

4-4-4 Results of Investigation

(1) Topographical Survey

A topographical map was drawn on a scale of 1:10,000. This map was used as the basis for preparing bathymetric charts and other maps.

(2) Hydrographical Survey

A bathymetric chart was produced on a scale of 1:10,000. It is shown in Fig. 4-4-3 on a scale of 1:20,000.

(3) Seismic Prospecting

The submarine geology in the survey area can be classified into two layers, depending upon the characteristics of reflecting patterns. The two layers were a hard basement rock and a sediment layer.

The surfaces of the basement rocks, which are scattered in the area to form shoals, are characterized by heavy undulations. The depth contours of the surfaces of the basement rocks are shown in Fig. 4-4-4.

The sedimentary soil has been deposited with a maximum thickness of 15 m below the sea bed. This layer consists mainly of clay. The isopach map of sediment layers is shown in Fig. 4-4-5.

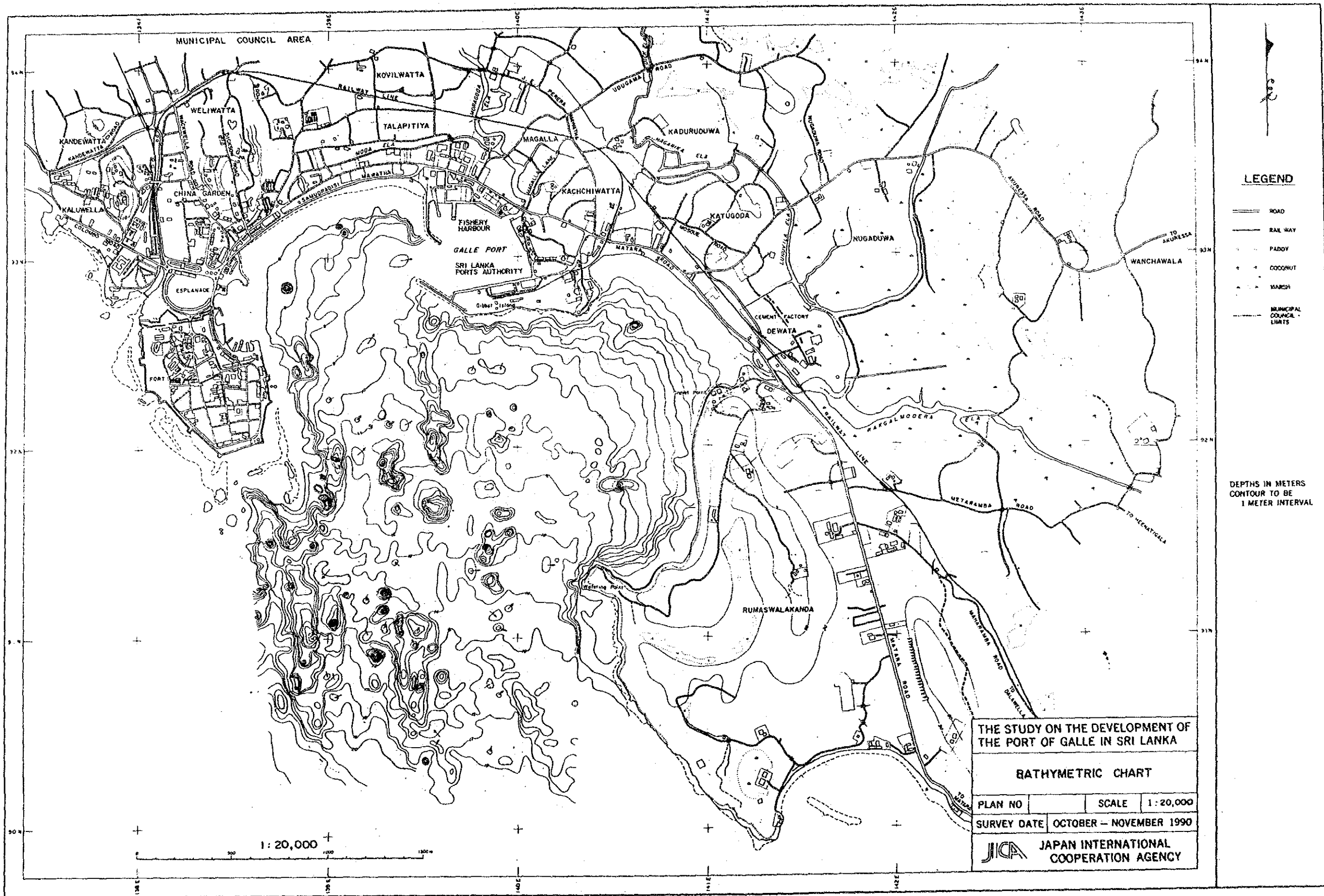


Fig. 4-4-3 Bathymetric Chart

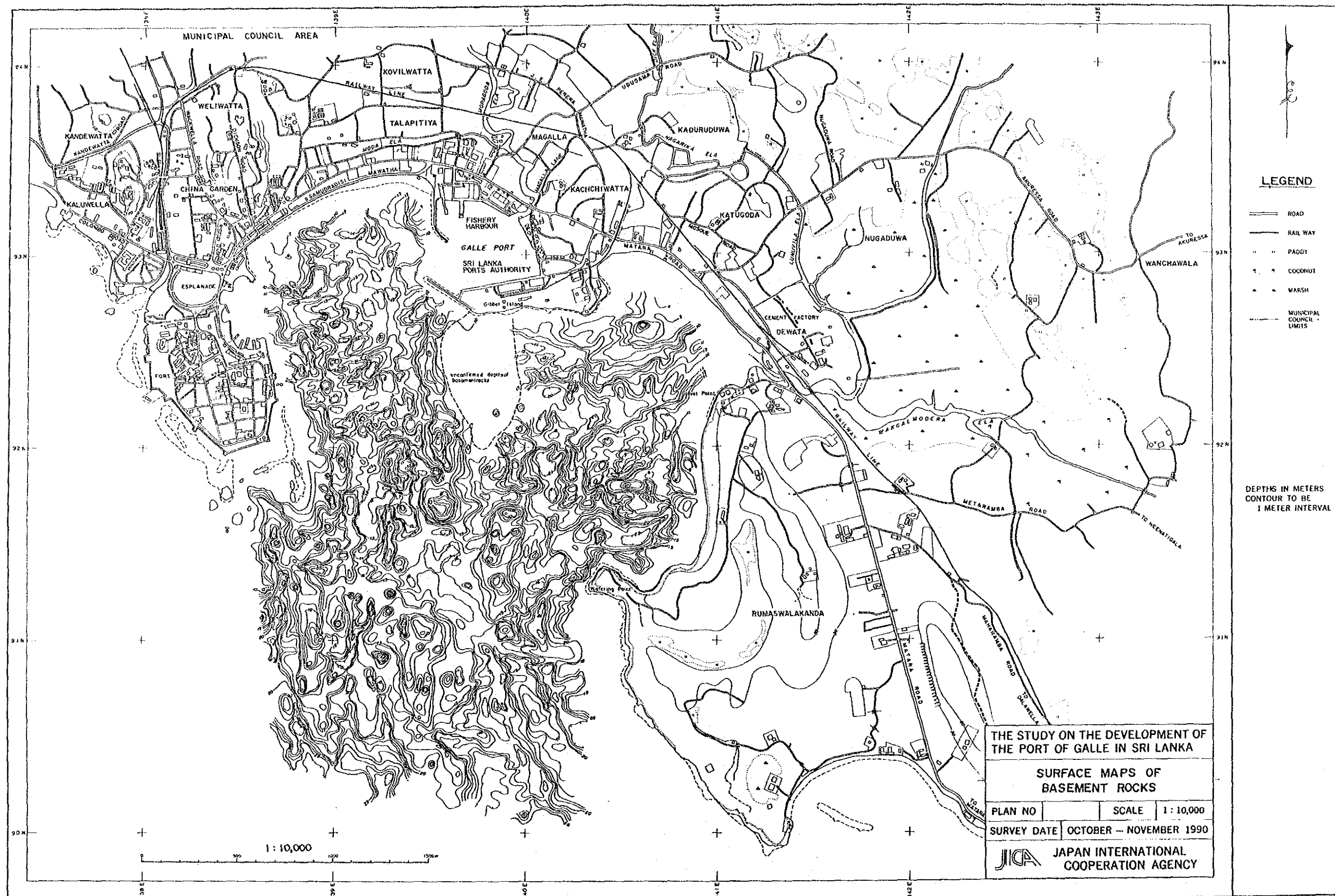


Fig. 4-4-4 Contour of Basement Surface Chart

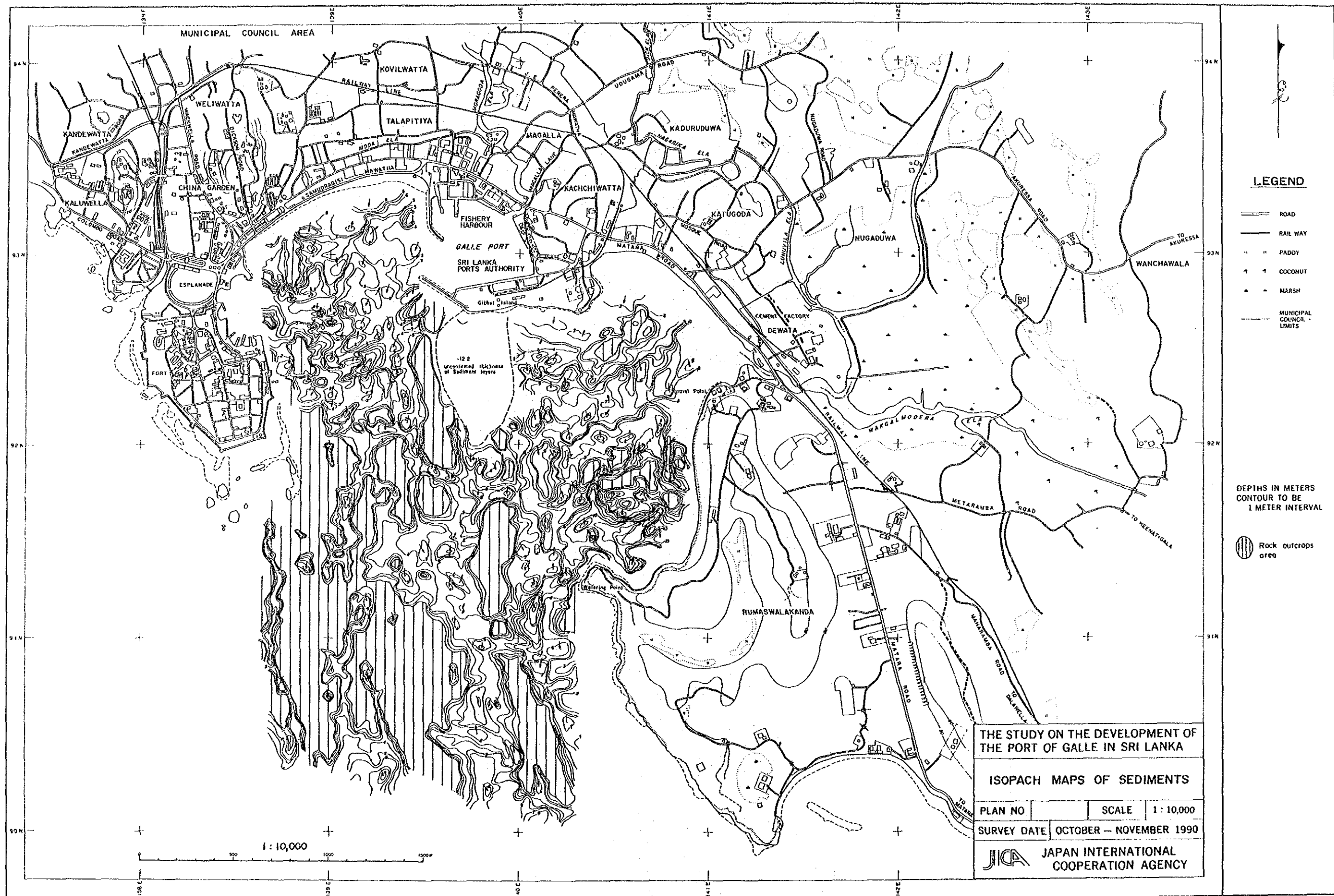


Fig. 4-4-5 Contour of Iso-thick Sediment Chart

(4) Soil Exploration

a) BH 1 and BH 2

The surface horizon of the sea bed in both boreholes consists of very loose saturated soft sediments ranging in thickness from 1.20m to 2.00m (Fig.4-4-6).

Below the surface horizon lies a fairly thick bed of very soft saturated organic clay which extends from 9.10 to 11.50m below WDL in BH 1 and from 9.20 to 15.50m in BH2. Hence the thickness range of this horizon from BH1 to BH2 is as shown in the profile (Fig.4-4-6). In addition, in BH 2 the horizon from 14.00 to 15.50m grades into a pure peat.

In BH 2 at 25.50m below WDL is encountered a plastic clay which terminates at 16.75m in dense compact weathered rock, as indicated by the high N-values obtained.

As shown in the profile, the zone of weathered rock is very thin in BH 1, and broadens in BH 2.

The N-values obtained, and the soil classification of BH 1 and BH 2 indicate that all the material above the weathered rock is soft and compressible, and therefore unsuitable for any foundation.

In the area of BH 1 any bearing stratum is below 11.50 m below WDL, while in BH 2 it is at a greater depth of 16.75m. Bedrock conditions are fresh in BH 1 as compared with those in BH 2.

b) BH 3

The surface horizon of the sea bed, which consists of loose saturated soft sediments, has a thickness of 0.80m, which is from 10.10-10.90m below WDL.

Below 10.90m down to a depth of 14.15m the material is soft plastic clays with Kaolin. This horizon is very soft with almost zero N-values.

However, below 14.15m the material appears to be in-situ weathered rock disintegrating to coarse quartz sand and quartz gravel with Kaolin. This horizon down to a depth of 16.90m gives moderate N-values. But below 17.50m the same weathered rock horizon is much softer due to a higher Kaolin content.

