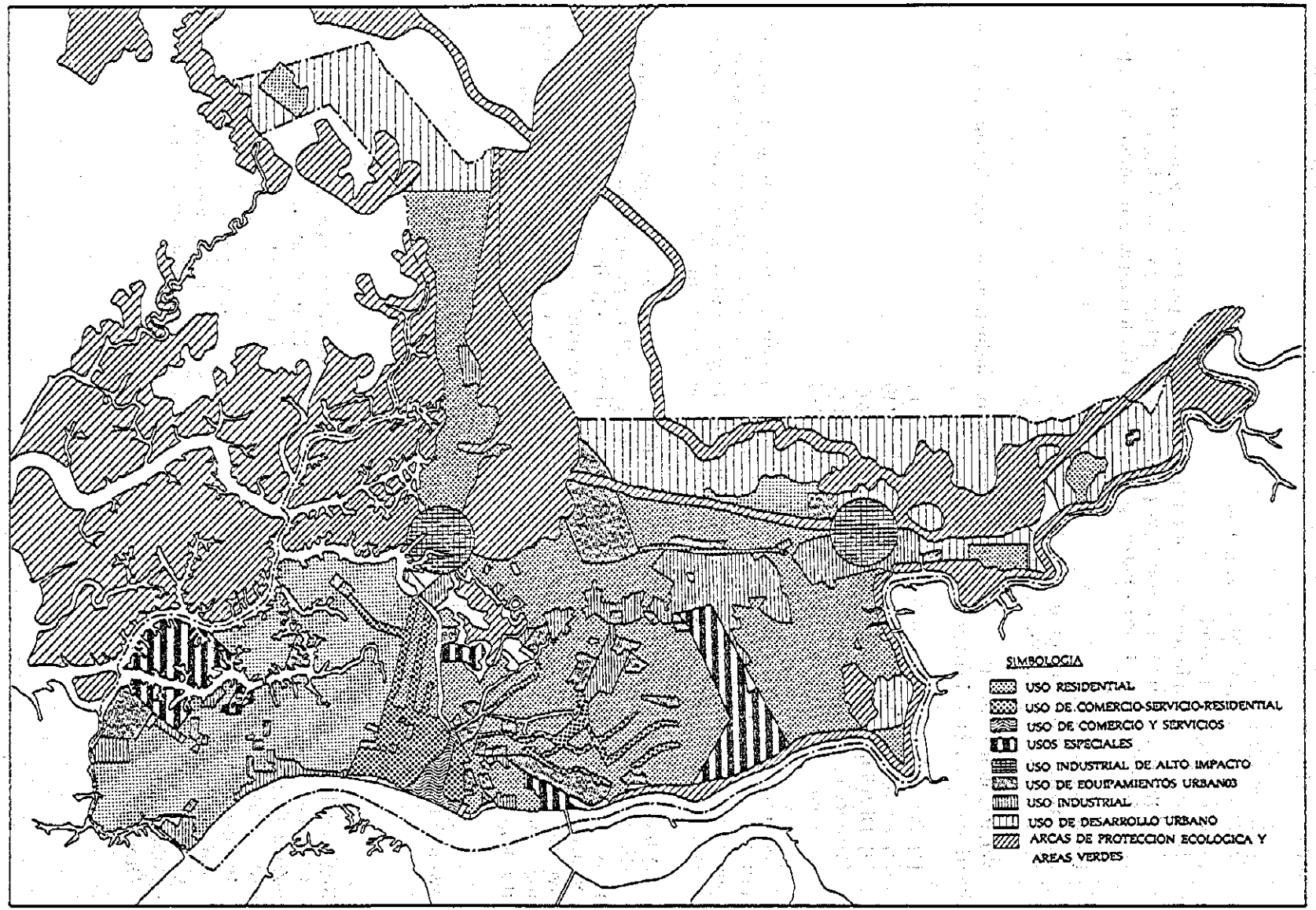


Figure II-1-3 Land Use Plan of Guayaquil City

D. Basic Concept of the Development Plan of the Port of Guayaquil

77. The basic target of the development of the port of Guayaquil up to the target year of the Master Plan is identified as follows.

- the core of distribution of international trading cargo
- the core of regional and economic development

78. In order to accomplish the target, the development and planning of the port of Guayaquil should be based on the following eight subjects.

(1) to realize the modernization of port activity
(2) to cope with the increasing trend of foreign trade and growing trend of containerization
(3) to assist the promotion of exports
(4) to support industrial development in Guayas Province and in Ecuador
(5) to maintain efficiency with regard to port management
(6) to offer good service to port users
(7) to consider the environment surrounding the port including mangrove area
(8) economic and financial issues including appropriate investment

Chapter 2 DEMAND FORECAST FOR 2010

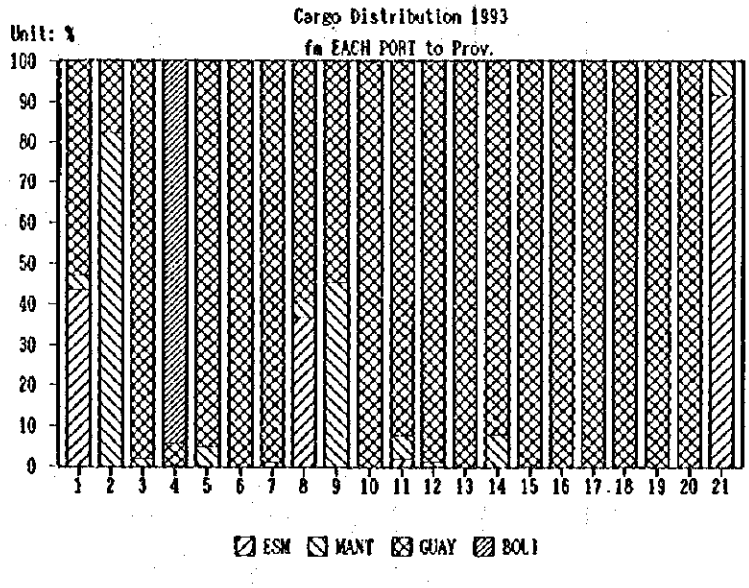
A. Socio-economic Frame for the Target Year

1) Hinterlands of Port of Guayaquil

1. The hinterland of the port of Guayaquil is determined from the data on the origin and destination of cargo passing through the port and from the inland transportation situation. Domestic sea transportation is carried out only domestic oil transport. The other cargos are transported on land in Ecuador.

2. The destination of the foreign trade import cargo passing through Guayaquil Port by each province, Guayas province accepts more than 73% of the imported cargos, followed by Pichincha province with about 22% and Azuay province with 3%.

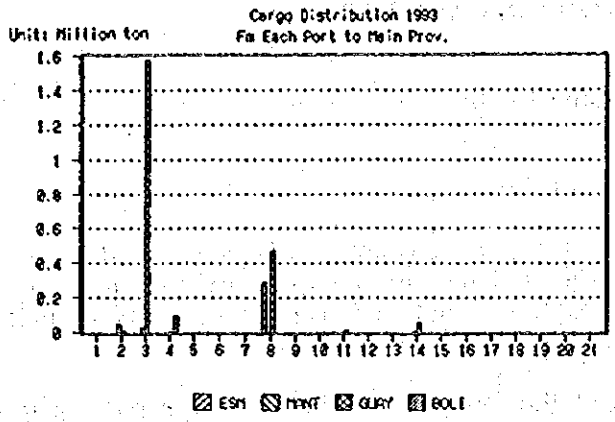
3. Figure II-2-1 shows the province of Esmeraldas 53% of its total cargo share from Guayaquil port, Manabi 18%, El Oro 6%, Pichincha 59%, Cotapaxi 55%, Sin Datos 0% and the other provinces about 100%.

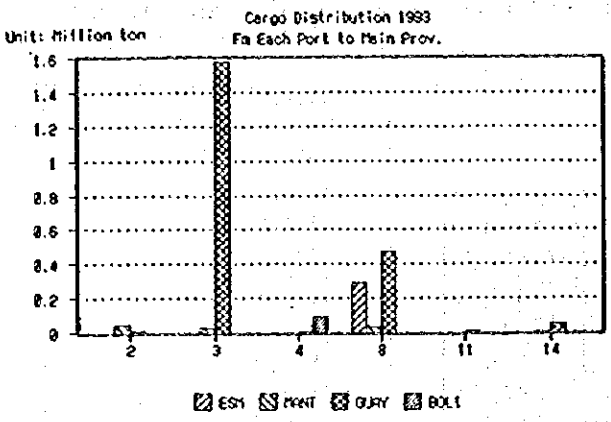


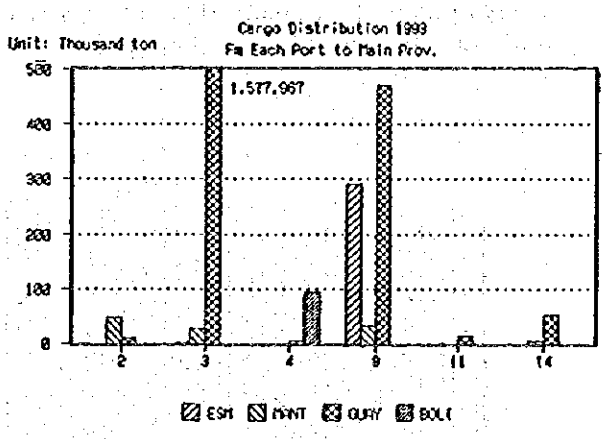
	Province
1	Esmeraldas
2	Manabi
3	Guayas
4	El Oro
5	Los Rios
6	Carchi
7	Imbabura
8	Pichincha
9	Cotopaxi
10	Bolivar
11	Tungurahua
12	Chimborazo
13	Canar
14	Azuay
15	Loja
16	Napo
17	Pastaza
18	Morona Santiago
19	Zamora Chinchipe
20	Galapagos
21	Sin Datos

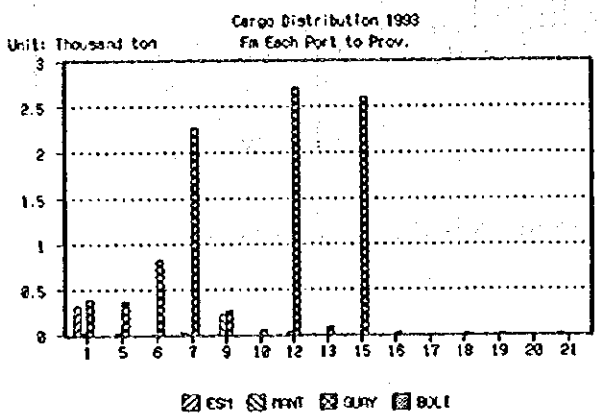
Source: DIGMER

Figure II-2-1 Cargo Distribution from Each Port to Provinces









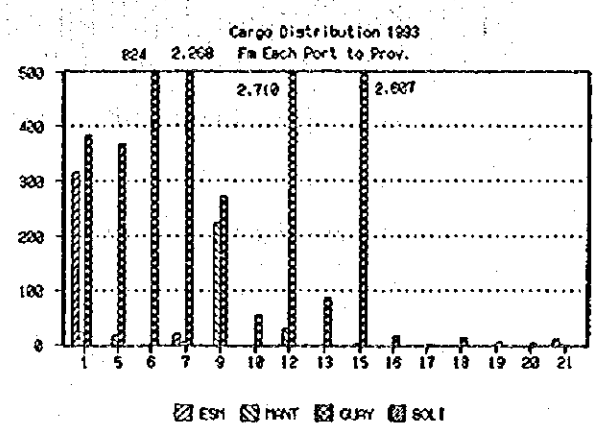


Figure II-2-2 Import Cargo from Each Port to Province

4. Figure II-2-2 shows the imported cargo transported from Esmeraldas port, Manta port, Guayaquil port and Bolivar port to the province of Guayas, El Oro, Pichincha, Tungurahua and Azuay. It can be seen that cargo of El Oro province is mainly transported from Bolivar port while cargo of other provinces comes from Guayaquil port.

5. Of the four ports, 55% of the export cargo is shipped via Guayaquil port, and 40% through Bolivar. Main commodity of Bolivar port is banana (99%) which is used Bolivar port is often referred to as the banana port. The share of export cargo excluding banana at Guayaquil port is 86%.

6. Banana exports comprise 3% of the total at Esmeraldas port, 50% at Guayaquil port and 47% at Bolivar port in 1993 according to DIGMER. The province with the largest banana area and production in the country is Guayas with 45,398 ha (32% of the total banana area) and with 1,361,925 ton (32%). In second place is the province of EL Oro with 41,928 ha (30%), and with 1,257,849 ton (29%), followed by the province of Los Rios with 33,575 ha (24%) and with 1,007,250 ton (23%), and the province of Esmeraldas with 10,569 ha (8%). Regarding the production, Esmeraldas had 317,067 ton (7%) in 1993 according to PNB. Banana product area through Guayaquil port is Guayas, Los Rios province.

7. In conclusion, when considering the inland transport network, we may consider that the hinterland for the port of Guayaquil is the entire area of Ecuador.

2) Projection of Socio-economic Indices

(a) Population

8. A census has been taken every eight years since 1974. According to the data, the population of Ecuador has been increasing with an annual growth rate of 2.3% between 1982 and 1990.

9. According to the census taken in 1990, the population of Ecuador is about 9.6 million, Guayas province 2.5 million, Pichincha province 1.8 million Manabi province 1.0 million and Azuay province 0.5 million.

10. The future population was estimated through Insituto Nacional de Estadistica y Censos (INEC) in Table II-2-1.

Table II-2-1 Projected Population

Year	2003	2010
Population ('000 persons)	13,343	14,899
Average Annual Growth (%) (from 1990)	2.04	1.88

Projected population in 1990 is 10,264,000.
Source: INEC

(b) Gross Domestic Products (GDP)

11. There are no authorized or published figures of the future GDP until 2010 in Ecuador. The GDP trend of the past 13 years indicates that the growth rate varied between -5.98% and 10.52% and that average increase rate during this period was about 2.42%.

12. The following two cases are assumed as economic frames;

Case 1; GDP growth rate is 3% from 1994-2003 and 4% from 2004-2010. This is based on past trends. Average GDP growth rate between 1988 and 1993 is about 3%. Growth rate from 2004 will be more than 3%. This is in line with APG's policy.

Case 2; GDP growth rate is 5.5% from 1994-2010. This is average rate between 6.8% which is maximum target from 1980 to 1993 by the national development plan and 4% which is latest target from 1993 to 1994 by Consejo Nacional de Desarrollo (CONADE).

13. According to "World Table 1993, World Bank", Gross National Income per capita in 1992 of Latin America and the Caribbean was 1.7 times larger than Ecuador's. Annual growth rate from 1993 to the target year will be 5% based on this situation.

14. The future values of GDP for each case are as indicated in Figure II-2-3.

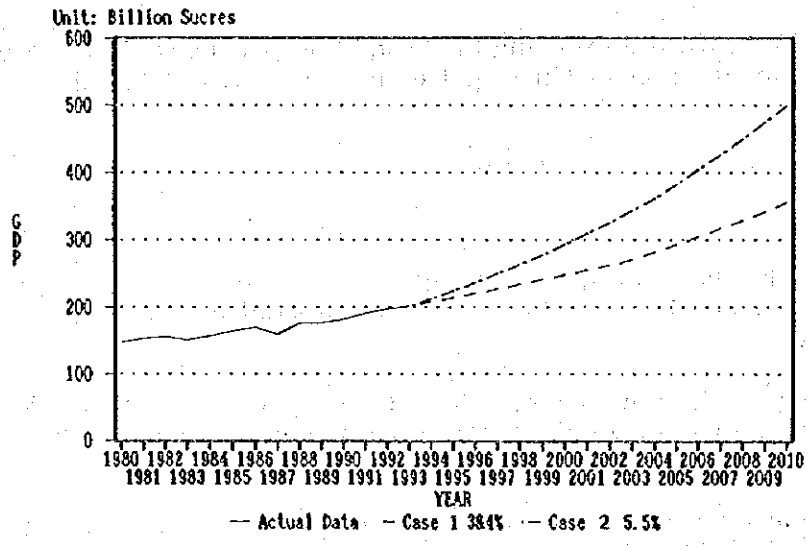


Figure II-2-3 Historical Growth of GDP

B. Methodology for Demand Forecast

15. There are two different methods of forecasting demand for port traffic in general. One is the so-called macro forecast method on the basis of socio-economic conditions, and the other is the so-called micro forecast method on the basis of the characteristics of cargo flow by each commodity group of cargo.

16. The former method forecasts the total cargo volume as a whole by statistical correlation between the cargo volume and socio-economic indices such as GDP (gross domestic products) of the hinterland of the port and/or population and the past time trend.

17. The latter one is a cumulative method forecasting the cargo volume based on the analyses of the patterns of major commodities individually (related indices, the forecast demand and supply situation).

18. Some private berths are located in the water area controlled by APG. On the handling cargo at these private berths, cargo handling statistics are submitted to APG. APG processes the data and submits it to DIGMER together with the data on the cargo through the APG berths. The berths of INDUSTRIAL MOLINERA, MOLINOS DEL ECUADOR, LA FAVORITA, TIMSA, SIPRESA, ECUAGRAN and GANGEL are located along the Guayas River; FERTISA is in Estero Muerto. Table II-2-2 shows commodity-wise cargo volume handled at Guayaquil Port and private berths from 1980 to 1993. Fuel and its derivatives, which is handled at another port, is excluded from the forecast. The demand of commodity is used with the grouping of Table II-2-2. Table II-2-3 shows the commodity-wise cargo at Guayaquil port in 1993.