No hard bedrock was encountered in this borehole down to a depth of 22.35m below WDL.

c) BH 4

The surface horizon of loose soft saturated sediments below the sea bed is 2.20 m thick and extends from 9.90 m to 12.10 m below WDL.

Below the horizon is formed a very thick layer of grayish to greenish soft plastic clay extending from 12.10 m to 19.90 m below WDL. This horizon of pure clay is highly compressible and unsuitable for a foundation, as indicated by the N-values obtained which are almost zero.

From 19.90 m down to 21.50 m below WDL is a horizon of fibrous soft peat which is highly compressible.

Weathered rock is encountered at 21.50 m below WDL and appears to be fairly compact below 22.40m. However, at 24.27 m the material is dense and hard, as indicated by hammer rebound during SPT. This depth is suitable for a foundation in this area.

d) BH 5

In this area, below the 1.0 m layer of soft saturated sediments is a horizon of soft highly compressible peat extending from 13.00 m to 17.60 m below WDL. As can be seen from the log, all material from 12.00 m to 17.60 m below WDL is very soft and saturated. Hence this part of the channel can be dredged with relative ease, if it needs deepening.

The material below 17.60m below WDL is hard dense weathered rock terminating in dense fresh rock basement at 18.08m.

e) BH 6,7,8 and BH 9

As shown in the profile (Fig. 4-4-6), the surface horizon of soft saturated sediments is fairly uniform and ranges from 0.6 m to 0.9m in thickness along this profile below the sea bed.

Along the profile from BH 6 to BH 9 no soft plastic clays, organic clays or peat exist below the above-mentioned surface horizon. Instead, the material is mainly decomposed rock in different degrees of weathering, as shown in the profile. The weathered rock is highly kaolinized in the area of BH 6 extending in depth from 15.30 m to 17.90 m below WDL.

This same weathered rock horizon grades into a dense, compact gravelly sand in BH 7 extending from 16.25 m to 20.25 m below WDL,

showing very high N values.

Toward the area of BH 8 the weathered rock horizon is very fresh and less kaolinized, containing cobbles and gravel of fresh rock in the horizon from 15.40 m to 17.95 m. In the area of BH 9, the weathered zone is not encountered at all, as seen from the profile.

Judging from the high N-values in BH 6, BH 7 and BH 8, this weathered horizon seems to be a densely compacted stratum suitable for a foundation.

The result of drilling, coordinates of boring points and relevant borehole logs are shown in appendix I-4-19.

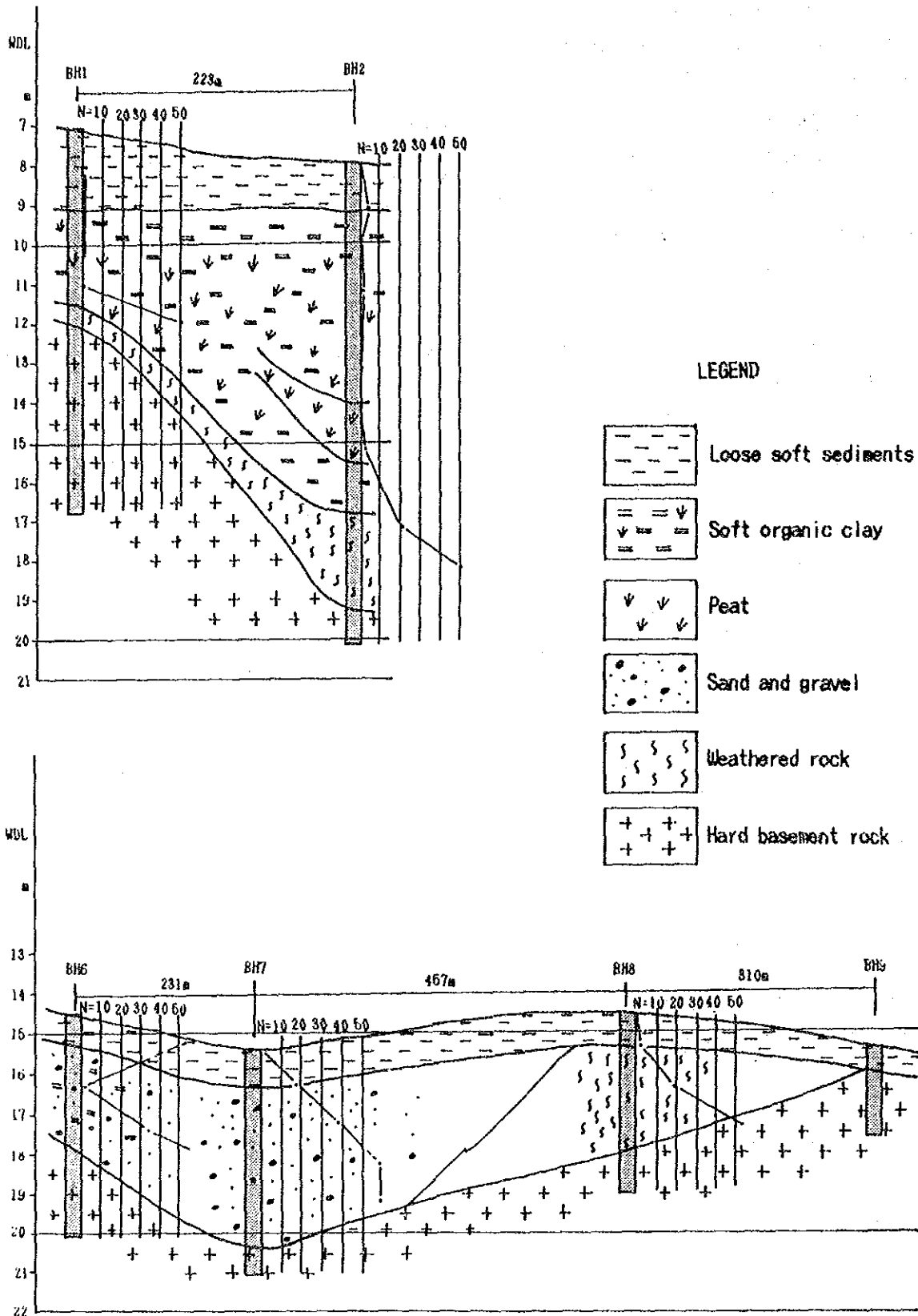


Fig. 4-4-6 Geological Cross Section

(5) Laboratory Test

Using undisturbed and disturbed samples used in the standard penetration tests, the following laboratory tests were performed according to the British Standards.

The laboratory test results are shown in Table 4-4-3 and Appendix I-4-20.

Table 4-4-3 Results of Laboratory Tests
for Undisturbed Samples

Bore Hole No.	BH 1	BH 2		BH 3	BH 4		BH 5
Depth(m)	10.1	12.2	16.2	13.9	14.1	18.1	14.0
Item of Laboratory Tests	{	{	{	{	{	{	{
	10.6	12.8	16.75	14.15	14.7	18.9	14.6
Water Content(%)	62.9	79.8	28.8	46.9	105	104	121
Unit Weight(kg/m ³)	1,450	1,448	1,856	1,675	1,474	1,396	1,373
Specific Gravity	-	-	2.68	2.68	-	2.64	2.50
Atterberg Limits							
Liquid Limit	45.0	40.8	-	-	-	43.6	-
Plastic Limit	22.2	29.9	-	-	-	18.0	-
Unconfined Compression							
Test (Cu)	-	-	54.8	36.7	24.3	26.0	28.2
(kN/m ²)							
Triaxial Test							
Cohesion(kPa)	-	24	-	-	-	-	-
Angle of Friction	-	4	-	-	-	-	-
(deg.)							
Consolidation Test	(See appendix I-4-20)			-	(See appendix I-4-20)		
Grain Size Distribution							
ø50 (mm)	-	-	0.12	0.18	-	0.037	0.069
<0.075mm(%)	-	-	46.3	41.6	-	100	100

[Note] N: Newton = Joule/m

Pa: Pascal = Newton/m²

5 PRESENT CONDITIONS OF THE PORT OF GALLE

5-1 Location and Brief History of the Port of Galle

The Port of Galle is located at latitude 6° N. longitude 82° 12'E, about 120 km south of the Port of Colombo on Sri Lanka's south-west coast. It has the longest history of any of Sri Lanka's ports.

Although some of the functions of the Port of Galle began to be transferred to the Port of Colombo in the 1890's, the port of Galle continued to be very active until the 1930's for handling cargoes such as tea, rubber and copra for export, and rice and sugar for import. In those days jetties were the only port facility. They still exist close to the entrance of the Fort.

Vessels were moored at the areas called Katta and Capera, which are located between Gibbet Island and the Fort, and cargo handling was carried out by barges.

The characteristics of natural conditions of this water area are swells, especially in the south-west monsoon season, and rocks scattered on the sea bed. The bay is divided into two parts, the eastern and western parts, by the reef located on the west side of Gibbet Island. It is almost impossible to use the eastern part in the south-west monsoon season on account of rough waves. Therefore, the berth located at the Watering Point in the eastern part is not used in this season.

The presence of rocks in the sea bed is also a problem. There are many pinnacles whose positions can not be pinpointed by soundings. On account of this fact, there have been many marine accidents. According to the record of the 1930's, some vessels such as the Jalapalaka and Jalamohan encountered accidents by hitting the sea bed.

Against this background, many plans to improve the conditions of Galle Bay have been formulated. Even if restricted to written plans only, these began in the middle of the 19th century.

It was 1971 when the present port was constructed. It made use of Gibbet Island. Gibbet Island is connected to the main land by reclaimed land composed of many rocks on which the administration building is located. It took 6 years to complete construction. The facilities of the fishery port were constructed at the same time.

Although the depth of the berth was 33 ft. in both plan and design, it was changed in the implementation phase and dredged to up to 28 ft. And from 1980 to 1982, more dredging works were carried out in basin and channel. Since then there has been no further construction.

5-2 Present Use of the Galle Port Area

The entrance of the Port of Galle is around 500 ft. wide and consists of two rubble mound breakwaters, one of which juts out northwest from Gibbet Island, while the other juts out to the south from the western side of the fisheries port.

The quay wall starts from the base of the breakwater at south of the entrance. One 60m-long part of the quay on the western side is partially damaged. At present the quay from here to the front of the warehouse is used for berthing a crane vessel. Although the land area along the quay is used for storing buoys and hoppers and so on, the inner area at the side of the revetment is not used. There is a water-supply facility (capacity: 200 tons) and the head of a pipe used for unloading refined petroleum from Colombo is installed at the sea-side. The width of the apron is 15 metres. Although there were railway facilities in the area until recently, they have been demolished. There are two warehouses, whose areas are 2,158m² and 4,316m² each. These can be used for storing large size cargoes but the main cargo now being stored is packed flour.

The handling procedure of this Cargo is as follows:

The ship's gear unloads a quantity of packed flour onto the quay. Two labourers load several of them onto a cart. One labourer then pushes them into the warehouse. Several labourers then stack the bags of flour. Because of manual handling, only 4 layers can be stacked.

At the back side of these warehouses there are rail tracks and platforms alongside. However, this railway is not used and several parts of the railway have been overlaid. The road runs along the railway. The rest house for labourers is situated in the area sandwiched between the road and the revetment. There are many unutilized parts in this area.

At present, the smaller warehouse is rented to the army. The apron continues to the gate as a part of the road of the port area.

The Customs office is just on south of the gate, and the administration office is located on the southwest side of it. The back yard of the administration office is used as a tank yard by Colombo Gas and Water Company Ltd. The engineers office and mechanical workshops are located on the west side of the gate. Half of the area surrounded by these structures and the road is used for storing old cranes as well as grabs that can be used as ship gear when necessary.

The innermost part of the basin extends from the front of the open storage area to the mouth of the Moragoda Ela. The structure of the revetment is rubble stones. Along the revetment, a carpenter's workshop and a residence for higher officials have been constructed. There are always several yachts anchored in the inner basin.

On the opposite side of the quay of the port is the fisheries port. Located there are the quay wall, jetty, ice plant, slipway, etc. For the most part, 3.5 ton fishing boats are berthed there. The slipway located in the extreme western part of the fisheries port has the capacity of repairing 500 ton vessels and is administered by the navy at present.

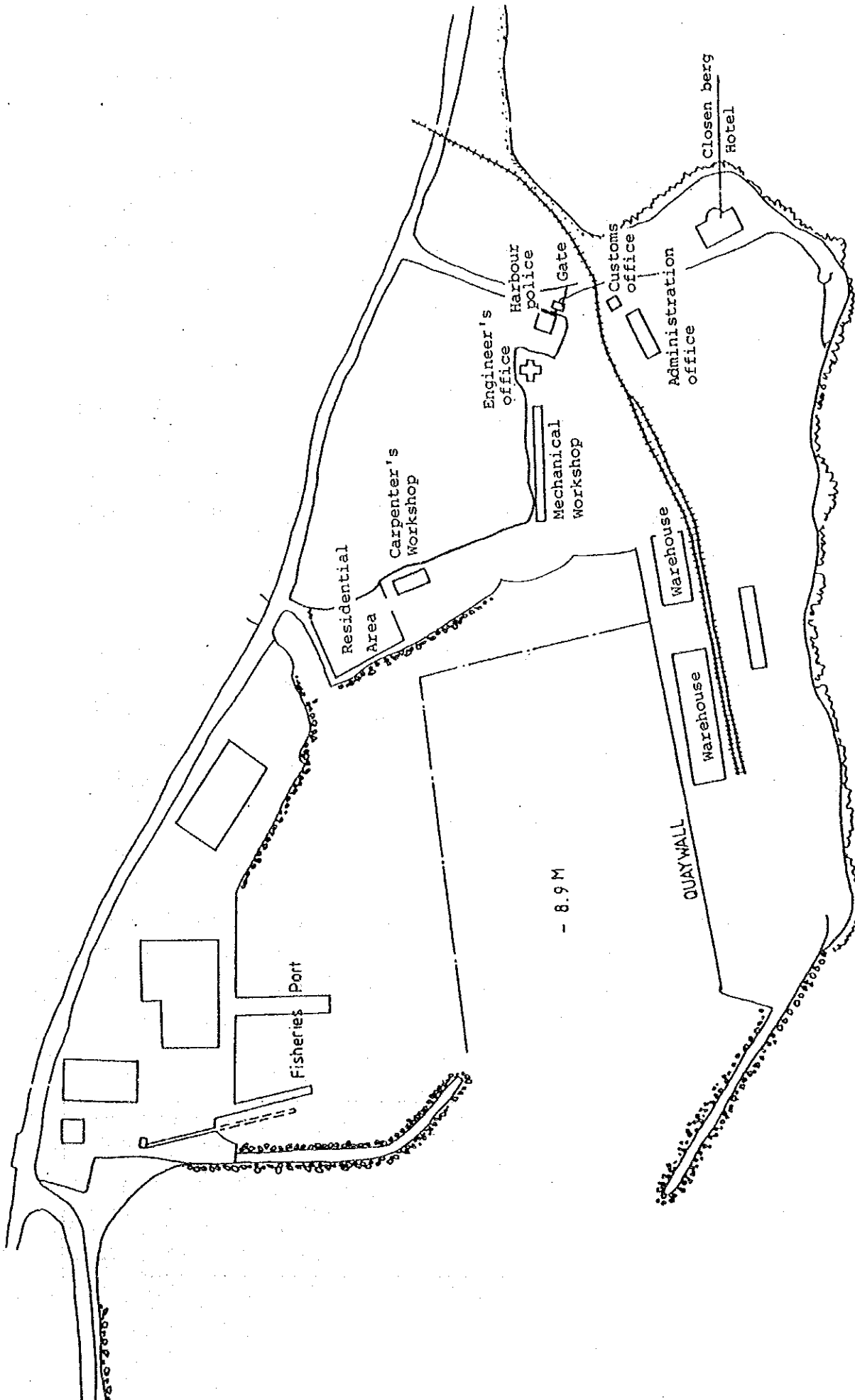


Fig. 5-2-1 Layout of the Port of Galle
Scale: 1/5,000

5-3 Port Facilities

(1) Breakwaters

There are two breakwaters, whose lengths are 250 m and 200 m each. Their structure is rubble mound and the mouth width is around 500 ft., which is sufficient for the designed ship length.

(2) Waterway

The waterway begins at the location of the bell buoy and it winds almost at right angle at the entrance of the port. The ship-length limit is 138 m, and sufficient space for turning is available only just before the entrance of the port. There are 6 buoys alongside the channel that point out shallow places. The waterway's official depth is 9.75 m, but it was actually dredged up to 9.8 m below LWOST.