19. Forecast is carried out using both commodity of Guayaquil port and private berths because the cargoes influence the hinterlands of Guayaquil port and the commodity-wise is mixing with the cargo of public and private port. The cargo of private berths is deducted to obtain the final result of forecast volume in the target year.

20. Future container volume is forecast based on the present state of containerization. Forecast of vessel is carried out using the classification of commodity and cargo type which is forecast by the condition of cargo and containerization.

C. Cargo Volume Forecast

1) Macro forecast

21. Macro forecast is carried out using two scenarios. One is that cargo volume will increase annually according to past trends which is known as time trend analysis. The other way uses the historical relation between cargo volume and macroeconomic indices such as GDP and population which is single regression model. The single regression model equation will be selected by a correlation coefficient.

(a) Macro forecast of import cargo

22. As mentioned in the methodology, the forecast of the port traffic is carried out by correlation between the cargo volume and GDP and/or the past time trend.

23. Import cargo including private berth will be forecasted in the target year, APG cargo will exclude private berth cargo because cargo volume in commodity combined APG and private berth cargo.

Table II-2-2 Commodity-wise Cargo Volume

Import

Unit: Ton

No	Commodity	Type	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	Wheat	Bulk	316,524	278,629	260,408	314,040	412,170	363,913	384,897	372,757	357,592	339,799	417,956	374,538	454,713	444,164
2	Sugar	Bag	13		22,071	111,068	75,368	7,615	27,017	29,973	47,469	64,464	51,599	49,063	90,081	74,257
3	Cereals	Bulk	53,678	71,579	78,888	83,361	137,793	66,033	52,203	85,533	107,428	107,659	67,029	106,838	156,539	119,667
4	Vegetable oil	Liquid	48,237	48,054	47,216	48,575	39,320	34,578	15,457	28,197	28,549	32,968	23,437	50,537	40,730	16,911
5	Paper and its derivative	General	72,184	94,320	78,792	121,990	154,939	157,871	168,884	166,892	165,377	162,455	185,920	262,337	258,393	205,236
6	Materials and minerals	Bulk	61,297	121,617	160,463	139,290	100,690	129,761	117,514	76,391	136,083	76,487	79,193	17,491	44,555	68,356
7	Construction material	Bulk	99,057	120,014	9,409	28,848	60,057	40,882	44,768	9,523	3,655	3,246	3,960	4,895	4,904	5,415
8	Manure and fertilizer	Bulk	86,052	86,112	104,877	55,480	91,850	110,076	137,734	127,560	138,021	194,376	214,412	212,603	157,404	205,790
9	Chemical product and others	General	209,814	245,467	293,132	228,639	277,864	252,201	291,440	262,333	205,492	279,587	235,973	325,607	394,920	388,486
10	Iron, steel and other metarls	Bulk	269,935	228,532	246,545	178,898	199,383	237,428	290,545	292,704	267,713	204,923	204,813	326,452	248,169	288,078
11	Vehicle and machinery	Bulk	98,865	93,036	121,209	27,991	29,308	54,564	68,755	60,006	62,909	32,525	43,532	89,864	100,875	86,052
12	Merchandise and other product	General	76,559	90,560	87,674	59,610	63,071	97,446	74,423	77,795	59,791	68,071	71,889	95,686	98,635	118,401
13	Manufacturing and metal product	General	64,202	68,566	50,897	36,966	43,281	49,813	54,298	50,692	54,299	46,196	49,603	63,949	72,500	78,246
14	General cargo	General	45,014	44,149	37,065	46,414	34,210	31,413	21,052	30,180	56,730	17,842	31,649	47,512	27,820	41,637
15	Fuel and derivation	Liquid	541,812	654,148	680,700	578,545	426,509	571,267	334,487	159,353	222,752	105,098	2,467	3,207	2,864	1,063
	Total		2,043,243	2,242,763	2,279,346	2,059,715	2,145,813	2,204,661	2,083,474	1,829,689	1,913,858	1,735,696	1,683,432	2,030,579	2,153,102	2,141,959
	Sub-Total (Exclude fuel)		1,501,431	1,588,615	1,598,646	1,481,170	1,719,304	1,633,394	1,748,987	1,670,336	1,691,106	1,630,598	1,680,965	2,027,372	2,150,238	2,140,896

Export

Unit: Ton

No	Commodity	Type	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	Banana	Box & Rel	489,506	548,509	533,796	377,498	387,437	482,511	496,310	485,038	558,469	654,698	885,239	1,313,626	1,233,463	1,339,493
2	Green banana	Box & Rel	23,307	25,963	26,373	33,827	37,884	36,293	30,922	27,340	40,313	51,045	41,103	53,199	45,701	
3	Coffee	General	36,297	33,705	43,972	42,275	46,735	56,683	78,421	79,206	56,053	78,594	74,371	61,440	55,227	81,613
4	Cacao and its derivative	General	68,839	65,946	77,561	32,939	75,418	101,216	72,538	71,066	80,607	78,588	101,017	92,557	66,366	74,881
5	Rice, cereals and its product	Bag	0	0	18	6	169	304	6	38,035	1,387	226	140	266	2,189	486
6	Sugar	Bag	45,821	35,221			18,884	22,005	16,641	9,529	9,737	11,487	16,838	21,717	14,302	12,212
7	Molasses	General	68,624	54,435	0	4,324	42,557	28,098	0	0	17,544	0	0	6,261	17,775	0
8	Fruit, vegitable and others	General	5,861	5,311	3,601	2,192	4,747	6,066	7,914	8,413	8,201	8,850	9,657	13,263	13,956	34,322
9	Wood & Balsa	Bulk	3,274	2,407	2,413	2,470	6,695	12,969	15,399	20,230	19,019	22,268	24,348	14,802	18,614	11,187
10	Fish, shellfish, mollusk	General	8,434	8,429	9,578	17,429	20,212	22,907	35,481	57,085	59,132	61,911	71,416	90,799	97,068	100,918
11	Fishmeal	General	49,854	44,270	53,463	10,200	73,316	210,020	144,731	74,899	102,739	50,070	4,157	3,730	121	
12	Materials and minerals	Bulk	14,034	2,817	1,231	2,516	1,987	1,528	3,470	28,187	25,450	42,783	23,940	21,820	22,254	16,038
13	Chemical product and others	General	861	1,543	686	465	617	1,126	4,616	3,532	1,794	697	1,035	3,823	2,373	5,613
14	Canned food	General	10,214	10,406	5,892	3,538	5,798	8,795	7,647	10,579	15,642	22,353	30,535	32,432	44,104	48,221
15	Manufacturing and metal product	General	1,811	1,589	1,031	1,901	4,992	3,613	2,015	2,399	3,291	4,089	4,452	2,561	2,848	4,103
16	General cargo	General	14,448	13,702	10,419	11,129	14,783	28,402	17,384	16,118	19,555	22,965	20,864	17,169	13,167	18,197
17	Fuel and derivation	Liquid	0	0	0	6	0	0	0	0	516	0	233	0	42	73
	Total		841,185	854,253	770,034	542,715	742,231	1,020,536	933,495	931,656	1,012,867	1,099,892	1,319,287	1,737,169	1,657,068	1,793,038
	Sub-Total (Exclude fuel)		841,185	854,253	770,034	542,709	742,231	1,020,536	933,495	931,656	1,012,351	1,099,892	1,319,054	1,737,169	1,657,026	1,792,965
	Sub-Total (Exclude fuel and Banan		351,679	305,744	236,238	165,211	354,794	538,025	437,185	446,618	453,882	445,194	433,815	423,543	423,563	453,472

Total

Unit: Ton

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	2,884,428	3,097,036	3,049,380	2,602,430	2,888,044	3,225,197	3,016,969	2,761,345	2,926,725	2,835,588	3,002,719	3,767,748	3,810,170	3,934,997
Sub-Total (Exclude fuel)	2,342,616	2,442,868	2,368,680	2,023,879	2,461,535	2,653,930	2,682,482	2,601,992	2,703,457	2,730,490	3,000,019	3,764,541	3,807,264	3,933,861
Sub-Total (Exclude fuel and Banana)	1,853,110	1,894,379	1,834,884	1,646,381	2,074,098	2,171,419	2,186,172	2,116,954	2,144,988	2,075,792	2,114,780	2,450,915	2,573,801	2,594,368

Source: JICA Study Team constructed the modified data based on APG stastistics.

Table II-2-3 Commodity-wise Cargo Volume at Guayaquil Port in 1993

Import

Unit: Ton

No	Commodity	G. Cargo	Solid Bulk	Liquid Bulk	Bag cargo	Total
1	Wheat		200,814			200,814
2	Sugar				65,332	65,332
3	Cereals		86,586			86,586
4	Vegetable Oil			13,435		13,435
5	Paper and its Derivative	205,236				205,236
6	Materials and Minerals		67,184			67,184
7	Construction Material		5,415			5,415
8	Manure and Fertilizer		46,710			46,710
9	Chemical Product	237,421				237,421
10	Iron, Steel		288,078			288,078
11	Vehicle and Machinery		86,036			86,036
12	Merchandise and Other	113,164				113,164
13	Manufacturing and Met.	78,444				78,444
14	General Cargo	44,516				44,516
	Total	678,781	780,823	13,435	65,332	1,538,371

Export

Unit: Ton

No	Commodity	G.Cargo	Solid Bulk	Liquid Bulk	Bag Cargo	Banana	Total
1	Banana					1,339,493	1,339,493
2	Green Banana					45,701	45,701
3	Coffee	81,366					81,366
4	Cacao and its Derivat.	74,512					74,512
5	Rice, Cereals				466		466
6	Sugar				12,212		12,212
7	Molasses	0					0
8	Fruit, Vegetables	34,322					34,322
9	Wood and Balsa		11,187				11,187
10	Fish, Shellfish	100,802					100,802
11	Fishmeal	0					0
12	Materials and Minerals		16,038				16,038
13	Chemical Product	5,607					5,607
14	Canned Food	48,221					48,221
15	Manufacturing	4,103					4,103
16	General Cargo	18,274					18,274
17	CEDEGE Project	0					0
	Total	367,207	27,225	0	12,678	1,385,194	1,792,304

Total

Unit: Ton

No	Commodity	G.Cargo	Solid Bulk	Liquid Bulk	Bag Cargo	Banana	Total
	Total	1,045,988	808,048	13,435	78,010	1,385,194	3,330,675

Source: APG, data modified by Study Team.

24. The import cargo of private berth will be estimated from 1991, 1992 and 1993 data. The forecasted private berth cargo in the target year is shown in Table II-2-4.

Table II-2-4 Import Cargo of Private Berth in Target Year

Unit: Ton

No	Commodity	1991	1992	1993	Project.
1	Wheat	264,200	259,673	243,350	265,000
2	Sugar			8,925	9,000
3	Cereals	39,862	49,733	33,081	50,000
4	Vegetable Oil	21,047	6,047	3,476	21,000
5	Paper and its Derivative	557			1,000
6	Materials and Minerals	9,680	6,039	1,172	10,000
7	Construction material				0
8	Manure and Fertilizer	146,642	128,562	159,080	160,000
9	Chemical Product	119,745	196,352	151,065	197,000
10	Iron. Steel				0
11	Vehicle and Machinery	132	17	16	0
12	Merchandise and Other			5,237	6,000
13	Manufacturing and Met.		2	2	0
14	General Cargo	20,198	7,328	10,397	21,000
	Total	622,061	653,753	615,802	740,000

a) Scenario 1

25. Correlation between the total cargo volume and years by a linear regression is shown below.

$$Y = 42{,}663.12 \times YEA - 83{,}017{,}136$$

where,
- Y: Total import cargo volume (metric tons)
- YEA: Year
- R: Correlation coefficient

26. The import cargo volume in the target year is estimated as 2,736,000 tons. Import cargo excluding that of private berth is 1,996,000 tons.

b) Scenario 2

27. The correlation coefficient of GDP is higher than one of population. Total import cargo volume handled at port is forecasted by its relation with GDP. The correlation between the cargo volume and GDP from 1980 to 1993 is expressed in the following equation.

$$Y = 11.04255 \times GDP - 143{,}797.47 \quad (R=0.897)$$

where,
- Y: Total import cargo volume (metric tons)
- GDP: GDP (1975's constant prices, million Sucres) in Ecuador
- R: Correlation coefficient

28. In Case 1, the import cargo volume in the target year is estimated as 3,790,000 tons. Import cargo excluding that of private berth is 3,050,000 tons.

(b) Macro forecast of export cargo

29. As mentioned in the methodology, the forecast of the port traffic is carried out by correlation between the cargo volume and GDP and/or the past time trend.

30. Export cargo included private berth will be forecasted in the target year, APG cargo will exclude private berth cargo because cargo volume in commodity combined APG and private berth cargo.

31. Export cargo of private berth will be estimated from 1991, 1992 and 1993 data. The forecasted private berth cargo in the target year is shown in Table II-2-5.

Table II-2-5 Export Cargo of Private Berth in Target Year

Unit: Ton

No	Commodity	1991	1992	1993	Project.
1	Banana				0
2	Green Banana				0
3	Coffee			247	1,000
4	Cacao and its Derivative			369	1,000
5	Rice, cereals				0
6	Sugar				0
7	Molasses	6,255	6,375		7,000
8	Fruit, Vegetables				0
9	Wood and Balsa				0
0	Fish, Shellfish, Mollusk	4,832	2,211	107	5,000
11	Fishmeal				0
12	Materials and Minerals				0
13	Chemical Product		500	6	1,000
14	Canned Food				0
15	Manufacturing and Met.	940	1		1,000
16	General cargo			9	0
	Total	12,027	9,087	738	16,000

a) Scenario 1

32. Correlation between the total cargo volume and years by a linear regression is shown below.

$$Y = 81{,}557{,}633 \times YEA - 160{,}924{,}564$$

where,

Y: Total export cargo volume (metric tons)
YEA: Year
R: Correlation coefficient

33. The export cargo volume in the target year is estimated as 3,006,000 tons. Export cargo excluding that of private berth and banana cargo is 2,990,000 tons.

b) Scenario 2

34. Total export cargo volume handled at port is forecasted by its relation with GDP. The correlation between the cargo volume and GDP from 1980 to 1993 is expressed in the following equation.

Y = 20.90828 x GDP - 2,464,191.3 (R=0.944)

where,

Y: Total export cargo volume (metric tons)
GDP: GDP (1975's constant prices, million Sucres) in Ecuador
R: Correlation coefficient

35. In Case 1, the export cargo volume in the target year is estimated as 4,985,00 tons. Export cargo excluding that of private berth and banana cargo is 4,969,000 tons.

(c) Summary of macro forecast

36. According to the above calculations, the results of the macro forecast are summarized in the following Table II-2-6.

Table II-2-6 Summary of Macro Forecast at APG Port by Case 1 in 2010

Unit: Thousand ton

Year 2010	Import	Export	Total
Scenario 1	1,996	2,990	4,986
Scenario 2	3,050	4,969	8,019

* Excluding petroleum and transhipment container cargo

2) Micro forecast

37. The micro approach will be carried out under the following conditions.

a) Future population which was estimated in Table II-2-1 will be used.

b) GDP growth rate will be used for Case 1 and Case 2.

Import Cargo Volume

(1) Wheat

38. Production of wheat is very small in Ecuador and almost all wheat for domestic consumption is imported at the port of Guayaquil. As consumption of wheat is related to the population, so future import volume will in this study be estimated by its relation with population. The correlation between the import volume and population from 1980 to 1993 is expressed in the following equation.

Y = 46.91583 x X - 79,835.11 (R=0.785)

Where, Y : Import volume of wheat (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

39. Figure II-2-4 shows projection for the import volume of wheat. The import volume of wheat in the target year is estimated as 619,000 tons. Between 1991 and 1993, APG handled 40% of imported, therefore, in the target year, APG is expected to handle 248,000 tons.

(2) Sugar

40. Demand will be forecast by correlation with population. The following formula shows the correlation between sugar and population from 1986 to 1993.

$$Y = 31.44204 \times X - 264,903 \quad (R=0.850)$$

Where, Y : Import volume of sugar (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

41. Figure II-2-5 shows projection for the import volume of sugar. The import volume in the target year is estimated as 204,000 tons. The import volume of APG excluding the private berth cargo is 195,000 tons.

(3) Cereal

42. Demand will be forecast by time series analysis. The following formula shows the correlation between cereal and year from 1980 to 1993.

$$Y = 4,256.004 \times X - 8,362,108$$

Where, Y : Import volume of cereal (ton)
X : Year
R : Correlation coefficient

43. Figure II-2-6 shows projection for the import volume of cereal. The import volume in the target year is estimated as 192,000 tons. The import volume of APG excluding the private berth cargo is 142,000 tons.

(4) Vegetable oil

44. The fluctuation of the import of vegetable oil is sharp between 1980 and 1993. Demand increase is commensurate with past maximum between 1980 and 1993.

45. Figure II-2-7 shows projection for the import volume of vegetable oil. The import volume of vegetable oil in the target year is estimated as 51,000 tons. The import volume of APG excluding the private berth cargo is 30,000 tons.

(5) Paper and its derivative

46. Demand will be forecast by correlation with population. The following formula shows the correlation between paper and derivative and population from 1980 to 1993.

$$Y = 55.50871 \times X - 362,282.6 \quad (R=0.892)$$

Where, Y : Import volume of vegetable liquid (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

47. Figure II-2-8 shows projection for the import volume of paper and derivative. The import volume in the target year is estimated as 465,000 tons. The import volume of APG excluding the private berth is 464,000 tons.

(6) Material and minerals

48. The fluctuation of the import of material and minerals is sharp between 1980 and 1993. Demand increase is commensurate with the past maximum between 1980 and 1993.

49. Figure II-2-9 shows projection for the import volume of material and minerals. The import volume of material and minerals in the target year is estimated as 160,000 tons. The import volume of APG excluding the private berth cargo is 150,000 tons.

(7) Construction materials

50. Demand will be forecast by correlation with GDP. The following formula shows the correlation between construction material and GDP from 1988 to 1993.

$$Y = 0.0745579 \times X - 9{,}608.80 \quad (R=0.967)$$

Where, Y : Import volume of construction material (ton)
X : GDP (million sucres at 1975 price) in Ecuador
R : Correlation coefficient

51. Figure II-2-10 shows projection for the import volume of construction materials. The import volume of construction materials in the target year is estimated as 17,000 tons. The import volume of APG excluding the private berth cargo is 17,000 tons.

(8) Manure and fertilizer

52. The import volume is gradually increasing. Demand will be forecast by correlation with population. The following formula shows the correlation between manure and fertilizer and population from 1980 to 1993.

$$Y = 2.566310 \times X - 298{,}895.4 \quad (R=0.862)$$

Where, Y : Import volume of manure and fertilizer (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

53. Figure II-2-11 shows projection for the import volume of manure and fertilizer. The import volume in the target year is estimated as 395,000 tons. The import volume of APG excluding the private berth is 235,000 tons.

(9) Chemical product and others

54. Chemicals are imported for private consumption as well as industry and agriculture. Thus the import volume of chemicals has a close relation with the GDP. The import volume is forecasted by its correlation with GDP. The correlation between the import volume and GDP from 1980 to 1993 is expressed in the following equation.

$$Y = 2.438578 \times X - 136{,}569.4 \quad (R=0.734)$$

Where, Y : Import volume of chemical product and others (ton)
X : GDP (million sucres at 1975 price) In Ecuador
R : Correlation coefficient

55. Figure II-2-12 shows projection for the import volume of chemical product and others. The import volume in the target year is estimated as 732,000 tons. The import volume of APG excluding the private berth cargo is 535,000 tons.

(10) Iron, steel and other materials

56. Demand will be forecast by time series analysis because as Iron, steel and materials is based on industry, it will increase steadily following the investment in the plant and equipment. The following formula shows the correlation between iron, steel & other materials and year from 1980 to 1993.

$$Y = 3{,}237.6879 \times X - 6{,}182{,}801$$

Where, Y : Import volume of iron, steel and other materials (ton)
X : Year
R : Correlation coefficient

57. Figure II-2-13 shows projection for the import volume of iron, steel and others materials. The import volume in the target year is estimated as 325,000 tons. The import volume of APG excluding the private berth is 325,000 tons.

(11) Vehicle and machinery

58. The fluctuation of vehicle and machinery volume is sharp between 1980 and 1993. Demand determined by the trend and characteristics of the past cargo volume. Demand increase is commensurate with annual growth rate of GDP. This method uses annual growth rate of GDP in Case 1 and based year is fixed at 1990 (Business recovered in this year).

59. Figure II-2-14 shows projection for the import volume of vehicle and machinery. The import volume in the target year is estimated as 85,000 tons. The import volume of APG excluding the private berth cargo is 85,000 tons.

(12) Merchandise and other product

60. Demand increase is commensurate with annual growth rate of GDP. This method uses annual growth rate of GDP in Case 1 and cargo demand elasticity for GDP is calculated and set to be 1.05.

61. Figure II-2-15 shows projection for the import volume of merchandise and other product. The import volume in the target year is estimated as 250,000 tons. The import volume of APG excluding the private berth cargo is 190,000 tons.

(13) Manufacturing and metal product

62. The import volume of manufacturing and metal product is forecasted by its correlation with GDP. The correlation between the import volume and GDP from 1980 to 1993 is expressed in the following equation.

$$Y = 13.59501 \times X - 78{,}649.01 \quad (R=0.775)$$

Where, Y : Import volume of manufacturing and metal product (ton)
X : GDP (million sucres at 1975 price) in Ecuador
R : Correlation coefficient

63. Figure II-2-16 shows projection for the import volume of manufacturing and metal product. The import volume in the target year is estimated as 173,000 tons. The import volume of APG excluding the private berth cargo is 173,000 tons.

(14) General cargo

64. Demand increase is commensurate with annual growth rate of GDP. This method uses annual growth rate of GDP in Case 1 and cargo demand elasticity for GDP is calculated and set to be 1.05.

65. Figure II-2-17 shows projection for the import volume of general cargo. The import volume in the target year is estimated as 73,000 tons. The import volume of APG excluding the private berth cargo is 52,000 tons.

(15) Summary of import cargo

66. According to the above equation, the import volume is estimated and the results are given below.

Table II-2-7 Summary of Import Cargo at Guayaquil Port by Case 1 in 2010

Unit: Ton

No	Commodity	G. Cargo	Solid Bulk	Liquid Bulk	Bag cargo	Total
1	Wheat		248,000			248,000
2	Sugar				195,000	195,000
3	Cereals		142,000			142,000
4	Vegetable Oil			30,000		30,000
5	Paper and its Derivative	464,000				464,000
6	Materials and Minerals		150,000			150,000
7	Construction Material		17,000			17,000
8	Manure and Fertilizer		235,000			235,000
9	Chemical Product	535,000				535,000
10	Iron. Steel		325,000			325,000
11	Vehicle and Machinery		85,000			85,000
12	Merchandise and Other	190,000				190,000
13	Manufacturing and Met.	173,000				173,000
14	General Cargo	52,000				52,000
	Total	1,414,000	1,202,000	30,000	195,000	2,841,000

Table II-2-8 Summary of Import Cargo at Guayaquil Port by Case 2 in 2010

Unit: Ton

No	Commodity	G. Cargo	Solid Bulk	Liquid Bulk	Bag cargo	Total
1	Wheat		248,000			248,000
2	Sugar				195,000	195,000
3	Cereals		142,000			142,000
4	Vegetable Oil			30,000		30,000
5	Paper and its Derivative	464,000				464,000
6	Materials and Minerals		150,000			150,000
7	Construction Material		28,000			28,000
8	Manure and Fertilizer		235,000			235,000
9	Chemical Product	887,000				887,000
10	Iron. Steel		325,000			325,000
11	Vehicle and Machinery		127,000			127,000
12	Merchandise and Other	278,000				278,000
13	Manufacturing and Met.	268,000				268,000
14	General Cargo	85,000				85,000
	Total	1,982,000	1,255,000	30,000	195,000	3,462,000