(3) Mooring Basin

Widths of 250 m at the entrance and 220 m at the inner most part are secured for the mooring basin. Ships turn there around 180 degrees with the assistance of a tugboat and anchor. The mooring basin is not big enough. It has a depth of 8.85 m. Yachts using this area for anchoring have to keep at least 500 ft. away from the quaywall because of cargo ships.

(4) Berths

The length of the quaywall is 426.7 m and the depth at the berths is 8.85 m. The apron width is 15.2 m. The dimensions given below are officially published as these alongside berthing facilities.

Table 5-3-1 Present Conditions of Berths

Quay	Berth No.	Southern Length m	West Monsoon Draught m	Northeastern Length m	Monsoon Draught m	Apron Width m
Closenburg	1	135	7.31	135	7.92	7.2
Jetty	2	135	7.31	135	7.92	7.2

(5) Warehouse

There are two warehouses located just behind the apron. Their main dimensions are shown in Table 5-3-2 :

Table 5-3-2 Present Conditions of Warehouses

	Cubic Capacity m ³	Floor Area m ²	Average Height m	Average Stacking Weight m
Warehouse No.1	14,244	2,158	8.7	6.6
Warehouse No.2	28,488	4,316	8.0	6.6
Total	42,732	6,474	8.0-8.7	6.6

There is no open storage area.

(6) Water Supply Facilities

There is a water pump with a capacity of 200 tons, and an overhead tank whose capacity is 100 tons. The delivery rate depends on gravity and is 15 tons per hour on average.

(7) Others

Railway tracks are laid along the warehouses, but they are not used. The road connecting the gate of the port with the marine drive is administered by the SLPA. There are 3 lighters under repair whose capacity is 40 tons each. The management building has two storeys and its total area is 790 m².

5-4 Handling Equipment

There is no special handling equipment such as a quay crane in the port of Galle. Almost all cargo handling is carried out by ship gear.

Handling equipment owned by the SLPA is as follows:

Mobile Crane (Capacity 7 tons): 1 unit
 Forklift (Capacity 2.5 tons): 3 units

5-5 Cargo Handling Volume

The Port of Galle was an export port until around 1965. In those days, it handled cargoes such as tea, rubber, coconuts for export, and their volume was twice as big as that of import. However, exports of tea and coconut products ceased after 1970 and export of rubber stopped after 1981. Nowadays, the Port of Galle is an import port. Until the middle of the 1980's, total cargo volume was less than 50,000 tonnes, but exceeds 200,000 tonnes at present. Total cargo volume in 1989 was 212,300 tonnes. Main cargoes are clinker and flour and their shares are 78.6% and 21.3% respectively. The recent cargo increase owes much to the increase of clinker, from which cement is made. At first clinker was imported from Southeast Asian countries, but it mostly comes from Middle Eastern countries at present. Another main cargo is flour. This is distributed from Trincomalee by coastal shipping. There is a flour mill in Trincomalee.

Table 5-5-1 Tonnage of Cargo Handled by Commodities
 1980-1989 Port of Galle

YEAR	DISCHARGED							LOADED	Total Tonnage handled
	Rice	Flour	Sugar	Cement	Fertilizer	Other Cargo	Total Discharged	Total Loaded	
1980	30,025	7,708	-	-	-	2,483	40,216	5,937	46,153
1981	17,281	13,785	1,512	-	-	5,422	38,000	1,954	39,954
1982	17,278	-	-	-	-	997	18,275	-	18,275
1983	24,709	2,908	3,841	1,293	-	5,616	38,367	266	38,633
1984	9,068	17,174	-	-	-	10,792	37,034	403	37,437
1985	20,622	20,644	3,953	-	-	21,556	66,775	2,574	69,349
1986	16,398	30,283	1,950	2,969	-	117,288	168,888	-	168,888
1987	13,826	37,572	-	-	-	174,589	225,987	-	225,987
1988	5,873	37,147	-	-	-	130,644	173,664	11	173,675
1989	3,983	41,491	-	-	-	166,858	212,332	1,387	213,719

5-6 Calling Vessels

The number of calling vessels increased from the middle of the 1980's. The number of ships in 1989 was 78, compared with 20 in 1980. Concerning distribution of ship size, more than 70% are below 2,000 GRT, indicating that around 8,000 GRT is the maximum size of ship which can enter the present port.

Table 5-6-1 Total No. of Ships Arrived

Year	PORT OF GALLE		ALL PORTS	
	NO.OF SHIPS	G.R.T. ('000)	NO.OF SHIPS	G.R.T. ('000)
1980	20	-	2,123	-
1981	31	34	2,115	18,364
1982	12	27	2,027	19,817
1983	16	69	2,093	20,768
1984	31	30	2,274	20,991
1985	37	61	2,381	22,390
1986	59	129	2,784	25,673
1987	83	224	2,714	24,030
1988	66	126	2,717	24,466
1989	78	166	2,801	33,785

Table 5-6-2 Distribution of Ship Size

PORT OF GALLE

G.R.T	1986		1987		1988		1989	
	NO. of Ships	%	NO. of Ships	%	NO. of Ships	%	NO. of Ships	%
Below- 2,000	30	50.8%	60	72.3%	51	77.3%	60	76.9%
2,000- 3,999	21	35.6%	6	7.2%	1	1.5%	1	1.3%
4,000- 5,999	3	5.1%	2	2.4%	6	9.1%	10	12.8%
6,000- 7,999	3	5.1%	11	13.3%	5	7.6%	6	7.7%
8,000- 9,999	2	3.4%	4	4.8%	2	3.0%	1	1.3%
10,000-11,999					1	1.5%		
12,000-13,999								
14,000-15,999								
16,000-17,999								
18,000-and over								
Total Ships	59	100.0%	83	100.0%	66	100.0%	78	100.0%

ALL PORTS

G.R.T	1986		1987		1988		1989	
	NO. of Ships	%	NO. of Ships	%	NO. of Ships	%	NO. of Ships	%
Below- 2,000	598	21.5%	762	28.1%	703	25.9%	540	19.3%
2,000- 3,999	345	12.4%	249	9.2%	283	10.4%	349	12.5%
4,000- 5,999	152	5.5%	194	7.1%	203	7.5%	221	7.9%
6,000- 7,999	234	8.4%	198	7.3%	184	6.8%	138	4.9%
8,000- 9,999	376	13.5%	368	13.6%	401	14.8%	365	13.0%
10,000-11,999	291	10.5%	182	6.7%	213	7.8%	207	7.4%
12,000-13,999	181	6.5%	183	6.7%	158	5.8%	178	6.4%
14,000-15,999	128	4.6%	131	4.8%	118	4.3%	105	3.7%
16,000-17,999	160	5.7%	95	3.5%	96	3.5%	71	2.5%
18,000-and over	319	11.5%	352	13.0%	358	13.2%	627	22.4%
Total Ships	2,784	100.0%	2,714	100.0%	2,717	100.0%	2,801	100.0%

5-7 Pilotage

(1) General

The harbour master's section has its own small port, which is called the old port, near the Fort.

Pilotage hours are from sunrise to sunset, namely from 6 a.m. to 6 p.m., basically.

Boats managed by the harbour master's section are as follows:

Pilot Boat.....	1
Mooring Launch.....	1
Small Tug.....	1

The main members of the section are a Pilot, who is the assistant harbour master and also head of harbour master's section, and a chief clerk.

Only the central channel is used at present. Pilot services are provided for over 1,000 D.W.T. ships in practice.

As for navigational aids, a bell buoy and 6 other buoys are provided. (See Fig. 11-1-1, concerning the positions of buoys in the port.)

(2) Method of Navigation

The harbour master is given notice regarding entrance 24 hours in advance by agents. If there are any changes, agents have to inform the harbour master 12 hours before entrance.

When the ship comes to the area within the range of VHF (about 30 miles), captains of ships have to contact the harbour master.

The pilot waits for the ship at the bell buoy outside the harbour. And a tug boat waits in front of the breakwaters. When the ship arrives at the bell buoy, the pilot boards the ship. Within the breakwater, the ship is turned around and is berthed with its mooring head facing the port entrance.

(3) Berth Assignments (in the Port of Colombo)

The harbour master holds a Berth Committee meeting with shipping agents every Wednesday to hear about the latest schedule.

On the other hand, agents submit the schedules for the next month to the chief operations manager and terminal managers who are in the SLPA's operations division. The control room, which consists of 4 people, including the chief operations manager as leader, decides on the berth assignments every morning, 24 hours before entrance. Before making their decision, they hear the opinions of the harbour master. The control room then notifies the harbour master of the berth assignments at 11 a.m. every day.

The decisions are made considering the following priorities:

1. Explosive Cargo
2. Security Forces Cargo
3. Main Line Ships

If the ship has been assigned a berth by priority, extra charge need not be paid.

5-8 Port Management and Operation

5-8-1 Organization of Management

The Sri Lanka Ports Authority is constituted under the provisions of the Sri Lanka Ports Authority Act, No. 51 of 1979, on the 1st of August, 1979, effecting the merger of the Colombo Port Commission Department and two existing statutory corporations. This resulted in a unified organization with a streamlined structure and a cadre of about 22,000. The Ports Authority does not receive financial allocations from the Government but operates using its own revenue and resources.

The Ports Authority, as a body corporate constituted under the provisions of the Sri Lanka Ports Authority Act, No. 51 of 1979 as amended by Act, No. 7 of 1984 and Act, No. 35 of 1984, was established on the 1st of August, 1979. Section 6 (1) of the Act defines its main objects and duties as:

- (1) Provision of efficient and regular services for stevedoring,

shipping and transshipping, landing and warehousing, wharfage, the supply of water, fuel and electricity to vessels, handling petroleum, petroleum products and lubricating oil to and from vessels and between bunkers and depots, pilotage and mooring of vessels, and diving and underwater ship repairs.

- (2) Provision of efficient and regular tally and protective services.
- (3) Regulation and control of navigation within the limits and the approaches of the port.
- (4) Maintenance of port installations and promotion of the use, improvement and development of the specified ports and such other duties as defined.

The authority functions under the direction of a nine-member board of directors. The chairman, vice-chairman and 3 other directors are appointed by the President. The other directors are nominated by the ministers concerned, and represent the various organizations closely related to the port.