Remark: Elastic value of Import in Case 2 is 1.04

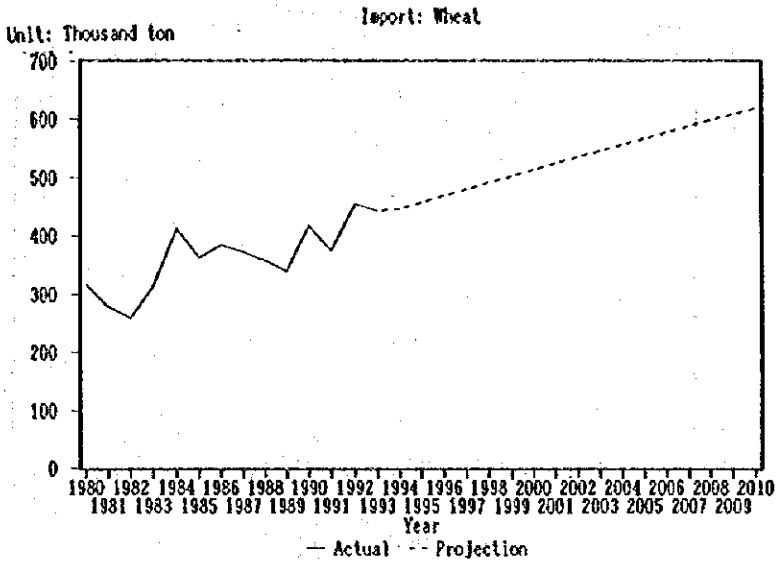


Figure II-2-4 Forecast Import Volume of Wheat

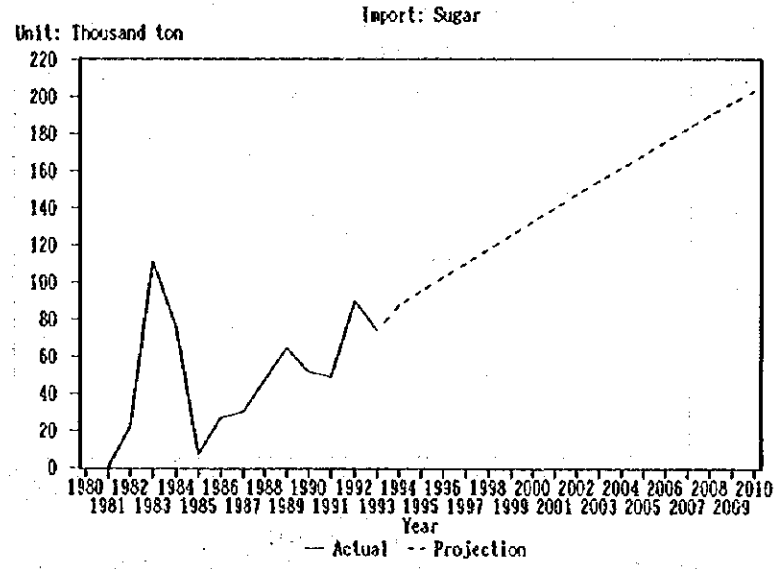


Figure II-2-5 Forecast Import Volume of Sugar

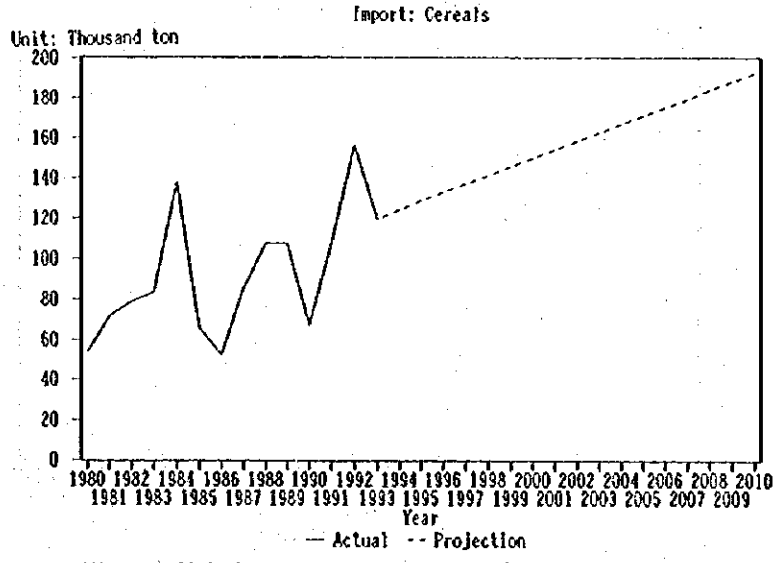


Figure II-2-6 Forecast Import Volume of Cereal

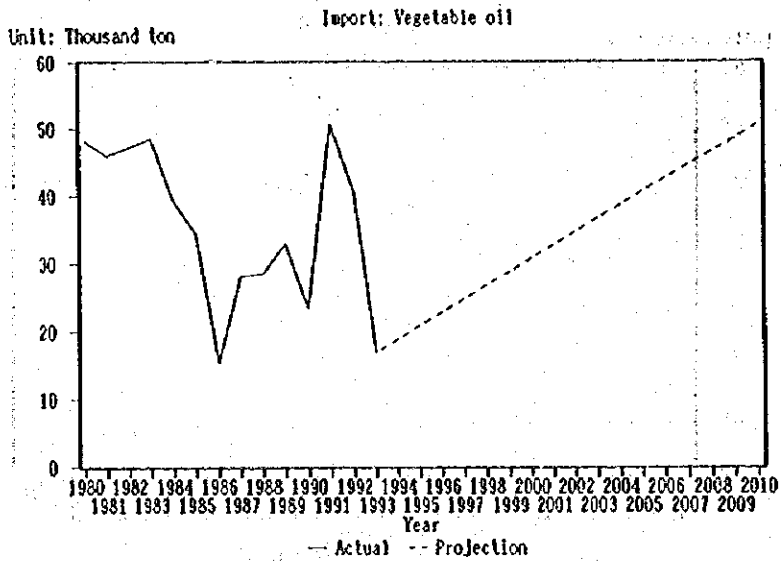


Figure II-2-7 Forecast Import Volume of Vegetable Oil

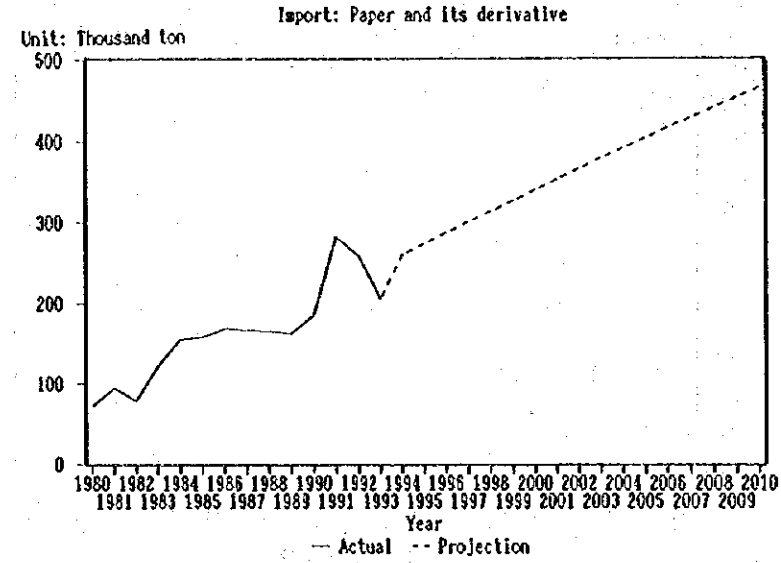


Figure II-2-8 Forecast Import Volume of Paper and its Derivative

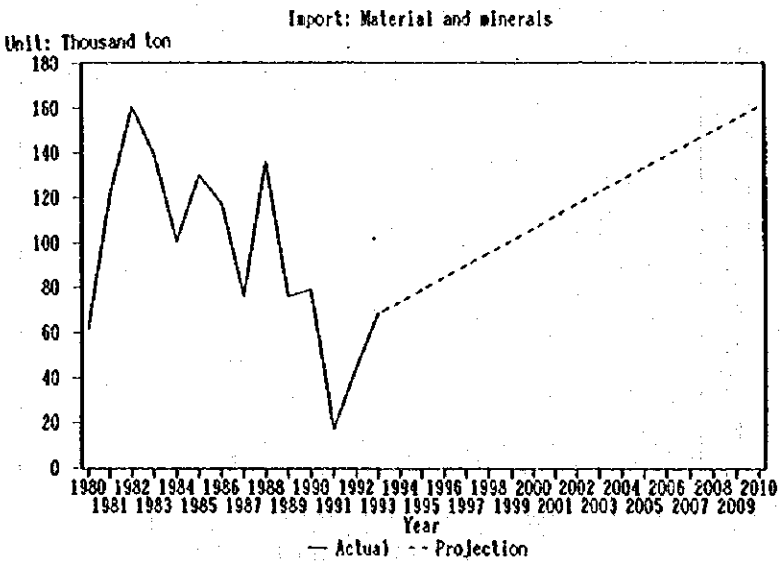


Figure II-2-9 Forecast Import Volume of Material and Minerals

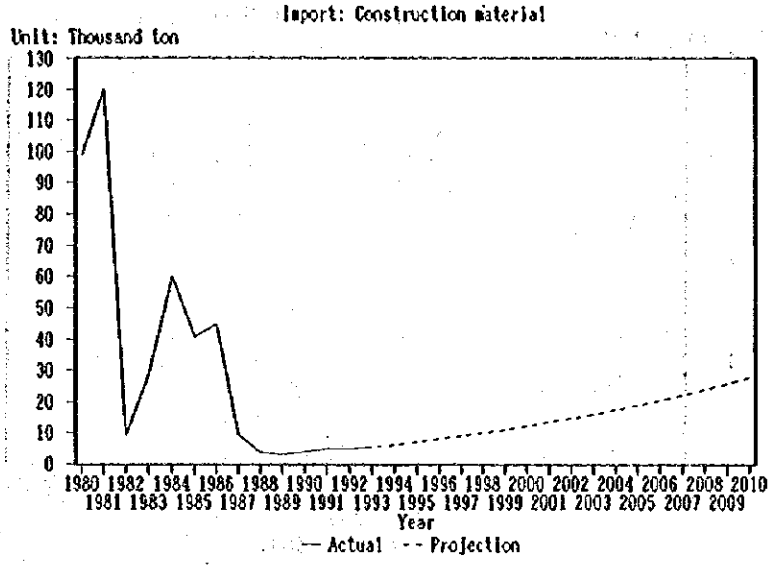


Figure II-2-10 Forecast Import Volume of Construction Materials

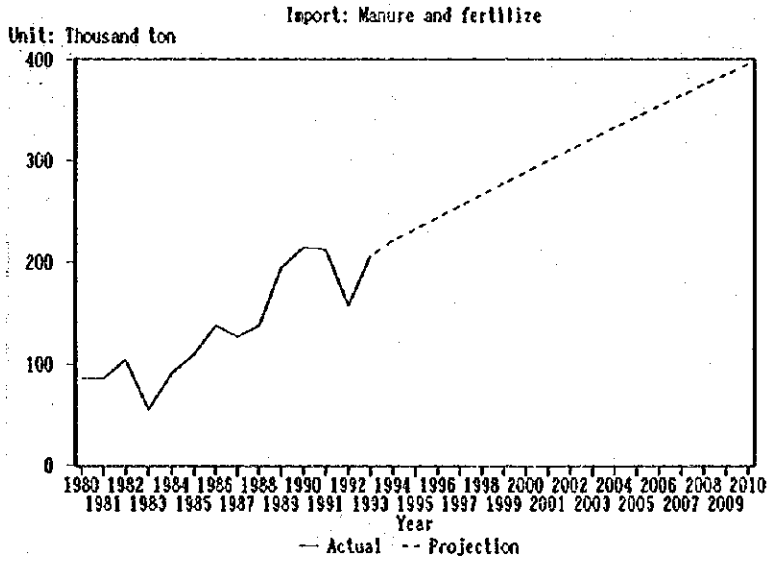


Figure II-2-11 Forecast Import Volume of Manure and Fertilizer

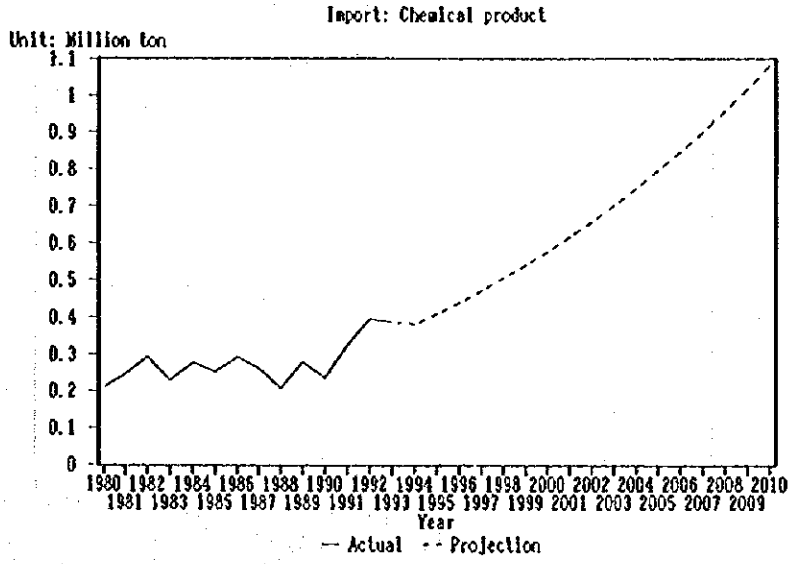


Figure II-2-12 Forecast Import Volume of Chemical Product and Others

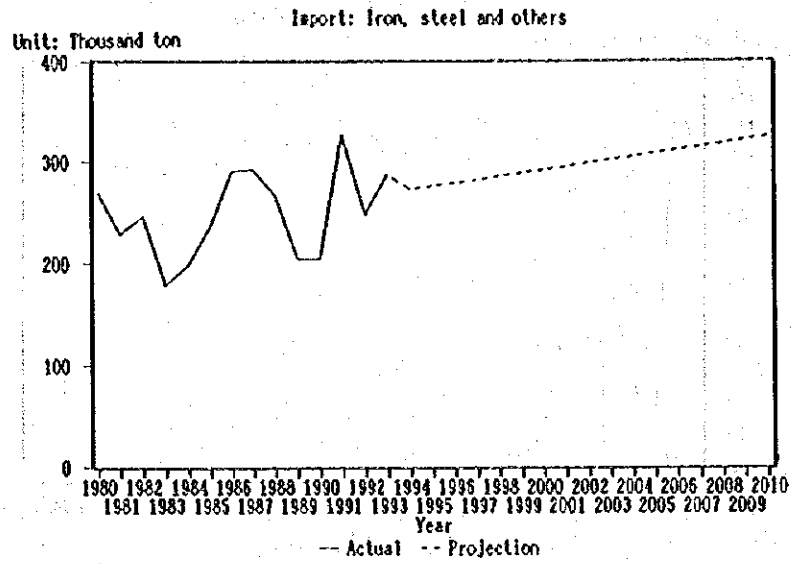


Figure II-2-13 Forecast Import Volume of Iron, Steel and Other Materials

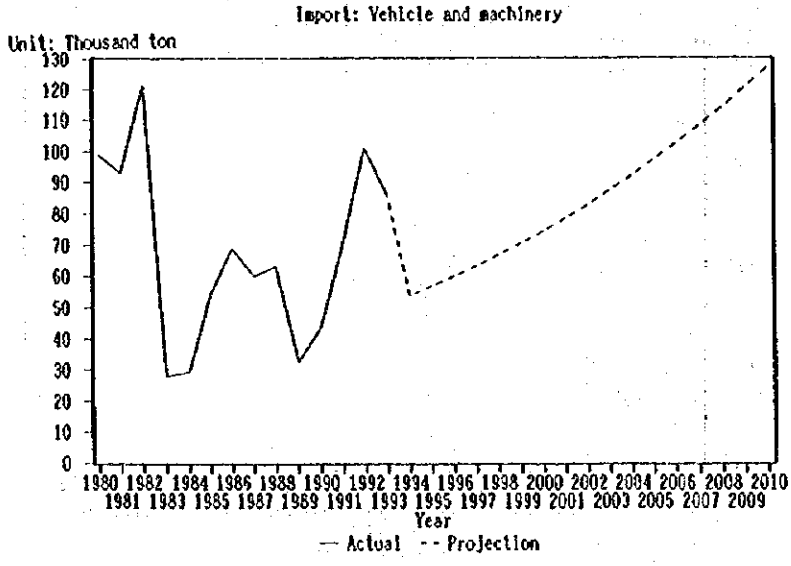


Figure II-2-14 Forecast Import Volume of Vehicle and Machinery

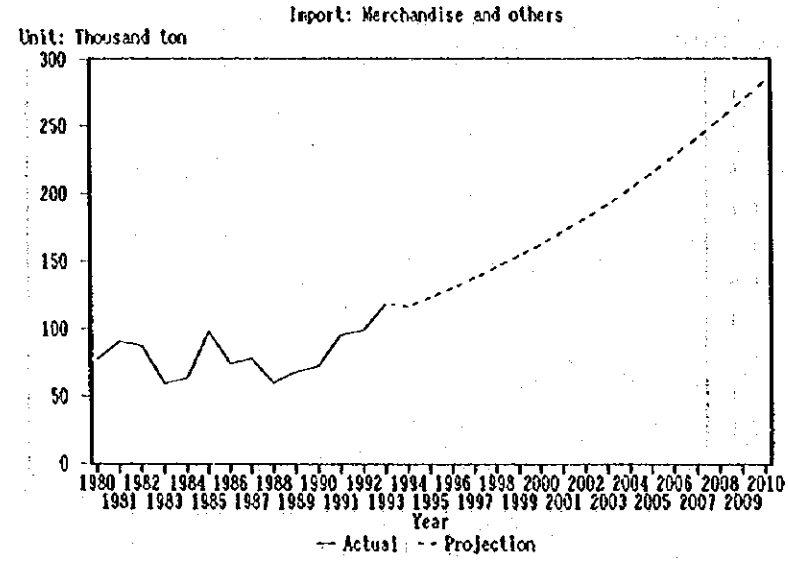


Figure II-2-15 Forecast Import Volume of Merchandise and Other Product

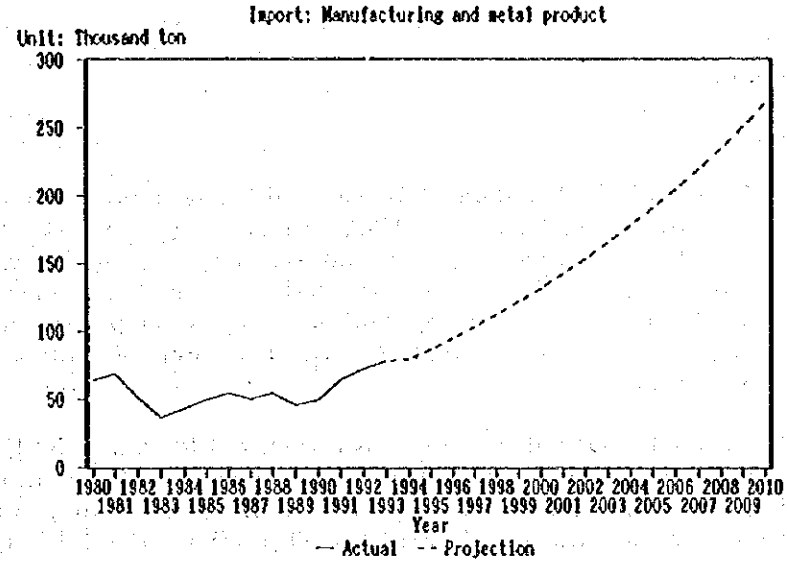


Figure II-2-16 Forecast Import Volume of Manufacturing and Metal Product

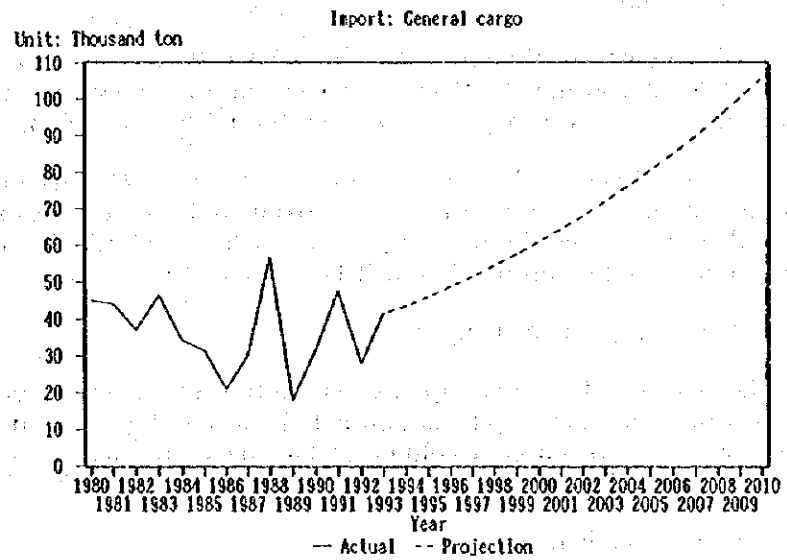


Figure II-2-17 Forecast Import Volume of General Cargo

Export cargo volume

(1) Banana

67. Based on the world market data of banana which was prepared by FAO (1990), increase rate of consumption of banana for USA and West Europe was estimated at 0.7% because the per capita consumption per annum reached 9 to 10 kg which was near saturation, but Russia and East Europe are expected to become new markets for banana and increase rate is assumed at 3.4%; Middle East is also expected to increase consumption. Based on the above situation, export volume of banana in Ecuador is expected to increase a little.

68. Following the interview with Programa Nacional del Banano (PNB), cultivated area for export will be maintained at 120,000 ha and the yield will be improved from 26 ton/ha to 50 ton/ha until 2010. Loss of export is 15%, share of Guayaquil port in 1994 is 60%. So exported volume will be 120,000 ha x 50 ton/ha x (1-0.15) X 60% = 2,550,000 ton.

(i) Production of banana

69. Production of banana in Ecuador reached 2,269,000 MT in 1980 and recorded 4,422,000 MT in 1993 according to INEC. Based on interviews with MAG, future cultivated area will remain the same as at present though yield will be increased.

70. Between 1989 and 1993 yield of banana in Ecuador was 21 ton/ha, while that of Dole was 2.5 times higher (21x2.5=52.5 ton/ha). Productivity of Honduras is 52 ton/ha between 1988 and 1992. Yield in the target year will be 35 ton/ha roughly in the middle of Ecuador and Dole. Production will be 7,126,000 tons.

(ii) Domestic consumption of banana

71. Based on the data of MAG, per capita consumption of bananas reached 133 kg in 1992. Future consumption per capita is estimated as 140 kg. Based on the above mention, future domestic consumption volume of banana is forecasted by estimating per capita consumption and future population. Domestic consumption is 2,086,000 tons.

(iii) Export volume of banana

72. Export volume is estimated by deducting the domestic consumption volume from the production volume. According to the statistics of export, 50% of the export volume of banana has been handled through the port of Guayaquil. Based on the above, future export volume of banana through the port of Guayaquil is estimated as 2,520,000 tons. Figure II-2-18 shows projection for the export volume of banana.

(2) Green banana

73. The export volume is gradually increasing. Demand will be forecast by correlation with population. The following formula shows the correlation between green banana and population from 1980 to 1993.

$$Y = 7.994739 \times X - 39,370.3 \quad (R=0.834)$$

Where, Y : Export volume of green banana (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

74. Figure II-2-19 shows projection for the export volume of green banana. The export volume in the target year is estimated as 80,000 tons. The export volume of APG excluding the private berth cargo is 80,000 tons.

(3) Coffee

75. Based on the data of FAO, it was estimated that while annual increase rate of consumption of coffee in North America and West Europe will be 0.7 to 0.9%, it will become higher in Russia, East Europe and Japan. Therefore, it is expected that the export volume of coffee in Ecuador will increase gradually in the future.

(i) Production of coffee

76. From 1980 to 1993, production volume of coffee has been increasing favorably at a 5.4% annual increase rate, but it is assumed that annual increase rate will be down a little. The production volume of coffee is forecasted by its correlation with year. The correlation between the production volume of coffee and year from 1980 to 1993 is expressed in the following equation.

$$Y = 5{,}313.249\ X - 10{,}439{,}361$$

Where, Y : Production volume of coffee (ton)
X : Year
R : Correlation coefficient

77. According to the above equation, the production volume is estimated as 240,000 tons.

(ii) Export volume of coffee

78. The export volume of coffee in Guayaquil port is forecasted by its correlation with production volume. The correlation between the export volume of coffee and production volume from 1980 to 1993 is expressed in the following equation.

$$Y = 0.5276884 \times X - 1{,}999.2 \quad (R=0.850)$$

Where, Y : Export volume of coffee in Guayaquil port (ton)
X : Production volume of coffee (ton)
R : Correlation coefficient

79. Figure II-2-20 shows projection for the export volume of coffee. The export volume in the target year is estimated as 125,000 tons. The export volume of APG excluding the private berth cargo is 124,000 tons.

(4) Cacao and its derivarive

80. The fluctuation of export of cacao and derivarive is sharp between 1980 and 1993. Demand increase is commensurate with the past maximum between 1980 and 1993.

81. Figure II-2-21 shows projection for the export volume of cacao and derivarive. The export volume in the target year is estimated as 101,000 tons. The export volume of APG excluding the private berth cargo is 100,000 tons.

(5) Rice, cereals and its product

82. The fluctuation of export of rice, cereals and product is sharp between 1980 and 1993. Demand increase is commensurate with past trend between 1980 and 1993.

83. Figure II-2-22 shows projection for the export volume of rice, cereals and product. The export volume in the target year is estimated as 2,000 tons. The export volume of APG excluding the private berth cargo is 2,000 tons.

(6) Sugar

84. The fluctuation of export of sugar is sharp between 1980 and 1993. Demand increase is commensurate with past trend between 1980 and 1993.

85. Figure II-2-23 shows projection for the export volume of sugar. The export volume in the target year is estimated as 22,000 tons. The export volume of APG excluding the private berth cargo is 22,000 tons.

(7) Molasses

86. The fluctuation of export of molasses is sharp between 1980 and 1993. Demand increase is commensurate with past trend between 1980 and 1993.

87. Figure II-2-24 shows projection for the export volume of molasses. The export volume in the target year is estimated as 18,000 tons. The export volume of APG excluding the private berth is 11,000 tons.

(8) Fruit, vegetable and others

88. The export volume of fruit, vegetable and others is forecasted by its correlation with GDP. The correlation between the export volume and GDP from 1980 to 1993 is expressed in the following equation.

$$Y = 0.3562787 \times X - 51,104.3 \quad (R=0.797)$$

Where, Y : Export volume of fruit, vegetable and others (ton)
X : GDP (million sucres at 1975 price) in Ecuador
R : Correlation coefficient

89. Figure II-2-25 shows projection for the export volume of fruit, vegetable and others. The export volume in the target year is estimated as 76,000 tons. Export volume of APG excluding the private berth cargo is 76,000 tons.