- Chairman	(Appointed By President)
- Vice Chairman	(ditto)
- Working Director	(ditto)
- Director	(ditto)
- Director	(ditto)
- Director	(Customs)
- Director	(Ministry of Finance)
- Director	(Ministry of Fisheries)
- Managing Director	

The SLPA is under the jurisdiction of the Ministry of Ports and Shipping.

The present organizational structure of the SLPA is shown in Fig. 5-8-1, and the detailed organizational structure of Galle Section is shown in Fig. 5-8-2. The relations among the agencies at the Port of Galle is

shown in Fig. 5-8-3.

The total number of employees at the Port of Galle has been decreasing because the cargo-handling operations by lighters have been decreasing. The number of employees at the Port of Galle by section is shown in Table 5-8-1.

Table 5-8-1 Number of Employees at the Port of Galle

(At Dec. 31st 1985-1989)

(At Sep. 30th 1990)

SECTION	1985	1986	1987	1988	1989	1990
PERSONNEL	15	18	15	18	18	16
FINANCE	32	31	31	33	32	36
OPERATIONS	585	562	502	484	453	434
SECURITY	0	14	13	14	15	15
HARBOUR MASTER'S	51	51	61	54	52	50
ENGINEERING	247	202	196	210	214	196
HARBOUR INN	0	0	11	11	9	8
TOTAL	930	878	829	824	793	755

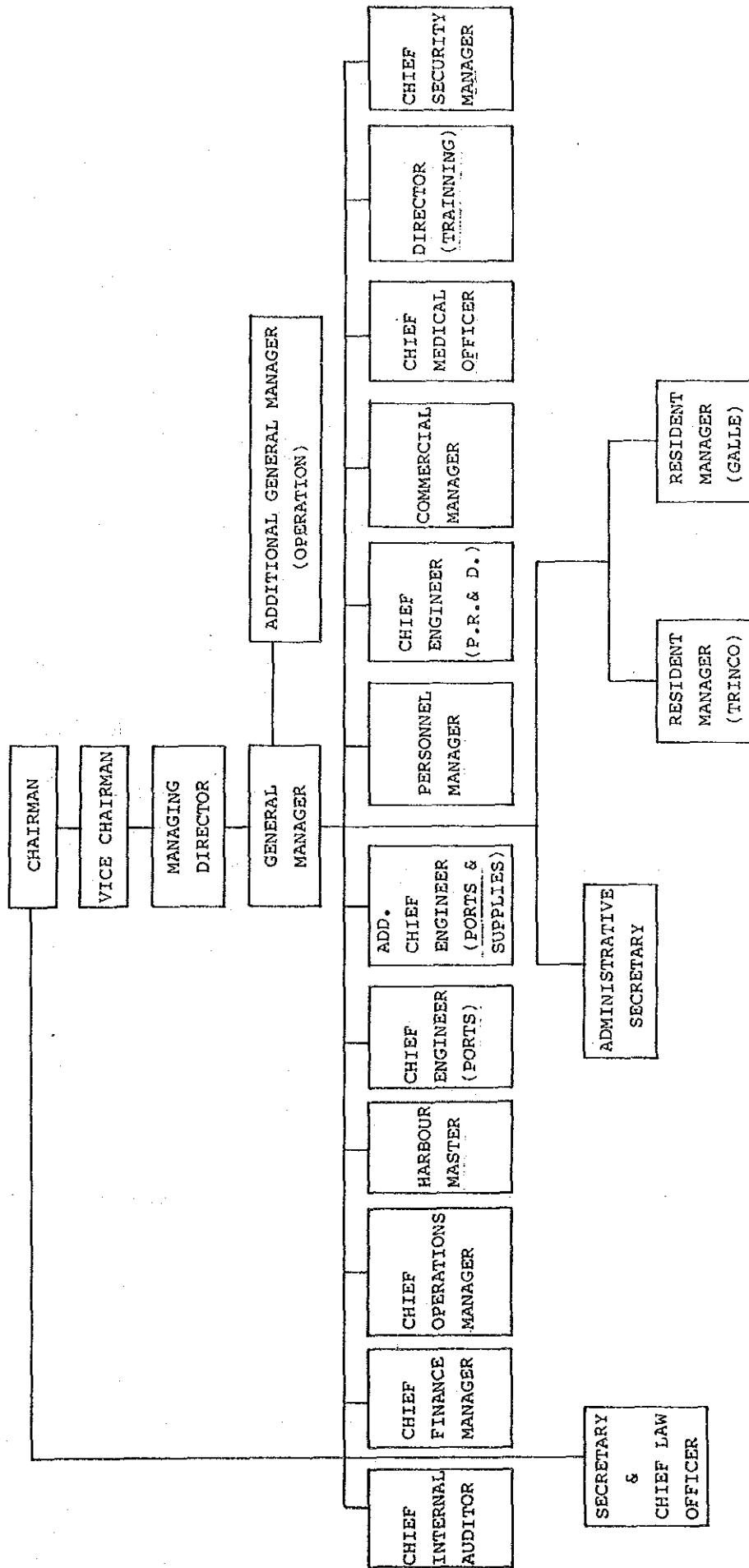


Fig. 5-8-1 Organizational Structure of SLPA

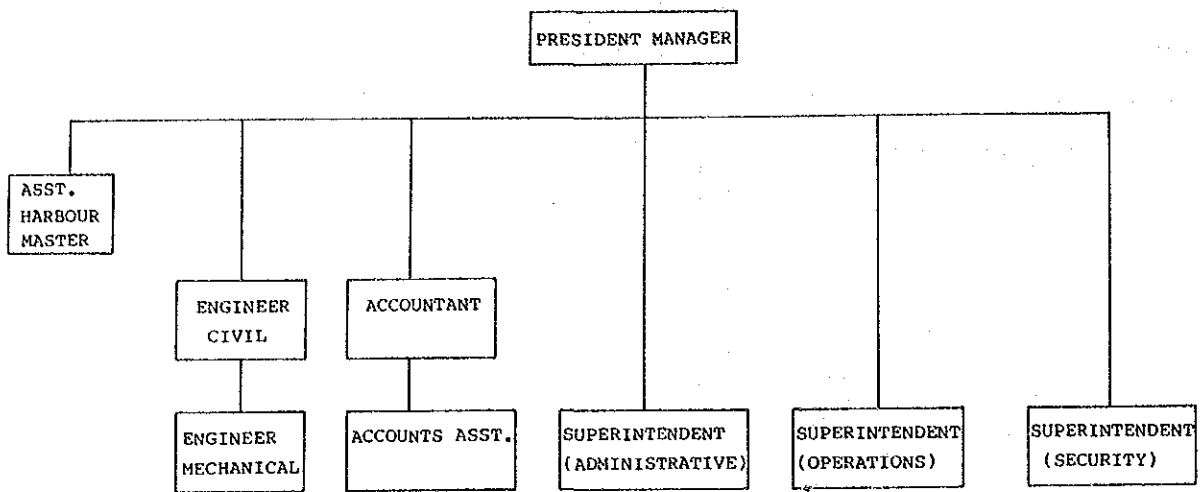


Fig. 5-8-2 Organizational Structure of The Port of Galle

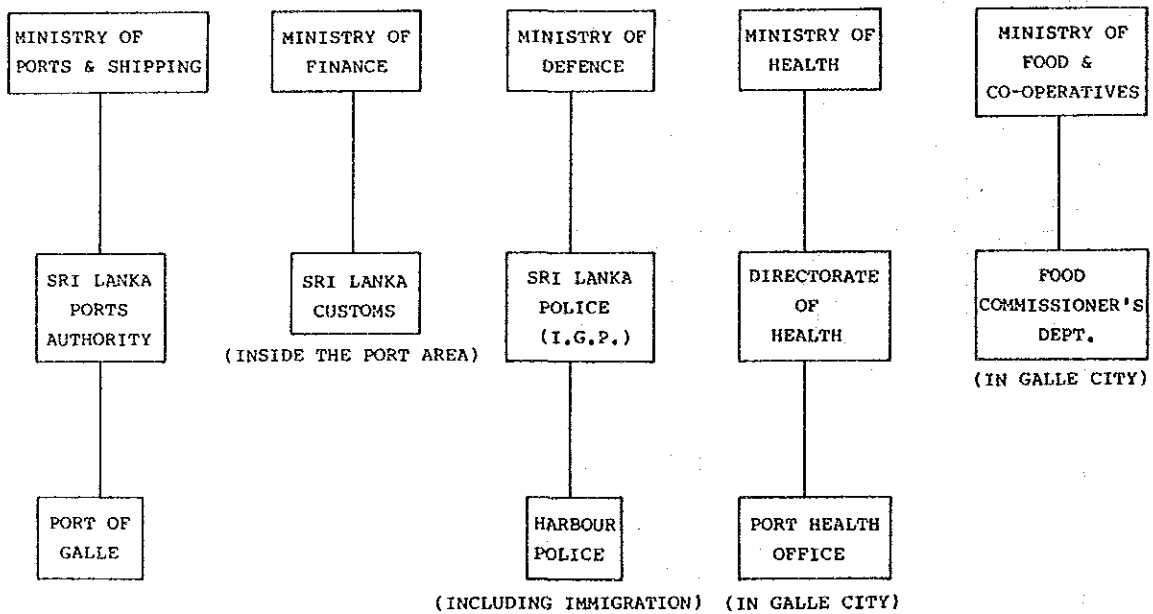


Fig. 5-8-3 Relations Among the Agencies Operating the Port

5-8-2 Working Hours and Labour

(1) Working Hours and Dates

The cargo-handling operations of Galle are a little different from those of Colombo. Though the operations of Galle are performed on a single shift system, Colombo and Trincomalee operate on a two-shift system.

Working Hours (Galle), normal working day

7.30 hrs. to 16.30 hrs. (excluding one hour for meals)

16.30 hrs. to 20.30 hrs. (extended)

Working Hours (Colombo, Trincomalee), normal working day

7.30 hrs. to 16.30 hrs. (excluding one hour for meals)

16.30 hrs. to 0.30 hrs. (ditto)

0.30 hrs. to 4.00 hrs. (1st extended shift)

4.00 hrs. to 6.30 hrs. (2nd extended shift)

There are four non-working port holidays a year.

Shinhala & Tamil New Year Day (April)

May Day (1st May)

Wesak Full Moon Poya Day (May)

Christmas Day (25th Dec.)

(2) Labour

There are many trade unions in the SLPA, but the number of unions having over 1,000 members is three, as follows:

	No. of Members (1st Apr. 1990)
* National Employees Union (J.S.S.) (affiliated with the United National Party)	7553
* Sri Lanka Independent Employees Union (affiliated with Sri Lanka Freedom Party)	1189
* Ceylon Mercantile Union (unaffiliated)	1259

Each trade union leader holds a discussion with the SLPA once a month.

About 50 percent of all employees belong to trade unions, while the rate is about 25 percent among skilled labourers. The rate is 75 percent among semi-skilled and non-skilled labourers. Those in positions from the level of chairman to that of Grade 4 cannot join the trade unions. But those who are at Grade 1 to Grade 4 can join the Staff Officer's Association for executives. The number of grades is 29.

The trade unions and the SLPA have had a good relationship for a long time. Therefore, cargo-handling operations have never been stopped by labour disputes. However, the operations were stopped for fourteen days in October 1988 due to civil disturbances.

5-8-3 Productivity of Cargo Handling

The following data indicate the present situations of the Port of Galle.

(1) The Number of Gangs

Stevedoring Gangs.....	8 units
Wharf Gangs.....	5 units

(2) The Constituents of Each Gang

1) Ship Side

Stevedoring Gang

Tindal.....	1 person
Winchmen.....	5 persons
Labourers.....	13 persons
Total-----	19 persons

2) Wharf Side

Wharf Gang

Kangani.....1 person
 Labourers.....18 persons
 Labourers for Stacking...12 persons
 Total-----31 persons

Direct Delivery

Kangani.....1 person
 Labourers.....8 persons
 Total-----9 persons

By the way, the number of operational staff members at the Port of Galle in the SLPA is shown in Table 5-8-2.

Table 5-8-2 Operational Staff Members, Galle Port, SLPA

Staff	Nos.
Asst. Unit Superintendents	2
Medical Center	2
Foremen	2
Supervising Officers	4
Labour Supervisors	5
Store-Keepers (Warehouse)	1
Warehouse Clerk	1
Tally Clerks	18
Clerks	3
Minor Employees	3
Supervisor (Welfare)	1
Drivers (Motor Vehicle)	1
hatch Tindals	7
Winchmen	27
Stevedoring Labour	147
Wharf Labour	168
Kangani	7
Lighter Section	21
Launchmen	7
Launch Coxwain	1
Launch Driver	1
Gearman	1
Gear Labour	3
Telephone Operator	1
Total	434

(3) Productivity of Cargo Handling

In the case of bag cargoes, the trade unions and the port authority have set 11 tons/hour of cargoes per gang as the amount to be handled. 140 tons/day of cargoes per gang is the agreed-upon daily target, and the labourers may go home once it has been reached.

The weight of cargo per bag is as follows:

Rice.....	100 kg/bag
Sugar, Flour, Fertilizer.....	50 kg/bag

The quantity to be carried per truck is 200-250 bags/truck in the case of an open truck and 100-150 bags/truck in the case of a closed truck.

5-8-4 Computer System

(1) The Existing Computer System (in Colombo Port)

The SLPA presently has an IBM 4381 and an IBM 4361 with a memory capacity of 44 megabytes and a disk storage with a memory capacity of 7,000 megabytes. And the SLPA has 130 terminal installations in all not only at port operation sections, but also at every section in Colombo Port. These terminals are connected to each other and the main computer by a telephone line or direct line. And two terminals at the shipping line are experimentally linked by telephone line.

Computerization at the SLPA started in 1985. The first system that was run on the computer was the Jaye Container Terminal Operation System. The SLPA purchased the Container Terminal Operating Package from Japan. This system consists of delivery & receiving of containers, control of empty containers, in-yard movement & export stacking plan, loading plan to ship, discharging plan from ship, etc.

At present, many application systems have been developed. The systems are operated as follows:

- 1) Jaye Container Operating System (version up)
 - Delivery & Discharging System
 - Receiving & Loading System
 - Yard Planning System
 - Ship Planning System
 - Berth & Ship Scheduling System
- 2) QEQ Operating System
 - This system is similar to the JCT System
- 3) Central Billing System
- 4) Payroll System
 - Salaries/Wages Preparation System
 - EPF System
 - MBPF System
 - Port Co-operative Bank
 - Port Loan System
- 5) Management Information System
 - Container Operating System (JCT and QCT)
 - Revenue & Expenditure System
 - Container Traffic Analyzing System
 - Personal Information System
- 6) Debtors' Ledger & Credit Control System
- 7) General Accounting System
 - Payments & Receipts Cash Book
 - General Ledger
 - Final Accounts
- 8) Stock Control System
 - Inventory Control System
 - Purchasing System
- 9) Fuel Control System
- 10) Electronic Data Interchange System
- 11) Electronic Mailing System
- 12) Container Clearance System

(2) Future Development Plans

With the development of JCT No.3 and No.4, the SLPA has the following plans.

1) The existing JCT Container Operating Package is needed to accommodate the following:

- High volume of containers anticipated
- 5 high stacking arrangement
- Additional Computer Terminals/Printers on-line to the system

2) Electronic Data Interchange

Port users such as shipping agents, customs and other parties related to shipping will be connected to the computer with a view toward minimizing document procedures and increasing the quality of customer service and the efficiency of port in general.

3) Management Information System

An ever expanding system which will provide up-to-date information for the decision makers.

4) Equipment Management Information System

5) Landing & Delivery Billing System

6) Port Security System

On the other hand, the hardware is also planned to expand.

The main computer with the disk storage of 10-20 GB and other related peripherals will be required.

PART II MASTER PLAN

1 DEVELOPMENT POTENTIAL IN GALLE BAY AND ITS VICINITY

1-1 Development Potential

1-1-1 Assumption of the Coastal Area to be Considered

The coastal area taken into consideration in this study is assumed to be about 20 Km of coast line between GINTOTA (West) and KOGGALA district (East), including the port area and the Koggala EPZ (Export processing zone).

The hinterland of the coastal area is assumed to be the Southern Province: GALLE, MATARA AND HAMBANTOTA. The coastlines in these three districts are Galle, 75 Km; Matara, 55 Km; and Hambantota, 135 Km.

1-1-2 Potential Factors to be Considered

Basic items to be considered for coastal development are as follows:

(1) Sea transportation

- i) Galle Bay is located very close to main shipping routes.
- ii) Galle Port is in close proximity to the Port of Colombo and therefore has the potential of acting as a second port to the Port of Colombo.

(2) Industrial development

- i) The Greater Colombo Economic Commission has already decided on the promotion of an export processing zone in the Koggala district.
- ii) There are a lot of educated and highly skilled people in the Southern Province, so the development of an industrial area in the Galle Port has the potential of creating job opportunities to meet the rapid growth of the labor force.
- iii) There is traditional agricultural production, i.e., rubber, coconut and rice in the hinterland adjacent to the coastal area.
- iv) This area is located very close to the abundant fishing grounds of the Indian Ocean and the Arabian Sea.

(3) Others

- i) There is the Fort which has many historic structures. This area also has good natural environmental potential, especially in offering water-front recreational facilities.

In the following section, evaluation of potential of each item listed above is described.

1-2 Evaluation of Potential

1-2-1 Sea Transportation

(1) Potential of the Port of Galle in Container Transshipment

- 1) Transferring Some of the Cargo Handling Functions from the Port of Colombo to the Port of Galle in the Future

The Port of Galle will be developed with a view to enabling it to carry out many functions, such as serving as a supplementary port to Colombo and acting as a spearhead for the development of the Southern Province. However quickly this project is carried out, it will take a very long time for the Port of Galle to catch up with the situation in the Port of Colombo. In order for shipping companies to have a willingness to make their vessels enter a specific port, it is necessary that many conditions be fulfilled. Even if these conditions are limited in the field of port facilities alone, many items are listed as follows:

- i) Safety of entering and maneuvering and anchorage facilities
 - * Water depth and width of channel, breakwaters, wharves, mooring facilities, beacons, sea charts etc., are arranged.
 - * Port services such as pilots, tug-boat, line handling, launch boats, etc., are prepared.
 - * Harbour communication systems such as various signals and radio are arranged accordingly.
- ii) Cargo-handling conditions are to be well-organized.
 - * Facilities such as exclusive-use berths and cargo-handling equipment that are able to execute effectively and safely operations such as loading and unloading of cargoes are provided.

- * Cargo-handling equipment is well arranged.
- iii) Provision of facilities necessary for storage and delivery of cargoes
 - * Warehouse and storage for cargo, containers, etc., are amply provided.
- iv) Feeders and connections with inland transportation are to be well-organized
 - * Access roads are arranged.
 - * Transportation systems such as feeder vessels to the neighbouring ports, railways, and trucks connecting the hinterland and ports are to be arranged.
- v) The dual functions of a base for ships' departure and stopover is to be provided.
 - * Supplying of bunkering, water, food and ship stores is possible.
 - * Repair and boarding facilities as well as facilities for crew relief should be provided.

These facilities described above are the minimum needed to facilitate the transfer of cargoes from the Port of Colombo to the Port of Galle.

Indeed, there are many other matters that must be considered to ensure attractive conditions for shipping companies.

2) Possibility of Cargo Transference

The following examination for the possibility of cargo transference from the Port of Colombo to the Port of Galle is carried out from the point of view of the cargo flow.

The table below shows data by origin (in) and destination (out) concerning transshipment cargo handled at the Port of Colombo from January to August 1988. Regions or countries are divided into assumed feeder areas and others. Although it is not easy to correctly assume which ports were feeders, ports in Eastern India, Bangladesh, Western India, Pakistan, the Persian Gulf and the Red Sea are selected as feeder ports in this examination.

Table 1-2-1 Origin and Destination of Transshipment Cargo

Unit: 1000 Tons

Region or Country	Origin (In)	Destination (Out)
Eastern India	156	170
Bangladesh	44	84
Sub-Total:	200	254
Western India	171	307
Persian Gulf and Red Sea	128	183
Pakistan	143	40
Sub-Total:	642	784
Others (Hub ports)	792	612
GRAND TOTAL:	1434	1396

(Note): Ports included in each region are as follows:

Eastern India: Calcutta, Madras, Haldia.