(9) Wood and balsa

90. The export volume is gradually increasing. Demand will be forecast by correlation with population. The following formula shows the correlation between wood and balsa and population from 1980 to 1993.

$$Y = 6.083511 \times X - 44,937.15 \quad (R=0.747)$$

Where, Y : Export volume of wood and balsa (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

91. Figure II-2-26 shows projection for export volume of wood and balsa. The export volume in the target year is estimated as 46,000 tons. The export volume of APG excluding the private berth cargo is 46,000 tons.

(10) Fish, shellfish and mollusk

92. The export volume is gradually increasing. Demand will be forecast by correlation with population. The following formula shows the correlation between fish, shellfish, mollusk and population from 1980 to 1993.

$$Y = 34.328001 \times X - 277,347.4 \quad (R=0.980)$$

Where, Y : Export volume of fish, shellfish and mollusk (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

93. Figure II-2-27 shows projection for the export volume of fish, shellfish and mollusk. The export volume in the target year is estimated as 234,000 tons. The export volume of APG excluding the private berth is 229,000 tons.

(11) Fishmeal

94. The fluctuation of the export of molasses is sharp between 1980 and 1993. Demand increase is commensurate with past trend between 1991 and 1993.

95. Figure II-2-28 shows projection for the export volume of fishmeal. The export volume in the target year is estimated as 1,000 tons. The export volume of APG excluding the private berth cargo is 1,000 tons.

(12) Materials and minerals

96. Demand will be forecast by correlation with population. The following formula shows the correlation between materials & minerals and population from 1980 to 1993.

$$Y = 8.269801 \times X - 63,324.14 \quad (R=0.616)$$

Where, Y : Export volume of materials and minerals (ton)
X : Total population (thousand) in Ecuador
R : Correlation coefficient

97. Figure II-2-29 shows projection for the export volume of materials and minerals. The export volume in the target year is estimated as 60,000 tons. The export volume of APG excluding the private berth cargo is 60,000 tons.

(13) Chemical product and others

98. Demand will be forecast by time series analysis because as chemical product and others is based on industry, it will increase steadily. The following formula shows the correlation between chemical product & others and year from 1980 to 1993.

$$Y = 225.60219 \times X - 446,117.2$$

Where, Y : Export volume of chemical product and others (ton)
X : Year
R : Correlation coefficient

99. Figure II-2-30 shows projection for the export volume of chemical product and others. The export volume in the target year is estimated as 7,000 tons. The export volume of APG excluding the private berth cargo is 6,000 tons.

(14) Canned food

100. The export volume of canned food is forecasted by its correlation with GDP. The correlation between the export volume and GDP from 1980 to 1993 is expressed in the following equation.

$$Y = 0.7878546 \times X - 115{,}760.8 \quad (R=0.932)$$

Where, Y : Export volume of canned food (ton)
X : GDP (million sucres at 1975 price) in Ecuador
R : Correlation coefficient

101. Figure II-2-31 shows projection for the export volume of canned food. The export volume in the target year is estimated as 165,000 tons. The export volume of APG excluding the private berth cargo is 165,000 tons.

(15) Manufacturing and metal product

102. Demand increase is commensurate with annual growth rate of GDP. This method uses annual growth rate of GDP in Case 1 and cargo demand elasticity for GDP is calculated and set to be 1.20.

103. Figure II-2-32 shows projection for the export volume of manufacturing and metal product. The export volume in the target year is estimated as 7,000 tons. The export volume of APG excluding the private berth cargo is 6,000 tons.

(16) General cargo

104. Demand increase is commensurate with annual growth rate of GDP. This method uses annual growth rate of GDP in Case 1 and cargo demand elasticity for GDP is calculated and set to be 1.20.

105. Figure II-2-33 shows projection for the export volume of general cargo. The export volume in the target year is estimated as 33,000 tons. The export volume of APG excluding the private berth is 33,000 tons.

(17) CEDEGE project

106. CEDEGE was created in 1965 and is a semi-autonomous public agency attached to MAG and to the Office of the President. It is located in Guayaquil, has its own endowment and is governed by a Board of Directors. It was created to carry out studies of ways to develop the Guayas River Basin.

107. CEDEGE project currently under construction will expand the irrigated area which is Santa Elena by 19,000 ha before 1995. Fruit production (Lemon, Mango, Papaya, Melon etc.) will reach 380,000 tons and 65% (250,000 tons) will be exported in 2000. These fruits cargo will be carried from Guayaquil Port.

(18) Summary of Export Cargo

108. According to the above equation, the export volume is estimated and the results are given below.

Table II-2-9 Summary of Export Cargo at Guayaquil Port by Case 1 in 2010

Unit: Ton

No	Commodity	G.Cargo	Solid Bulk	Liquid Bulk	Bag Cargo	Banana	Total
1	Banana					2,520,000	2,520,000
2	Green Banana					80,000	80,000
3	Coffee	124,000					124,000
4	Cacao and its Derivat.	100,000					100,000
5	Rice, Cereals				2,000		2,000
6	Sugar				22,000		22,000
7	Molasses	11,000					11,000
8	Fruit, Vegetables	76,000					76,000
9	Wood and Balsa		46,000				46,000
10	Fish, Shellfish	229,000					229,000
11	Fishmeal	1,000					1,000
12	Materials and Minerals		60,000				60,000
13	Chemical Product	6,000					6,000
14	Canned Food	165,000					165,000
15	Manufacturing	6,000					6,000
16	General Cargo	33,000					33,000
17	CEDEGE Project	250,000					250,000
	Total	1,001,000	106,000	0	24,000	2,600,000	3,731,000

Table II-2-10 Summary of Export Cargo at Guayaquil Port by Case 2 in 2010

Unit: Ton

No	Commodity	G.Cargo	Solid Bulk	Liquid Bulk	Bag Cargo	Banana	Total
1	Banana					2,520,000	2,520,000
2	Green Banana					80,000	80,000
3	Coffee	124,000					124,000
4	Cacao and its Derivat.	100,000					100,000
5	Rice, Cereals				2,000		2,000
6	Sugar				22,000		22,000
7	Molasses	11,000					11,000
8	Fruit, Vegetables	127,000					127,000
9	Wood and Balsa		46,000				46,000
10	Fish, Shellfish	229,000					229,000
11	Fishmeal	1,000					1,000
12	Materials and Minerals		60,000				60,000
13	Chemical Product	6,000					6,000
14	Canned Food	279,000					279,000
15	Manufacturing	8,000					8,000
16	General Cargo	47,000					47,000
17	CEDEGE Project	250,000					250,000
	Total	1,182,000	106,000	0	24,000	2,600,000	3,912,000

Remark: Elastic value of export in Case 2 is 1.10.