Bangladesh: Chittagong.

Western India: Bombay, Cochin, Mangalore.

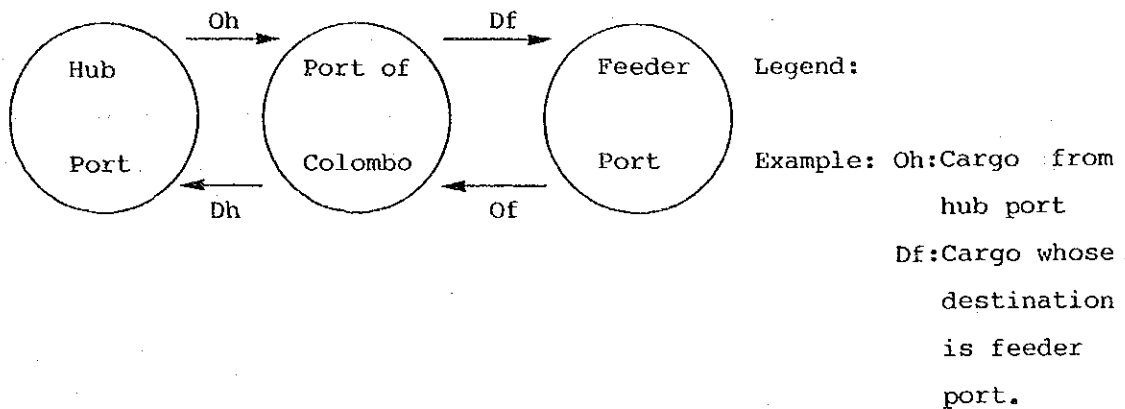
Pakistan: Karachi.

Persian Gulf

and Red Sea: Fujairah, Kuwait, Jeddah, Muscat, etc.

At first, it is examined whether selection of feeder ports has been carried out correctly.

Generally speaking, the following relationships exist in transshipment cargoes.



$$Oh = Df$$

$$Of = Dh$$

$$Oh + Of = Df + Dh$$

The numbers presented in the table do not satisfy this relationship completely; however, this discrepancy is to be expected in this type of statistical data. It is understood that the selection of feeder ports is correct because the equation is fulfilled on the whole.

How advantageous is the location of the port of Galle to shipping routes?

It is possible to assume that the ton-mile figure of transshipment cargo from origin to destination is in proportion to its cost. Then, we compare the ton-mile figure of transshipment cargo in using the Colombo Port as a transshipment port with the figure in using the Galle Port.

According to the data from the shipping route distance table, it is known that the loss caused by deviation from the main route for stopping over at Colombo is 36 nautical miles but is almost zero in

the case of stopping over at Galle Port. For feeder vessels, the difference in distance when the Port of Colombo is used as a transshipment port and when the Port of Galle is used as a transshipment port is 50 nautical miles for cargo coming from and heading west of both ports. The difference is 69 nautical miles for cargo coming from/heading east of the ports.

The next table is the result of calculations based on table 1-2-1 showing the difference in distance (ton-mile using Galle subtracted from ton-mile using Colombo).

Table 1-2-2 Ton-mile Difference

Unit: 1000 Ton Mile

Region or Country	Ton-Mile (via Colombo) minus Ton-Mile(via Galle)	
	From Feeder Port to Hub Port	From Hub Port to Feeder Port
Eastern India	16,380	17,850
Bangladesh	4,620	8,820
Western India	-2,394	-4,298
Persian Gulf and Red Sea	-1,792	-2,562
Pakistan	-2,002	-560
Total	14,812	19,250

(Note):(1) The difference of distance between Colombo and Galle is assumed as follows:

From/to west: 50 Nautical Miles

From/to east: 69 Nautical Miles

(2) Deviation distance from the main route is assumed as follows:

Port of Colombo: 36 Nautical Miles

Port of Galle: 0

(3) Hub Port means main ports in the world

The result shows that the ton-mile figure in using the Port of Galle is smaller than that of the Port of Colombo as a transshipment port. From this it is understood that the location of the Port of Galle is more appropriate to handle transshipment cargo.

When it is looked into more detail, the following will be clarified.

It is possible to divide transshipment cargo into two categories: one category consists of cargo whose origin or destination port is the eastern side of Sri Lanka, and the other category is cargo whose origin or destination port is the western side of Sri Lanka. Table 1-2-2 shows that the Port of Galle is beneficial for handling the former cargo and the Port of Colombo is appropriate for handling the latter cargo, theoretically.

In this calculation, only a comparison of the ton-mile figures of the two cases was carried out, and the factor of vessel size was omitted. But in actuality, vessels providing main route shipping service are much larger than those for feeder service and their ship-cost is very high. For instance, one estimate says the ship-cost is around US\$ 22,600 per day in the case of container ships with a capacity of 2,500 TEUs. Accordingly, it is generally assumed that the loss caused by longer transportation distance is heavy for mother vessel.

However, if the mother vessel stops over at the Port of Colombo, the extra distance for it is only 36 nautical miles, and the loss of time is 1.8 hours, on the condition that the vessel sails at the speed of 20 knots. In case of cargo whose origin or destination port is located on the western side of Sri Lanka, it is possible to compensate for this loss by the fact that the cost of a feeder service using the Port of Colombo is much cheaper than using the Port of Galle.

On the other hand, there is a 69-mile distance in the case of feeder vessels that are eastbound or dispatched from the east, which means that the loss of time by using the Port of Colombo is 9.2 hours in a round trip if the vessel runs at the speed of 15 knots. It is considered that this difference has a big influence on feeder shipping, which provides services within a comparatively small area. It is a matter of course that the Port of Galle is more beneficial

for mother vessels.

Considering these points, it is appropriate to assume that cargo handled at ports in Eastern India and Bangladesh would theoretically be shifted to the Port of Galle. Calculations based upon the figures in table 1-2-1 show that 32% of the total transshipment cargoes will be shifted.

As a result of these examinations, it can be said that on the whole the Port of Galle has a better position compared to the Port of Colombo. It is assumed that there is a potential for the Port of Galle to receive around 30% of the total transshipment cargoes handled at the Port of Colombo.

3) Points for Further Consideration in the Examination

The examination described above is carried out from the viewpoint of transportation cost.

There are some problems from shipping companies' point of view in this approach. The main items are as follows:

- * Local container cargoes in the hinterland of the Port of Galle are small.
- * There is some possibility that new container cargo flows will arise between the Port of Galle and the Port of Colombo.

a) Local Cargo

It is believed that the benefits derived from handling local cargo are much greater than those derived from handling transshipment cargo for shipping agents. Therefore, whether a good volume of local cargo exists in the hinterland of the port is a very important factor for a shipping line in its decision on whether to stop over. Unfortunately, the economic potential is not high in the Southern Province at present and its share in Sri Lanka's economy is very small. It cannot be said that production in the province will increase rapidly in the short term.

Accordingly, the shipping lines that have a strong intention to handle local cargo will not use the port of Galle despite its

locational superiority for transshipment cargo. For instance, in the case of a certain shipping company whose share of local cargo of the total cargo is around 75%, it can be assumed that this company will not readily enter the Port of Galle.

Furthermore, on account of the liberalization of the local cargo market, it is anticipated that foreign shipping lines will also strengthen their effort to acquire many more local cargo.

b) Container cargo flows between the Port of Galle and the Port of Colombo

In the examination, the allocation of cargo to two ports is carried out based on the transportation distance of feeder vessels, i.e., cargo whose origin or destination of feeder transportation is the eastern side of Sri Lanka will be handled at the port of Galle. On the other hand, cargo whose origin or destination of feeder transportation is the western side of Sri Lanka will be handled at the Port of Colombo.

Actually, however, there are many mother vessels that convey both westbound cargo and eastbound cargo in the same trip. There are, of course, some mother vessels that convey cargoes for specified feeder ports.

If the allocation of cargoes to both ports is done in the way stated above, it can be expected that shipping lines will implement selection of cargo by direction beforehand.

For the short term, however, this cannot be anticipated. Under these conditions, container cargo flows between the two ports will occur.

There are three means for handling of cargo flow, namely, railways, roads and shipping.

* Railways

It is said a rail system is very useful for container transportation. But, in fact, it is little used for container transportation in Colombo, despite the existence of some facilities. There is only a single track between Galle and Colombo and its condition is not conducive for smooth transportation. Nor are there enough wagons (cargo cars). It is necessary to improve several conditions to use the rail system.

* Roads

The road between Galle and Colombo is classified as A class. However, there are many sections where conditions are not good. For instance, there are more than 10 towns in which sections of the road are too narrow for trucks to pass each other easily. In particular, there are five bridges on which it is very difficult for trailer trucks with chassis to pass each other. Judging from these conditions, there are some problems in using roads for container transportation.

* Shipping

There are two means of shipping. One is a shuttle service between the two ports. In the other method, an eastbound feeder service is provided in Colombo Port while a westbound feeder service is provided in Galle Port.

(2) Capacity Evaluation of Galle Bay

1) Comparison Between Galle and Colombo Harbours

The tables below compare conditions at Galle harbour with Colombo harbour:

Table 1-2-3 Comparison of Topographical Conditions

	GALLE	COLOMBO
Location	Bay protected partly by the Fort and small cape	Originally open-water now protected by a 2.7 Km length breakwater
Shape	Open to the south-west, which is the direction of 6-month monsoon	Open to north-west and north
Area	Whole area 390 ha (possible area 450 ha) Water area 370 ha (possible area 430 ha) Land area 20 ha	Whole Area 330 ha Water Area 220 ha Land Area 110 ha
Soil condition of sea bed	Many rocks scattered in all areas of the Harbour	Rock bed under 14-metre depth
Sea bottom gradient	1/100 ~ 4/100	

Table 1-2-4 Comparison of Socio-Economic Conditions

	GALLE	COLOMBO
Relationship with the City	Population of 82,000 comprising part of the city	Population of 609,000 comprising part of the city
Conditions of land use	Some space for the development in the northeastern part	Lacking in space
Institutional restrictions for development	None: some restriction within the Fort and Rumasalla Hill	None
Transportation with hinterland	Road (two lanes) and railway	Road, railway Traffic congestion in area just behind the port
Present density of industry	Low. One cement plant. Koggala EPZ in the process of development.	High. Both EPZs under full operation.
Location with relation to international shipping route	Good (Much closer than Colombo)	Good

Table 1-2-5 Comparison of Oceanographical Conditions

	GALLE	COLOMBO
Waves	S~W Main direction SSW	SSW~W Main direction WSW, design wave height H _{1/3} = 6.1 m
Tide	H W L = 0.60 m	H W L = 0.77 m
Current	< 0.4 Knots	< 0.5 knots
Littoral Drift	No symptoms of littoral drift because of rocky topographic condition	No symptoms of depth changes near the mouth of Port

As a result of the comparison between Galle Harbour and Colombo Harbour as described above, Galle Harbour can be said to have the following characteristics:

- i) It is very close to international shipping routes and it has a significant meaning for the development of the port as a transshipment port for containers.
- ii) There is the comparatively large city of Galle just behind the Port. It means there is economic accumulation, which provides indispensable conditions for regional development.
- iii) The Koggala Export Processing Zone, which is located about 8 miles east from Galle, is now under planning and some construction works

of sites were started. The Asian Development Bank will provide the necessary assistance for this project.