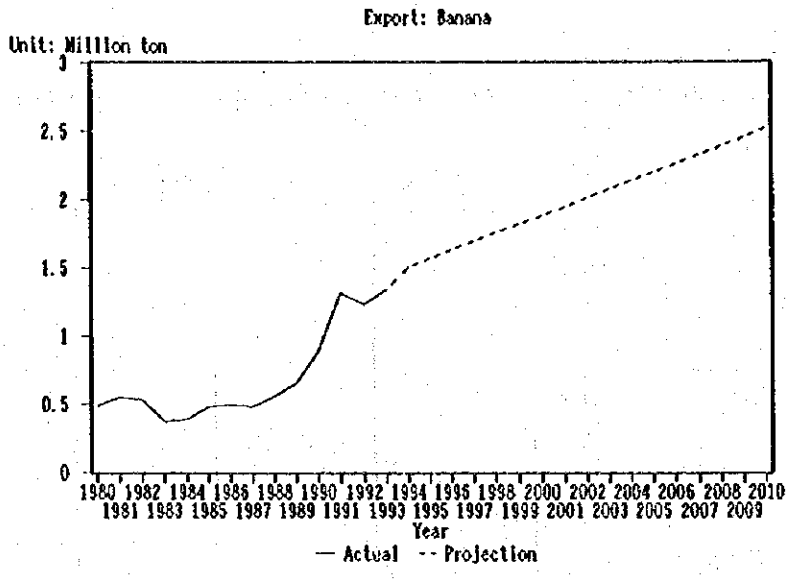


Figure II-2-18 Forecast Export Volume of Banana

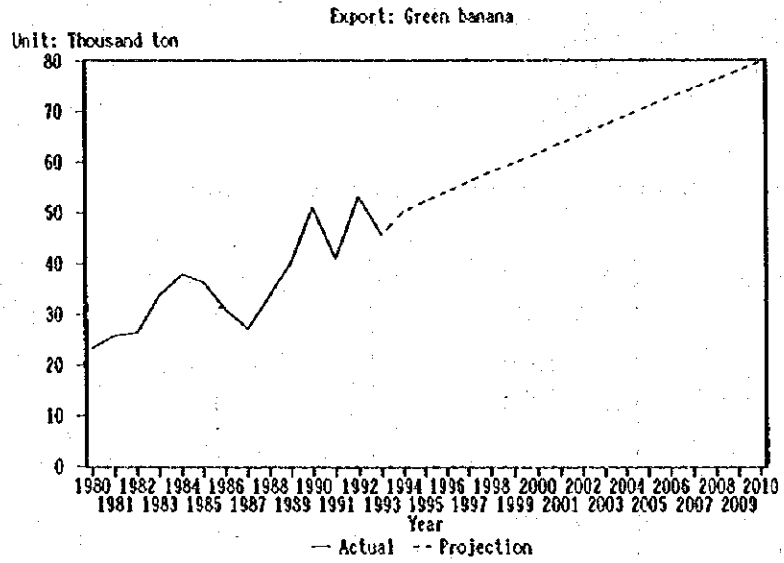


Figure II-2-19 Forecast Export Volume of Green Banana

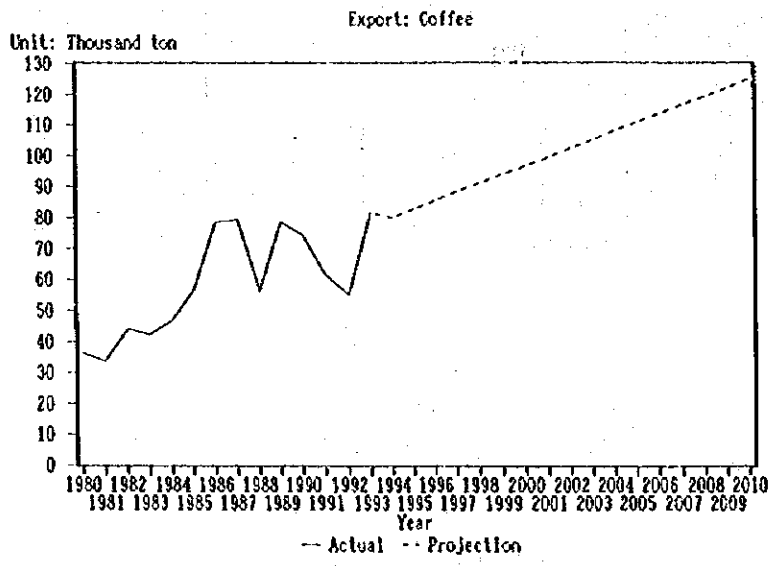


Figure II-2-20 Forecast Export Volume of Coffee

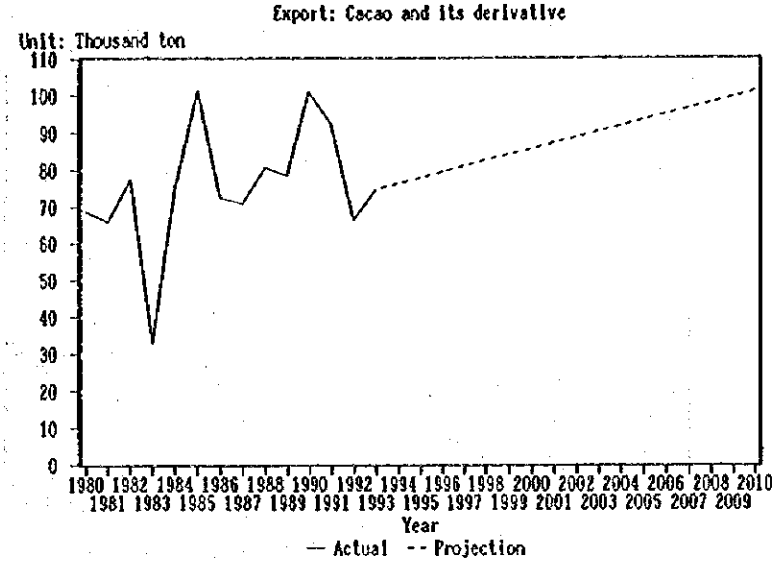


Figure II-2-21 Forecast Export Volume of Cacao and its Derivarive

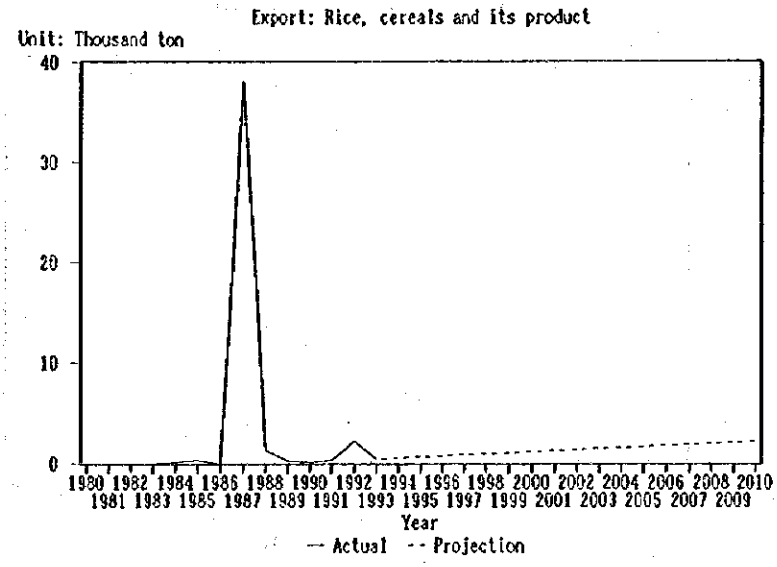


Figure II-2-22 Forecast Export Volume of Rice, Cereals and its Product

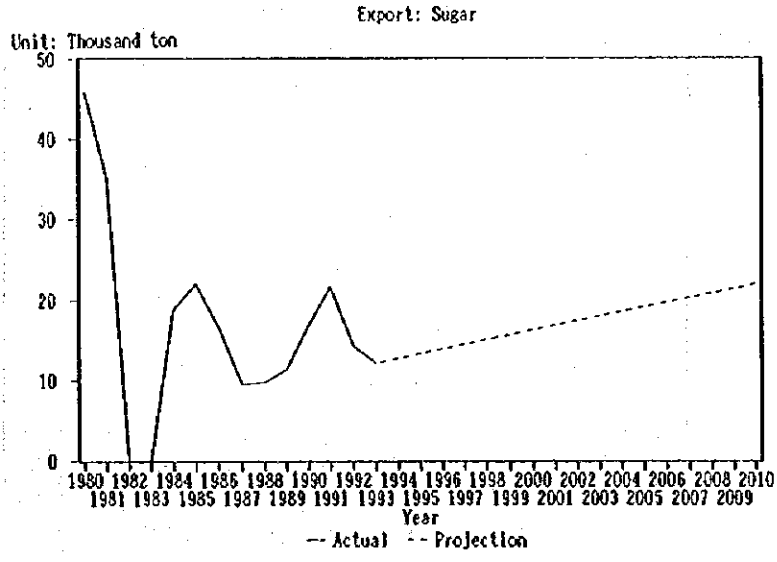


Figure II-2-23 Forecast Export Volume of Sugar

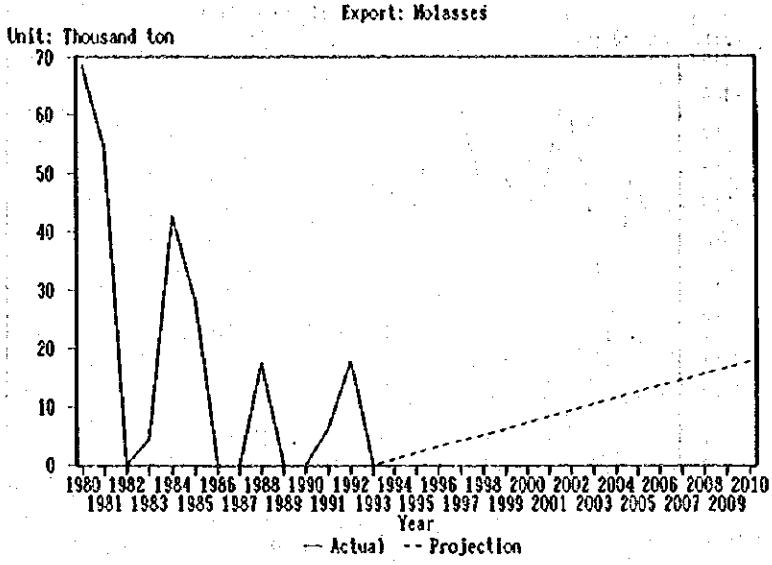


Figure II-2-24 Forecast Export Volume of Molasses

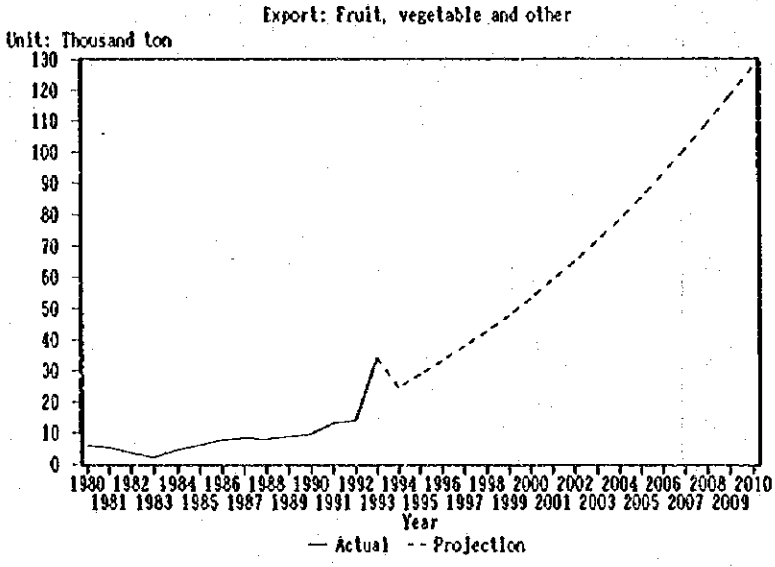


Figure II-2-25 Forecast Export Volume of Fruit, Vegetable and Others

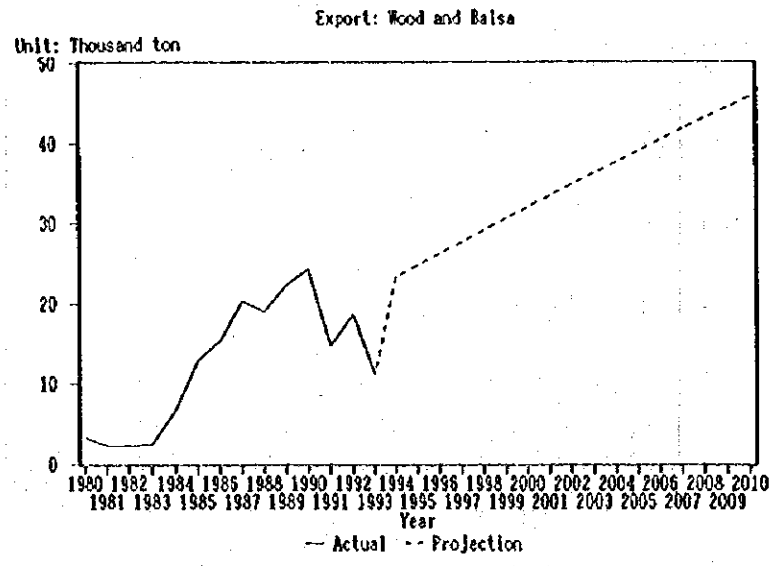


Figure II-2-26 Forecast Export Volume of Wood and Balsa

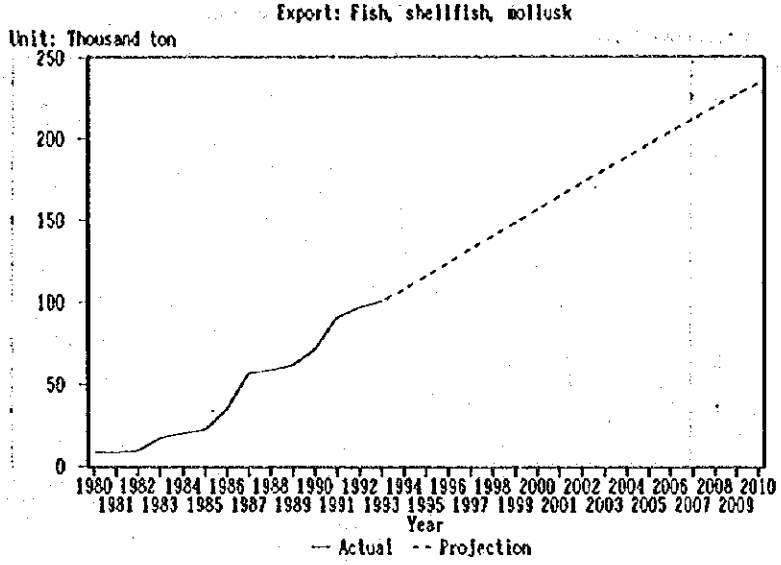


Figure II-2-27 Forecast Export Volume of Fish, shellfish and Mollusk

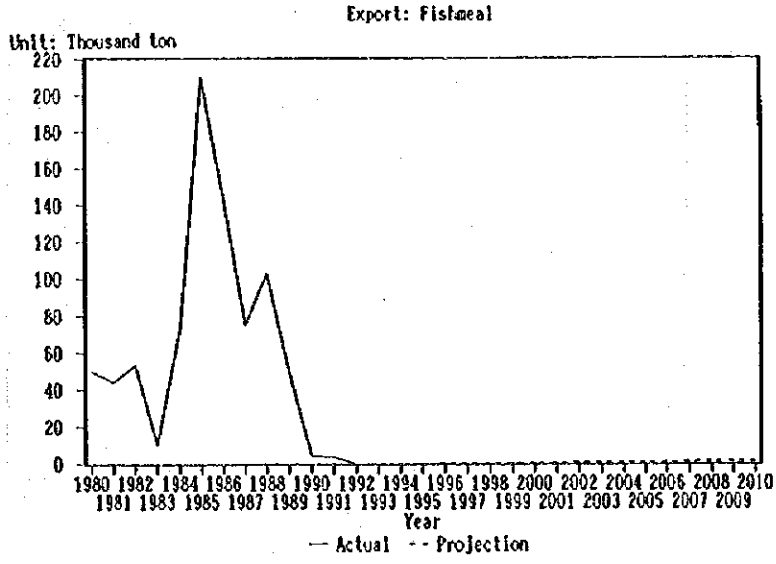


Figure II-2-28 Forecast Export Volume of Fishmeal

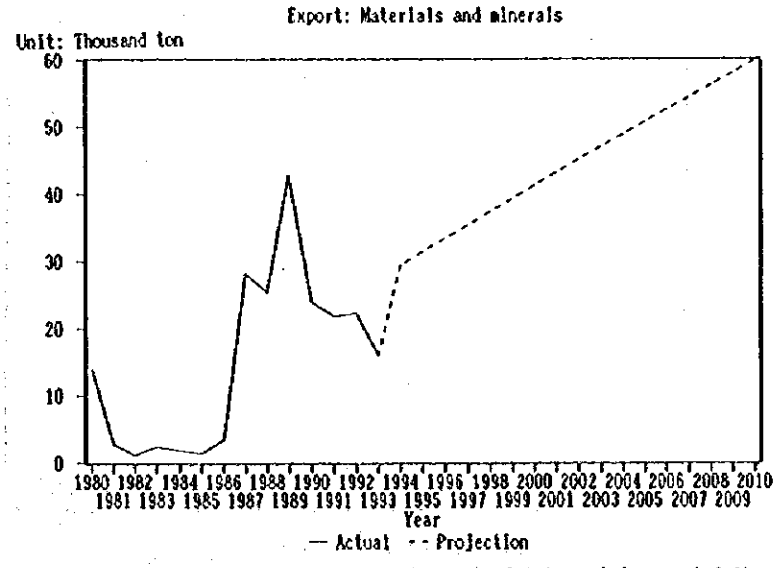


Figure II-2-29 Forecast Export Volume of Materials and Minerals

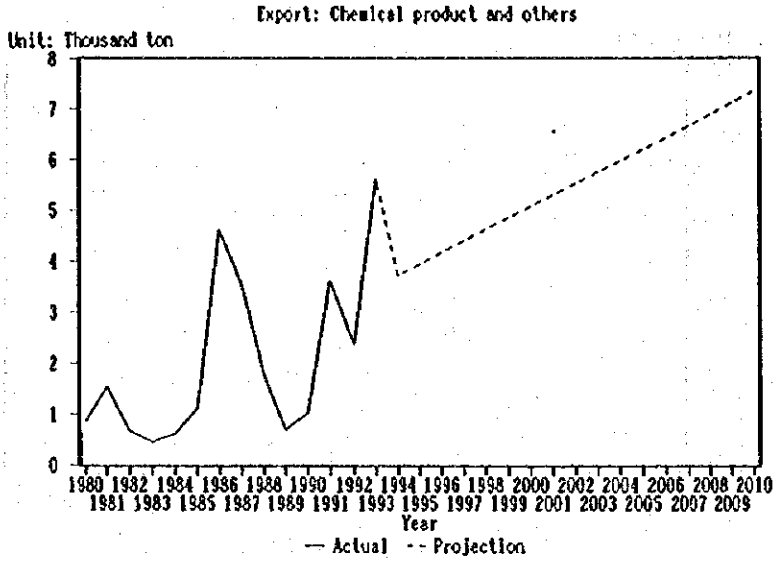


Figure II-2-30 Forecast Export Volume of Chemical Product and Others

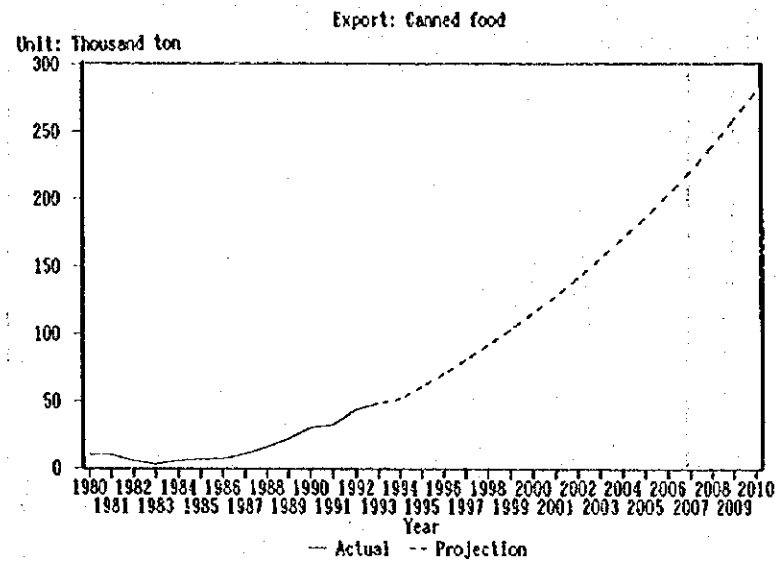


Figure II-2-31 Forecast Export Volume of Canned Food

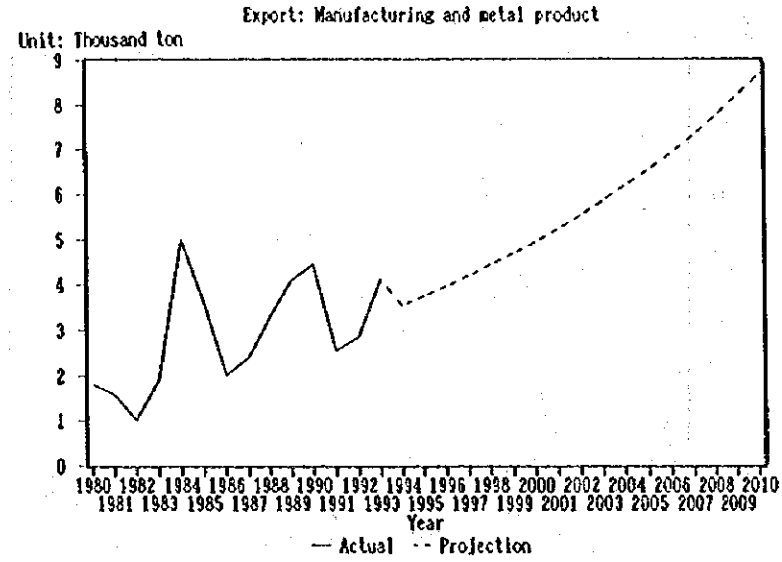


Figure II-2-32 Forecast Export Volume of Manufacturing Metal Product

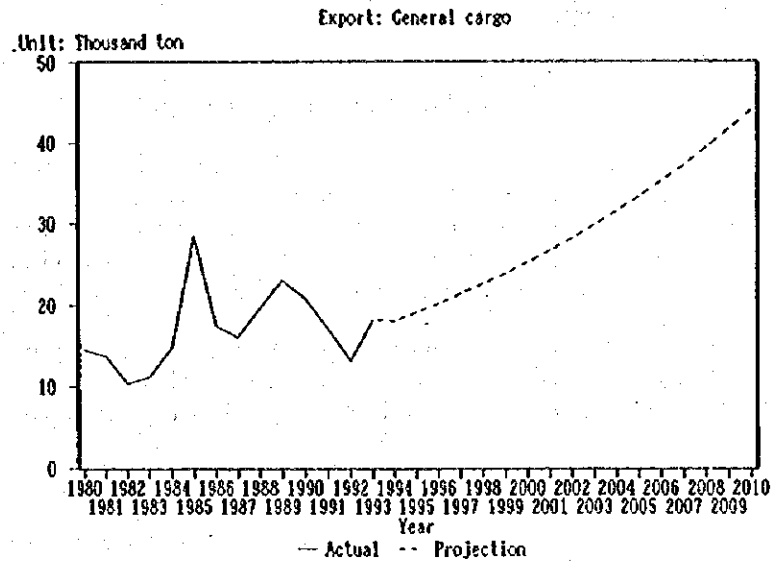


Figure II-2-33 Forecast Export Volume of General Cargo

3) Results of the Forecast

109. Import and export cargo volume which was estimated by the above micro method is compared with import cargo volume which is estimated by the macro method and results is shown in Table II-2-11.

Table II-2-11 Forecast of the Cargo Volume by Case 1 in 2010

Unit: Thousand ton

	Import	Export	Total
Macro Forecast	1,996-3,050	2,990-4,969	4,986-8,019
Micro Forecast	2,841	3,731	6,572

110. Although there is a slight difference between the macro and micro forecasts, the difference is negligible. Hence, the cargo volumes handled at the port Guayaquil for the target year will be forecast as those obtained by the micro forecast method.

D. Estimation of Containerization

1) Forecast of Container Cargo (excluding transhipment cargo)

111. The volume of container cargo is forecast by multiplying containerized cargo volume by the containerization rate. Containerized cargo is estimated by an assessment of the physical characteristics of the major cargo categories and their suitability for the containerization from the port statistic data. Flow chart of the process to calculate container volume is shown in Figure II-2-34.

112. The main categories of the containerized goods include most paper & derivarive, chemical product, banana, coffee, cacao, fruit and so on. Other cargoes such as wheat, cereal, liquid bulk, timber and metal product have been pronounced unsuitable for containerization.

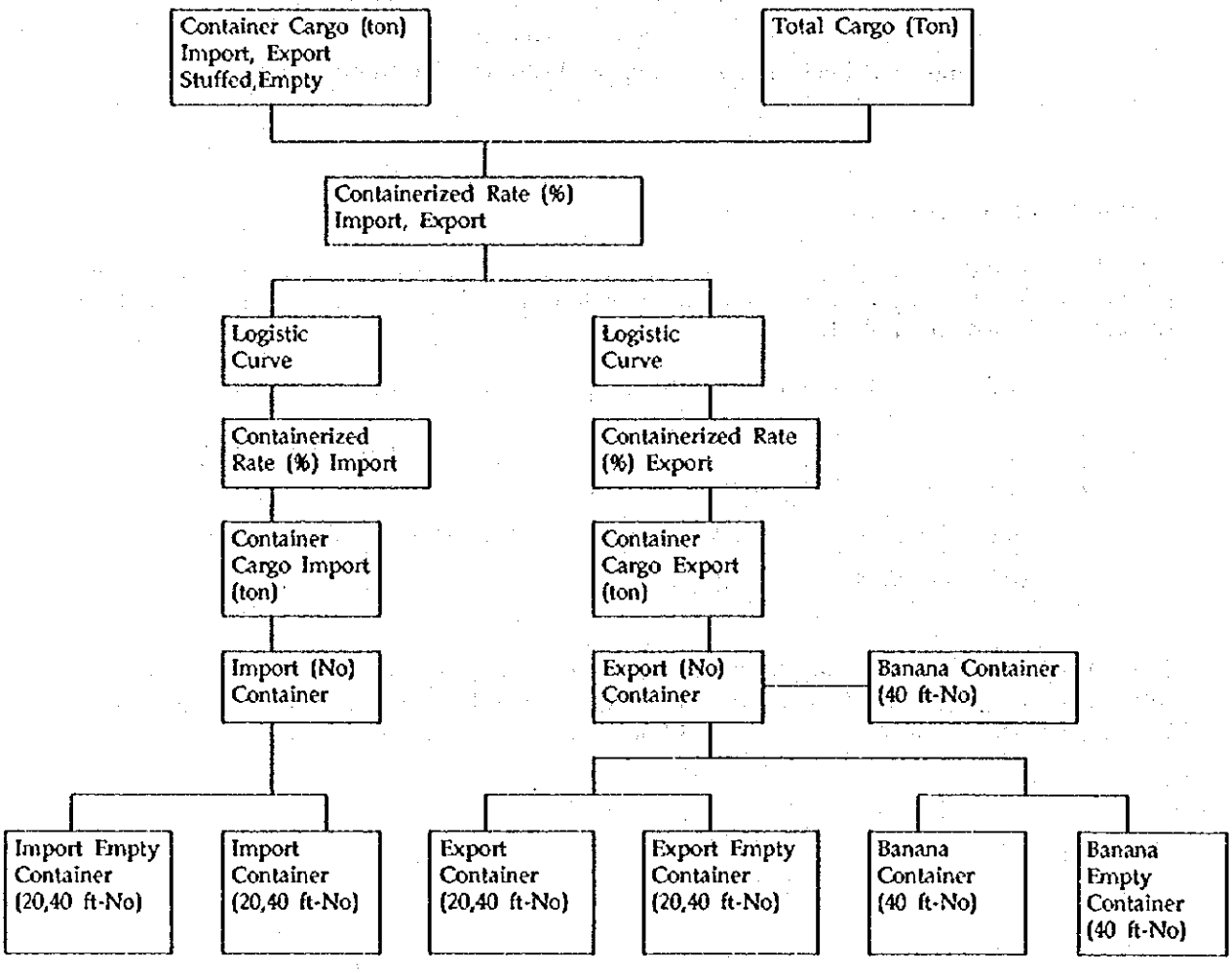
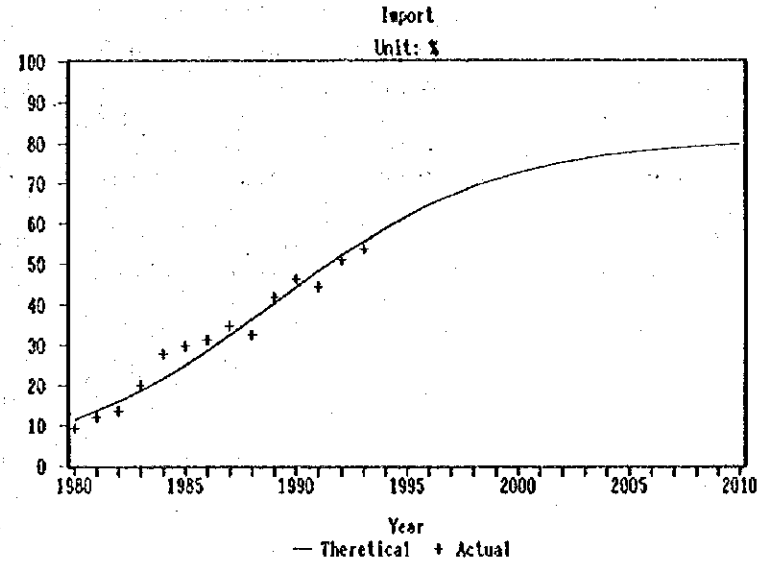


Figure II-2-34 Flow Chart Volume Calculation Container

113. The containerization rate is the percentage of the volume of containerized cargo to the containerizable cargo. The containerization rate in target year is forecast based on the logistic curve method as shown in Figure 2-2-35.



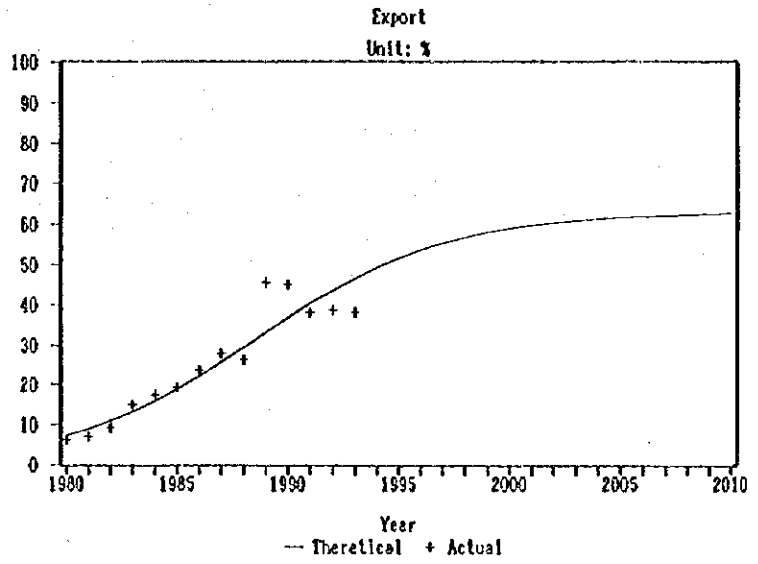


Figure II-2-35 Containerization Rate at Guayaquil Port

114. Table II-2-12 shows percentage of containerization at Guayaquil port from 1980 and 1993. Table II-2-13 shows container cargo, no and TEU.

Table II-2-12 Percentage of Containerization at Guayaquil Port

Year	1980	1981	1982	1983	1984
Import Container Cargo (ton)	74,042	103,559	123,737	127,088	192,932
Import Containerized Cargo (ton)	800,166	853,095	903,754	631,843	693,472
Percentage of Containerization	9%	12%	14%	20%	28%
Export Container Cargo (ton)	46,493	57,314	70,358	78,705	123,745
Export Containerized Cargo (ton)	744,390	820,105	764,899	524,254	709,038
Percentage of Containerization	6%	7%	9%	15%	18%
Total Container Cargo (ton)	120,535	160,873	194,095	205,793	316,677
Total Containerized Cargo (ton)	1,544,556	1,673,200	1,666,653	1,156,097	1,402,510
Percentage of Containerization	8%	10%	12%	18%	23%
Year	1985	1986	1987	1988	1989
Import Container Cargo (ton)	236,388	275,767	294,762	257,801	295,144
Import Containerized Cargo (ton)	792,848	882,717	851,093	791,368	704,239
Percentage of Containerization	30%	31%	35%	33%	42%
Export Container Cargo (ton)	187,031	211,961	251,577	253,567	483,398
Export Containerized Cargo (ton)	971,021	894,540	906,251	962,926	1,057,695
Percentage of Containerization	19%	24%	28%	26%	46%
Total Container Cargo (ton)	423,419	487,728	546,339	511,368	778,542
Total Containerized Cargo (ton)	1,763,869	1,777,257	1,757,344	1,754,294	1,761,934
Percentage of Containerization	24%	27%	31%	29%	44%
Year	1990	1991	1992	1993	
Import Container Cargo (ton)	341,434	477,120	507,295	539,243	
Import Containerized Cargo (ton)	739,162	1,075,693	996,165	1,006,070	
Percentage of Containerization	46%	44%	51%	54%	
Export Container Cargo (ton)	571,245	639,096	609,115	668,353	
Export Containerized Cargo (ton)	1,267,125	1,681,711	1,580,365	1,754,197	
Percentage of Containerization	45%	38%	39%	38%	
Total Container Cargo (ton)	912,679	1,116,216	1,116,410	1,207,596	
Total Containerized Cargo (ton)	2,006,287	2,757,404	2,576,530	2,760,276	
Percentage of Containerization	46%	41%	43%	44%	

Table II-2-13 Summary of Container Cargo in 1993

Unit: ton

Year 1993	Import	Export	Total
Refrigerator for Banana	0	324,263	324,263
General Cargo	539,243	344,090	883,333
(GC Full Container Ship)	(219,308)	(99,737)	(319,045)
(GC Multi Ship)	(319,935)	(244,353)	(564,288)
Total	539,243	668,353	1,207,596

Remarks: Container of import; 14.20 ton/No, Container of export; 16.39 ton/No, Total; 15.33 ton/No and 9.6 ton/TEU between 1992 and 1993.

Container	Import	Export	Total	Import	Export	Total
	Unit: No	Unit: No	Unit: No	Unit: TEU	Unit: TEU	Unit: TEU
Full						
Banana 40 ft	0	18,015	18,015	0	36,030	36,030
General 20 ft	20,021	11,139	31,160	20,021	11,139	31,160
General 40 ft	17,187	12,139	29,326	34,374	24,278	58,652
Total	37,208	41,293	78,501	54,395	71,447	125,842
Empty						
Banana 40 ft	10,088	0	10,088	20,176	0	20,176
General 20 ft	4,084	11,300	15,384	4,084	11,300	15,384
General 40 ft	14,140	8,464	22,604	28,280	16,928	45,208
Total	28,312	19,764	48,076	52,540	28,228	80,768
Full+Empty						
Banana 40 ft	10,088	18,015	28,103	20,176	36,030	56,206
General 20 ft	24,105	22,439	46,544	24,105	22,439	46,544
General 40 ft	31,327	20,603	51,930	62,654	41,206	103,860
Total	65,520	61,057	126,577	106,935	99,675	206,610

Remarks; No of banana's container (18 ton/No) is estimated by Study Team.

115. Volume of container cargo forecast is shown in Table II-2-14. The volume of container cargo in target year can be obtained from the general cargo and banana by the package type. The share of 20 foot, 40 foot and empty container will be estimated from actual data from 1992 and 1993.

116. At port of Cristobal in Panama, the rate of the containerized cargo volume is from 71% to 82% for import and 68% to 73% for export between 1987 and 1991. At port of Cortes in Honduras, the rate of the containerized cargo volume is from 58% to 77% for import and 60% to 71% for export between 1988 and 1992. Therefore, the rate of the containerized cargo at Table II-2-14 in 2010 is not high.

Table II-2-14 Summary of Container Cargo by Case 1 in 2010

Unit: ton

Year 2010	Import	Export	Total
Refrigerator for Banana	-	1,267,000	1,267,000
General Cargo	1,131,000	976,000	2,107,000
Total	1,131,000	2,243,000	3,374,000
Containerized Cargo	1,414,000	3,601,000	5,015,000
Percentage of Containerization	80%	62%	67%

Remarks; Container of import; 14.20 ton/No, Container of export; 16.39 ton/No, Total 15.33 ton/No between 1992 and 1993.

Container	Import	Export	Total	Import	Export	Total
	Unit: No	Unit: No	Unit: No	Unit: TEU	Unit: TEU	Unit: TEU
Full						
Banana 40 ft	0	70,000	70,000	0	140,000	140,000
General 20 ft	43,000	37,000	80,000	43,000	37,000	80,000
General 40 ft	37,000	30,000	67,000	74,000	60,000	134,000
Total	80,000	137,000	217,000	117,000	237,000	354,000
Empty						
Banana 40 ft	35,000	0	35,000	70,000	0	70,000
General 20 ft	7,000	41,000	48,000	7,000	41,000	48,000
General 40 ft	13,000	28,000	41,000	26,000	56,000	82,000
Total	55,000	69,000	124,000	103,000	97,000	200,000
Full+Empty						
Banana 40 ft	35,000	70,000	105,000	70,000	140,000	210,000
General 20 ft	50,000	78,000	128,000	50,000	78,000	128,000
General 40 ft	50,000	58,000	108,000	100,000	116,000	216,000
Total	135,000	206,000	341,000	220,000	334,000	554,000

Table II-2-15 Summary of Container Cargo by Case 2 in 2010

Unit: ton

Year 2010	Import	Export	Total
Refrigerator for Banana		1,268,000	1,268,000
General Cargo	1,586,000	1,152,000	2,738,000
Total	1,586,000	2,420,000	4,006,000
Containerized Cargo	1,982,000	3,782,000	5,764,000

Remarks: Container of import; 14.20 ton/No, Container of export; 16.39 ton/No, Total 15.33 ton/No between 1992 and 1993.

Container	Import	Export	Total	Import	Export	Total
	Unit: No	Unit: No	Unit: No	Unit: TEU	Unit: TEU	Unit: TEU
Full						
Banana 40 ft	0	70,000	70,000	0	140,000	140,000
General 20 ft	60,000	40,000	100,000	60,000	40,000	100,000
General 40 ft	51,000	38,000	89,000	102,000	76,000	178,000
Total	111,000	148,000	259,000	162,000	256,000	418,000
Empty						
Banana 40 ft	35,000	0	35,000	70,000	0	70,000
General 20 ft	10,000	45,000	55,000	10,000	45,000	55,000
General 40 ft	32,000	31,000	63,000	64,000	62,000	126,000
Total	77,000	76,000	153,000	144,000	107,000	251,000
Full+Empty						
Banana 40 ft	35,000	70,000	105,000	70,000	140,000	210,000
General 20 ft	70,000	85,000	155,000	70,000	85,000	155,000
General 40 ft	83,000	69,000	152,000	166,000	138,000	304,000
Total	188,000	224,000	412,000	306,000	363,000	669,000

2) Forecast of Transhipment Container Cargo

117. Transhipment container cargo handled at the port of Guayaquil is very limited at present even though the port is located in a very important link in the container transportation network between the Far East and U.S. West Coast. Low efficiency of container cargo handling mainly causes this situation and makes shipping operators reluctant to use the port as a mother port for transhipment feeder services to Central and South American countries.

(a) Method of Forecast

118. To forecast transhipment container cargo to be handled at the port is very difficult. Needless to say, the method of forecast of transhipment cargo is different from that of the cargo mentioned in Section E. The premises in which are established that transhipment container cargo handled at present remains unchanged basically until the target year is adopted.

119. Total container cargo handled at port in Central and South American countries (these areas are referred to as "the Area" hereinafter) and total GDP of the Area are calculated from the past records. Then, the total future GDP of the Area is projected by a simple linear regression analysis and the future container cargo is forecast from correlation between total container cargo and total GDP of the Area.

(b) Total Transhipment Container Cargo in the Area

a) Total Container Cargo in the Area

120. The total container cargo was calculated using the data from 1986 to 1992 from "Containerization International Yearbook" published by Emap Response Publishing Ltd.

121. The following thirteen ports were selected for calculating the total container cargo in the Area.

Acajutla (El Salvador), Lazaro Cardenas (Mexico), Salina Cruz (Mexico), Balboa (Panama), Antofagasta (Chili), Arica (Chili), Iquique (Chili), San Antonio (Chili), Valparaiso (Chili), Buenaventura (Colombia), Guayaquil (Ecuador), Callao (Peru), Matrani (Peru)

122. The total container cargo in the Area is shown in Table II-2-16.

Table II-2-16 Total Container Cargo in the Area

Unit: TEU

Year	Container Cargo
1986	327,724
1987	400,389
1988	380,682
1989	398,930
1990	462,266
1991	574,746
1992	613,351

Source: Containerization Yearbook 1993

b) Total GDP of the Area

123. The total GDP of the above countries was calculated using the data from "World Table 1993, the World Bank" as shown in Table II-2-17.

Table II-2-17 Total GDP of the Area
(1987's constant prices)

Unit: Million US$

Year	GDP
1986	202,718
1987	217,643
1988	254,437
1989	293,266
1990	335,592
1991	385,379
1992	443,922

Source: World Tables 1993, The World Bank

124. Using the time series analysis, the projected total GDP of the Area is described in the following formula.

$$Y = 40{,}722.821 \times X - 80{,}692{,}984$$

where, Y: GDP at 1987's constant prices (million US$)
X: Year

125. The GDP for the target years is shown in Table II-2-18.

Table II-2-18 Total Projected GDP of the Area
(1987's constant prices)

Year	2003	2010
Total GDP (million US$)	874,828	1,159,887

c) Total Container Cargo for Target Year

126. Correlation between total container cargo and total GDP of the Area is shown below.

$$Y = 1.041496 \times X + 140{,}231.69 \quad (R=0.944)$$

where, Y: Total container cargo of the Area (TEU)
X: Total GDP of the Area (million US$)
R: Correlation coefficient

127. According to the above formula, the projected container cargo was calculated as shown in Table II-2-19.

Table II-2-19 Projected Container Cargo of the Area

Year	2003	2010
Total Container Cargo (TEU)	1,051,000	1,348,000

(c) Transhipment Container Cargo at Port of Guayaquil

128. According to Table II-2-20, transhipment container cargo handled at the ports of Guayaquil corresponds approx. from 0.08% to 0.14% (average 0.1%) of the total container cargo of the Area.

Table II-2-20 Transhipment Container Cargo

Year	1990	1991	1992	Ave.
Guayaquil Port				
Transhipment Container 20 ft (No)	369	195	355	306
Transhipment Container 40 ft (No)	149	122	98	123
A:Sub-Total	518	318	452	429
Transhipment Container 20 ft (TEU)	369	195	355	306
Transhipment Container 40 ft (TEU)	298	244	195	246
B:Sub-Total	667	440	550	552
C:Container of Central and South America (TEU)	462,266	574,746	613,351	550,121
B/C (%)	0.144	0.077	0.090	0.100

Remarks: In Guayaquil port, transhipment container cargo, container 20 ft for 13.8 ton/No and container 40 ft for 16.3 ton/No is estimated by Study Team.

129. It is assumed that transhipment container cargo is handled at the current rate of 0.1% of the total container cargo of the Area until 2010.

130. The possible transhipment container cargo at the port for the target years is estimated in the following Table II-2-21.

Table II-2-21 Estimate of Transhipment Container Cargo

Year	1993	2003	2010
Transhipment Container Cargo (TEU)	630	1,050	1,350
Transhipment Container Cargo 20 ft (TEU)	350	580	750
Transhipment Container Cargo 40 ft (TEU)	280	470	600
Estimated Cargo Volume (metric tons)	7,000	12,000	15,000

Remarks: Above transhipment cargo is shown only one way.

131. Accordingly, the container cargo excluding transhipment handled at the port of Guayaquil becomes 554,000 TEU by Case 1 in 2010. The above throughput of transhipment container cargo represents 0.5% of the total container cargo on the basis of TEU in 2010 respectively. In the world container transport system, ports of Singapore, Colombo (Sri Lanka), Hong Kong and Dubai (UAE) are well-known as transhipment ports and the ratios of transhipment containers to total containers handled were approx. 60 to 70% (not publicized) at Singapore, 70% at Colombo, 22% at Hong Kong and 39% at Dubai in 1991.

E. Forecast by Cargo Type

132. Table II-2-22 shows the summary of cargo type in 1993. The container cargo is transported by full container ships and conventional type ships. In the calculation the relation between conventional type cargo and container cargo with conventional type cargo is assumed to remain the same as present in the Master Plan. Under this assumption 31% of container cargo is transported with conventional type cargo and another 69% is by full container ships.

133. Estimated cargo volume of each commodity at Guayaquil port is classified into packing type. The cargo consists of general cargo, solid bulk, liquid bulk bag cargo, banana cargo and container. Table II-2-23 shows the cargo volume package type.

Table II-2-22 Cargo Volume by Cargo Type in 1993

Unit: Ton

Package Type	Import	Export	Total
General Cargo	139,538	23,117	162,655
Solid Bulk	446,713	27,225	473,938
Grain Bulk	287,400	0	287,400
Fertilizer Bulk	46,710	0	46,710
Liquid Bulk	13,435	0	13,435
Bag Cargo	65,332	12,678	78,010
Banana Box Cargo	0	1,060,931	1,060,931
Container Banana 40 foot	0	324,263	324,263
Container General Cargo 20 foot	271,665	170,493	442,158
(Container Terminal 20 foot)	(110,485)	(49,419)	(159,904)
(Multi-Terminal 20 foot)	(161,180)	(121,074)	(282,254)
Container General Cargo 40 foot	267,578	173,597	441,175
(Container Terminal 40 foot)	(108,823)	(50,318)	(159,141)
(Multi-Terminal 40 foot)	(158,755)	(123,279)	(282,034)
Total	1,538,371	1,792,304	3,330,675

Remark: The conventional type cargo transports the container cargo which rate is 0.31= (282,254+282,034)/ (162,655+473,938+46,710+78,010+1,060,931).

Table II-2-23 Cargo Volume by Cargo Type by Case 1 in 2010

Unit: Ton

Package Type	Import	Export	Total
General Cargo	284,000	25,000	309,000
Solid Bulk	577,000	106,000	683,000
Grain Bulk	390,000	0	390,000
Fertilizer Bulk	235,000	0	235,000
Liquid Bulk	30,000	0	30,000
Bag Cargo	195,000	24,000	219,000
Banana Box Cargo	0	1,333,000	1,333,000
Container Banana 40 foot	0	1,267,000	1,267,000
Container General Cargo 20 foot	565,000	557,000	1,122,000
(Container Terminal 20 foot)	(334,000)	(329,000)	(663,000)
(Multi-terminal 20 foot)	(231,000)	(228,000)	(459,000)
Container General Cargo 40 foot	565,000	419,000	984,000
(Container Terminal 40 foot)	(334,000)	(248,000)	(582,000)
(Multi-terminal 40 foot)	(231,000)	(171,000)	(403,000)
Total	2,841,000	3,731,000	6,572,000

Table II-2-24 Cargo Volume by Cargo Type by Case 2 in 2010

Unit: Ton

Package Type	Import	Export	Total
General Cargo	396,000	30,000	426,000
Solid Bulk	630,000	106,000	736,000
Grain Bulk	390,000	0	390,000
Fertilizer Bulk	235,000	0	235,000
Liquid Bulk	30,000	0	30,000
Bag Cargo	195,000	24,000	219,000
Banana Box Cargo	0	1,332,000	1,332,000
Container Banana 40 foot	0	1,268,000	1,268,000
Container General Cargo 20 foot	793,000	601,000	1,394,000
(Container Terminal 20 foot)	(528,000)	(400,000)	(928,000)
(Multi-terminal 20 foot)	(265,000)	(201,000)	(466,000)
Container General Cargo 40 foot	793,000	551,000	1,344,000
(Container Terminal 40 foot)	(528,000)	(367,000)	(895,000)
(Multi-terminal 40 foot)	(265,000)	(184,000)	(449,000)
Total	3,462,000	3,912,000	7,374,000

Table II-2-25 Container Cargo by Case 1 in 2010

Unit: No

	Import	Export	Total
Banana 40 foot	0	70,000	70,000
Full Container Ship 20 foot	26,000	21,000	47,000
Full container Ship 40 foot	23,000	17,000	40,000
Empty Banana 40 foot	35,000	0	35,000
Empty 20 foot	4,000	24,000	28,000
Empty 40 foot	8,000	16,000	24,000
Transhipment 20 foot	750	750	1,500
Transhipment 40 foot	300	300	600
(Sub Total)	(97,050)	(149,050)	(246,100)
Multi Ship 20 foot	17,000	16,000	33,000
Multi Ship 40 foot	14,000	13,000	27,000
Empty 20 foot	3,000	17,000	20,000
Empty 40 foot	5,000	12,000	17,000
(Sub Total)	(39,000)	(58,000)	(97,000)
Total	136,050	207,050	343,100

Table II-2-26 Container Cargo by Case 2 in 2010

Unit: No

	Import	Export	Total
Banana 40 foot	0	70,000	70,000
Full Container Ship 20 foot	41,000	26,000	67,000
Full container Ship 40 foot	35,000	25,000	60,000
Empty Banana 40 foot	35,000	0	35,000
Empty 20 foot	7,000	29,000	36,000
Empty 40 foot	22,000	20,000	42,000
Transhipment 20 foot	750	750	1,500
Transhipment 40 foot	300	300	600
(Sub Total)	(141,050)	(171,050)	(312,100)
Multi Ship 20 foot	19,000	14,000	33,000
Multi Ship 40 foot	16,000	13,000	29,000
Empty 20 foot	3,000	16,000	19,000
Empty 40 foot	10,000	11,000	21,000
(Sub Total)	(48,000)	(54,000)	(102,000)
Total	189,050	225,050	414,100

F. Vessel in 2010

1) Present Condition of Ship Size

134. Figure II-2-36 shows the classification of the calling vessel size by ship type at Guayaquil port in 1993. According to this, general cargo vessels are predominantly 16,000-18,000 DWT, refrigerator vessels are 10,000-12,000 DWT, dry bulk vessels are 26,000-28,000 DWT, liquid bulk vessels are 1,000-2,000 DWT, other vessels are 2,000-3,000 DWT, container vessels are 12,000-14,000 DWT and total is 12,000-14,000 DWT. The distribution of DWT for dry bulk and container ship differs from conventional patterns because of the small number of ship calls and fixed vessels.

135. According to 1993 records on regarding size of ships calling, the standard ship size by ship type is shown in Table II-2-27 and the largest vessels by ship type are shown in Table II-2-28.

Table II-2-27 Standard Size of Ship Type

Ship Type	GT (ton)	DWT (ton)	Length (m)	Wide (m)	Draft (m)	Handled Volume(ton)
Mix Type Ship	9,900	12,400	148	22	8.9	2,000
Dry Bulk	15,400	25,400	165	25	10.1	14,500
Liquid Bulk	5,800	9,100	121	16	7.0	2,600
Other	14,900	9,000	152	24	7.3	300
Container	16,600	18,600	170	26	9.1	2,800

Source: APG, modified by JICA Study Team
Remarks: GT; Gross Ton, DWT; Dead Weight Ton

Table II-2-28 Largest Vessel by Ship Type

Ship Type	Ship Name	G.T. (ton)	DWT (ton)	ength (m)	Wide (m)	Draft (m)
General Cargo	Captan Manolis	20,375	32,629	181.7	25.7	11.2
Refrigerator	Charles Island	14,061	14,140	179.9	25.2	9.2
Dry Bulk	Mariana Antartico	19,383	34,835	197.0	24.3	11.1
Liquid Bulk	Yepifan Kovtysheri	15,034	22,610	186.3	23.5	9.7
Other	Hual Margarita	53,168	16,317	200.0	32.3	9.0
Container	Laser Pacific	31,446	34,660	201.0	32.3	15.2

Source: APG

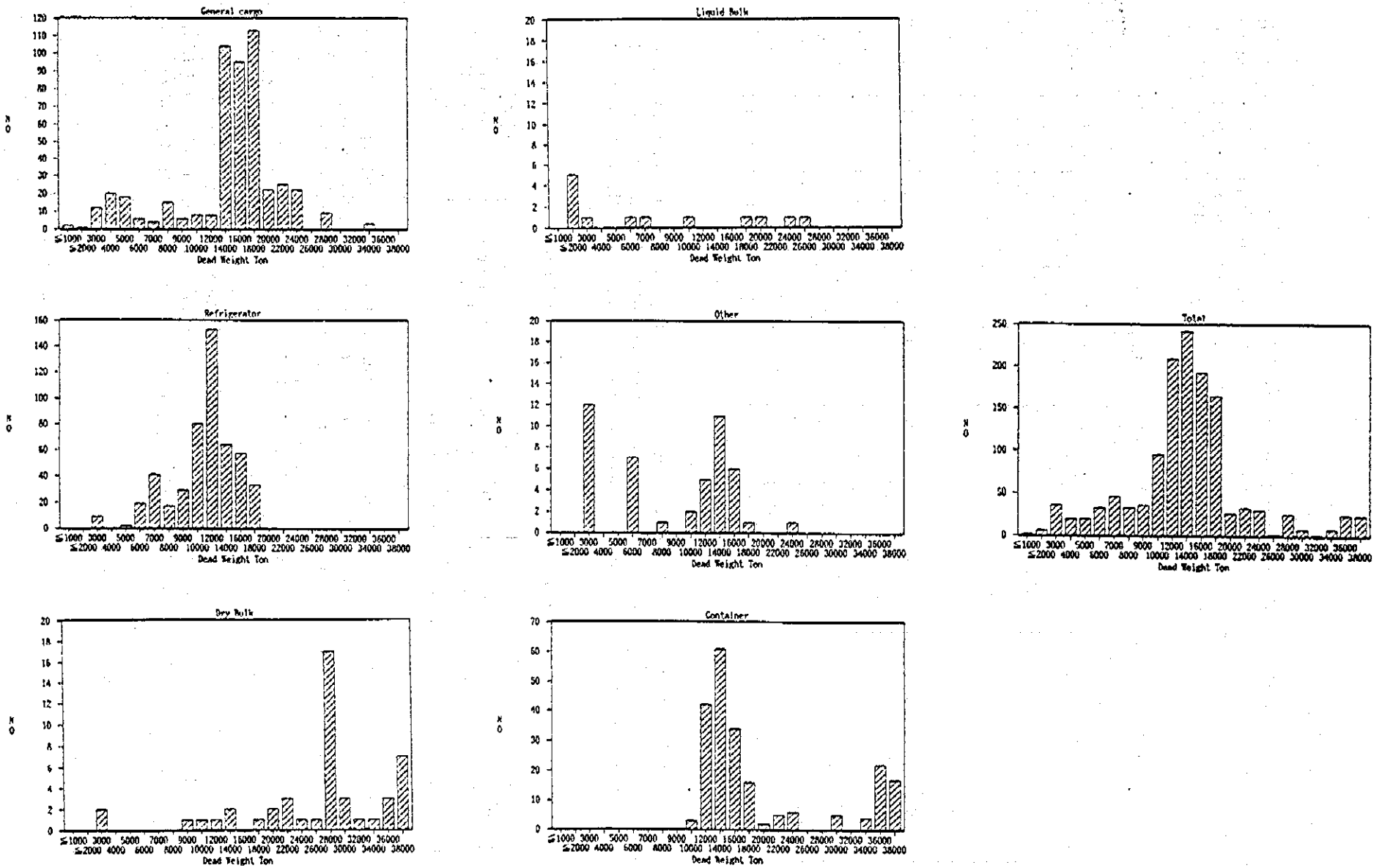


Figure II-2-36 Classification of Calling Vessel by Ship Type (1993)

2) Forecast of Vessel

136. Referring to the full draft of large vessel, the full draft exceeds the existing depth of channel and the planned depth of berth. The condition of draft and tide shall be considered when vessels enter Guayaquil port. The number of large size vessels will be the same at present. DWT per vessel has tended to increase slightly (see Table II-2-29).

Table II-2-29 DWT of Ship Size

Unit: No

DWT \ YEAR	1986	1987	1988	1989	1990	1991	1992	1993
2,000	9	10	13	8	8	20	42	23
4,000	19	17	13	28	27	25	29	26
6,000	61	56	59	40	47	43	35	25
8,000	48	61	77	41	43	75	59	66
10,000	117	94	89	133	179	156	96	70
12,000	83	103	102	101	120	90	106	122
14,000	101	131	89	108	132	148	151	173
16,000	94	108	105	91	95	73	72	72
18,000	25	35	35	31	38	66	68	105
620,000	10	12	19	11	25	20	18	12
>20,000	95	75	76	76	82	102	97	78
No data	424	430	473	505	528	696	756	798
Total	1,086	1,132	1,150	1,173	1,324	1,514	1,529	1,570
Average (DWT/ship No)	10,601	10,994	10,810	10,797	10,950	10,824	10,781	11,530

Source: APG, ship call includes private berth.

137. According to the size of ship calling at Guayaquil port, the size of ship for mix type, dry bulk and liquid bulk ship is adopted from the above average ship type. The progress of container vessels can be classified into four generations (Refer to Table II-2-30).

Table II-2-30 Progress of Container Vessel

Generation	First	Second	Third	Fourth
DWT (ton)	<15,000	15,000-35,000	35,000-45,000	45,000-55,000
Capacity TEU		700-1,500	2,000	3,000

Remarks: First generation is mainly converted ships with on-board cranes.

138. At present, the size of the container vessels calling Guayaquil port represents first or second generation container vessels. Considering the tendency of the number of large container vessels calling Guayaquil port and the standard size of container vessels on the international routes around Central America and South America, second generation container vessels, of which capacity is about 700-1,500 TEU, will call Guayaquil port in the planning period of this project.

139. Figure II-2-37 shows the trend of load per ship. Using the time series analysis, the projected load per ship is described in the following formula. In the target year (2010), the load per ship will achieve 2,900 ton/Ship. Rate of calculation of 1993 year by one of 2010 is 1.3.

$$Y = 41.2882 \times X - 80,045.80$$

Where, Y: Load per ship (ton/ship No)
X: Year

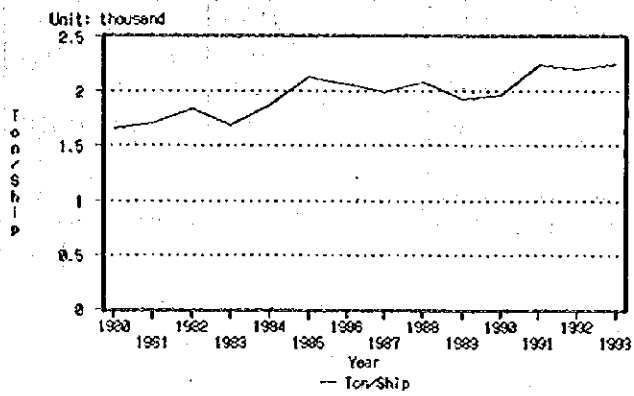


Figure II-2-37 Load per Ship

140. According to interviews with major shipping agents, 350 (40 foot) containers of banana are handled per ship at present. The volume of bulk carriers are adjusted because the effective draft of the access is limited at present, so bulk carriers are assumed to handled the same level of cargo in the future. Handling volume of mix type ship, container ship will be estimated by actual volume in 1993 and the load trend in future. Table II-2-31 shows the standard ship size by ship type and ship calls in future.

141. Average DWT per ship is 14,500 DWT by Case 1 in 2010. Average load volume per ship is 6,572,000/2,250=2,900 ton/ship in 2010. Rate of handled volume per DWT in 2010 is 20% compared with 19% in 1993.

142. Transhipment cargo is included with full container ship because transhipment cargo is usually carried by full container ship in regular ship route.

Table II-2-31 Standard Ship by Case 1 in 2010

Ship Type	DWT (ton)	Handled Volume (ton/ship)	Cargo Volume (ton)	Ship Calls (No)
Mix Type Ship	12,000	2,600	3,639,000	1,400
Grain Bulk	26,000	14,000	390,000	30
Liquid Bulk	9,000	2,600	30,000	10
FC Banana & GC	12,000	1,360 TEU	210,000 TEU	160
FC G.Cargo	20,000	320 TEU	207,700 TEU	650
Total				2,250

Source: APG, modified by JICA Study Team
Remarks: DWT; Dead Weight Ton, FC; Full Container (TEU includes empty container.)
Above data is including transhipment cargo.

Table II-2-32 Standard Ship by Case 2 in 2010

Ship Type	DWT (ton)	Handled Volume (ton/ship)	Cargo Volume (ton)	Ship Calls (No)
Mix Type Ship	12,000	2,600	3,861,000	1,490
Grain Bulk	26,000	14,000	390,000	30
Liquid Bulk	9,000	2,600	30,000	10
FC Banana	12,000	1,360 TEU	210,000 TEU	160
FC G.Cargo	20,000	320 TEU	308,700 TEU	970
Total				2,660

Source: APG, modified by JICA Study Team
Remarks: DWT; Dead Weight Ton, FC; Full Container (TEU includes empty container.)