- iv) There are a few unutilized areas along the coastline of Galle Bay. These areas can be used for the development of industries.
- v) The area of Galle Bay is not large enough for large scale development. However, the water area within Galle Bay can be expanded with a well-aligned breakwater. In this way it is possible to secure an area about 1.4 times larger than Colombo Harbour.
- vi) Galle Bay is a natural bay, of which some parts are surrounded by the Fort and a small cape. However, it is necessary to construct a breakwater to maintain calmness within the Bay.
- vii) The direction to the entrance of the Bay is southwest and the wave direction is around the same. During the south-west monsoon season it is attacked by high waves. The significant wave height is 20% ~ 30% more in Galle than in Colombo.
- viii) There are some scattered rocks in Galle Bay. Therefore, it will be necessary to dredge rocks when deepening the channel to accommodate large vessels.

2) Capacity of Galle Bay for the Port Development

The area of Galle Bay depends on the alignment of the breakwater that is planned to be built at the Bay's mouth. Using the shortest breakwater alignment, which links the edge of the Fort to White Tower Cape of Rumassala, the area will be around 370 hectares. However, in another case, in which the breakwater is planned for the southern part of the Bay, the area can be expanded to around 450 hectares.

What capacity does this area have? Although it is difficult to assume a capacity of an area, our next estimation is carried out for reference purposes.

A rough estimation mainly using data from Colombo Port was carried out as follows:

In Colombo Port, 11 million tons of cargoes are handled within the 330 ha area, which is divided into two parts: the land area of 110 ha and the water area of 220 ha. From these facts, it is possible to obtain such numbers as 0.2 M²/t for the water area and 0.1 M²/t for the land area, respectively. There are also some calculated results concerning handling areas in ports in Japan. They are 5.7 t/M² for break bulk cargo and 9.7 t/M² for bulk cargo.

The port of Galle will be a supplementary Port to Colombo. However, the development plan for the Port of Galle should be formulated considering the future possibility for expansion of the port. So, 10 million tons and 15 million tons are assumed as possible future demand levels.

Table 1-2-6 Necessary Space by Cargo Volume

Unit : Hectares

		Land Area	Water Area	Total
CASE 1 (10 million tons)	Calculation based on Colombo Port	100	200	300
	Calculation based on Japanese ports	130	-	-
CASE 2 (15 million Tons)	Calculation based on Colombo Port	150	300	450
	Calculation based on Japanese ports	260	-	-

It seems that Galle Bay is large enough to handle cargoes of 10 million tons based on this calculation.

Although the Port of Colombo is now handling more than 11 million tons of cargoes, there are several problems especially concerning the lack of space:

i) Land Area

- * There are some quays, such as QEQ that present problems in conducting handling works because of a lack of land area.
- * The stuffing and un-stuffing many container cargoes handled in the Port of Colombo is carried out in container depots located in the inner part of the city.
- * Almost all the land area of the Port is well-utilized.

ii) Water Area

- * It cannot be said that there is enough water area considering the trend of large ships visiting the port area.
- * There still exist buoys for lighter handling, despite the fact that a number of them have been removed.

From the facts described above, the area used to handle a given amount of cargo at the Port of Colombo based on the present condition at the Port is thought to be small. There is a tendency for the size of vessels to increase, and it is very important to have enough space, including roads and open areas, for development.

Based on these considerations, it is appropriate to assume that the capacity of Galle Bay should be either around the same capacity of Colombo or a little bit bigger. Accordingly, it is necessary to secure whole water area of the bay in order to expect the same scale of development as Colombo.

1-2-2 Industrial Development

Evaluation of potential of manufacturing industry in the Southern Province is described in the next chapter. Here, other industrial activities, such as agriculture, fishery and tourism, are described.

(1) Agriculture

Agriculture dominates the economy of the Southern Province, but the situation of this industry is not good. The major subsectors are tea, rubber, coconuts and paddy. Tea, rubber, and coconuts are very important in earning foreign currency. In 1989, their shares of exports were 24.3%, 5.5% and 5.1%, respectively. On the other hand, rice is the main staple food for the Sri Lankan people and most of paddy is consumed as rice.

There are no national plans for agriculture.

1) Tea

Tea is one of the main products in the Southern Province and is mainly produced in Galle and Matara districts. The climatic conditions in both districts are considered suitable for tea production.

One feature of the tea industry is that it is one of the most labor-intensive industries, the other is that tea is a product for export. Both of these factors are very important for Sri Lanka as well as the Southern Province. Recently, the share of industrial exports has risen remarkably, especially in textiles and the share of agriculture decreased correspondingly. However, the share of tea was 24.3% in 1989 and still ranks high.

Productivity of tea plantation is comparatively high. According to the Report "Strategy for the Accelerated Development of the Southern Province of Sri Lanka" both districts' yields are average over 1200kg/ha; 56 per cent of the areas under tea cultivation yield more than 1200 kg/ha.

2) Rubber

Provinces where rubber are produced are mainly located in South-West Provinces. In the south-west provinces, Kegalle and

Kalutara districts are predominant in terms of the overall area available for rubber production and Galle and Matara districts are ranked 5th and 6th, respectively. Although the average yield obtained from each age class of plantation is comparatively high, there is a high percentage of old rubber trees. It is necessary to replant them using the best planting material. Research and development activities aimed at promoting productivity are strongly urged.

3) Paddy

According to the Annual Report published by the Central Bank, the availability of domestically produced rice for consumption amounted to 1.23 million metric tons in 1989, which accounted for only about 73% of the estimated domestic rice requirement.

Paddy production is fundamentally necessary for providing the people with the staple food. However, the yield per hectare in both Galle and Matara districts is low compared with the production level of major paddy-producing areas. In these districts, paddy cultivation is mainly rain-fed and maintenance of paddy fields is very poor.

In contrast, the district of Hambantota is a major paddy producing area. There is a high use of machinery and productivity is comparatively high. It is anticipated that higher yields will be obtained under irrigated conditions.

(2) Fishery Activity

1) Development Potential of the Galle Fishery Port

At present about 90% of Sri Lanka's production of marine fish is derived from the coastal inshore fishery, making the coastal fishery the most important subsector. It is easy to assume that this situation will not change in the short term. At the same time, it is a fact that the production of the coastal fishery will not increase sharply.

On the other hand, it is expected that offshore fishing will play an important role in the future. According to the National Fisheries Development Plan 1990-1994, this subsector is expected to

contribute 50,000 tonnes to the fish supply of the country by the year 1994. This will be 18% of the total production, and under this plan a total of 200 offshore boats are to be introduced.

There is very little deep sea fishing in Sri Lanka at present. However, it is very important for fishing industry of Sri Lanka to make every effort to venture into deep sea fishing.

The Fisheries Port of Galle is located at an advantageous place in Sri Lanka facing the Indian Ocean and has many facilities, such as a cold room with a storage capacity of 2400 tons. Unfortunately, these facilities are not fully utilized. For instance, the cold room has remained inoperative for several years. It will be necessary first to refurbish the cold room complex in order to make full use of its capacity. In the process of improvement, foreign investment or the introduction of advanced technology can be expected.

Judging from the conditions described above, the Fisheries Port of Galle will take on the role of operational base for offshore fishing.

2) Examination of Water Area Capacity of the Fishery Port

According to the data from the Ministry of Fisheries the following boats are present in Galle Bay:

3 1/2 Tons	-	25 Boats
17 - 23 FRP	-	60 "
Small Scale Oru Non-Mech.	-	50 "

Of the boats above mentioned, 3.5 ton boats and some FRP boats are berthed in the port and 5 hectares are reserved as a basin area for the Fisheries Port. There is a reference number for the required water area per boat, i.e., 250 M². It is calculated by using this number that the basin area has enough space for 200 boats.

Described below are the main dimensions of the fishing boats.

	3.5 TONS	10 TONS
Length	8.38 m	11.58 m
Draft	0.85 m	1.68 m
Breath	2.54 m	3.35 m

The length of the quay wall in the Port is 192 m, and either 50 boats of 3.5-ton type or 39 boats of 10-ton type can berth at a time.

Other than the quay wall, there is a jetty, whose length is 91 m, and further east of the quay wall there remains an undeveloped area for future expansion if necessary.

Judging from these rough examinations, there is enough water area space for fishing activities in the Fisheries Port of Galle.

(3) Tourism and Recreation

1) Tourism Resources in Galle City

The Fort is the most famous place in Galle. The Fort is called the Dutch Fort and is considered an important historical monument. The Fort dates back to the 1690's and has been earmarked for conservation by the Department of Archaeology. The Fort contains the Dutch Museum, the old port, ancient streets with old Dutch houses, sewers, churches, mosques, a hotel and government buildings. Recently, plans for Fort's restoration were set forth by a high government officer.

The playground, which is called the Esplanade, lies just outside the Fort walls and is the only formal playground in Galle.

Dharmapala Park to the west of the Esplanade and directly in front of the railway station is the only formal park in Galle.

There are also Buddhist temples, Hindu temples, a reservoir and so on (see Fig. 1-2-1).

Lace and goods produced from tortoise shells and other shells are well-known for shopping in Galle.

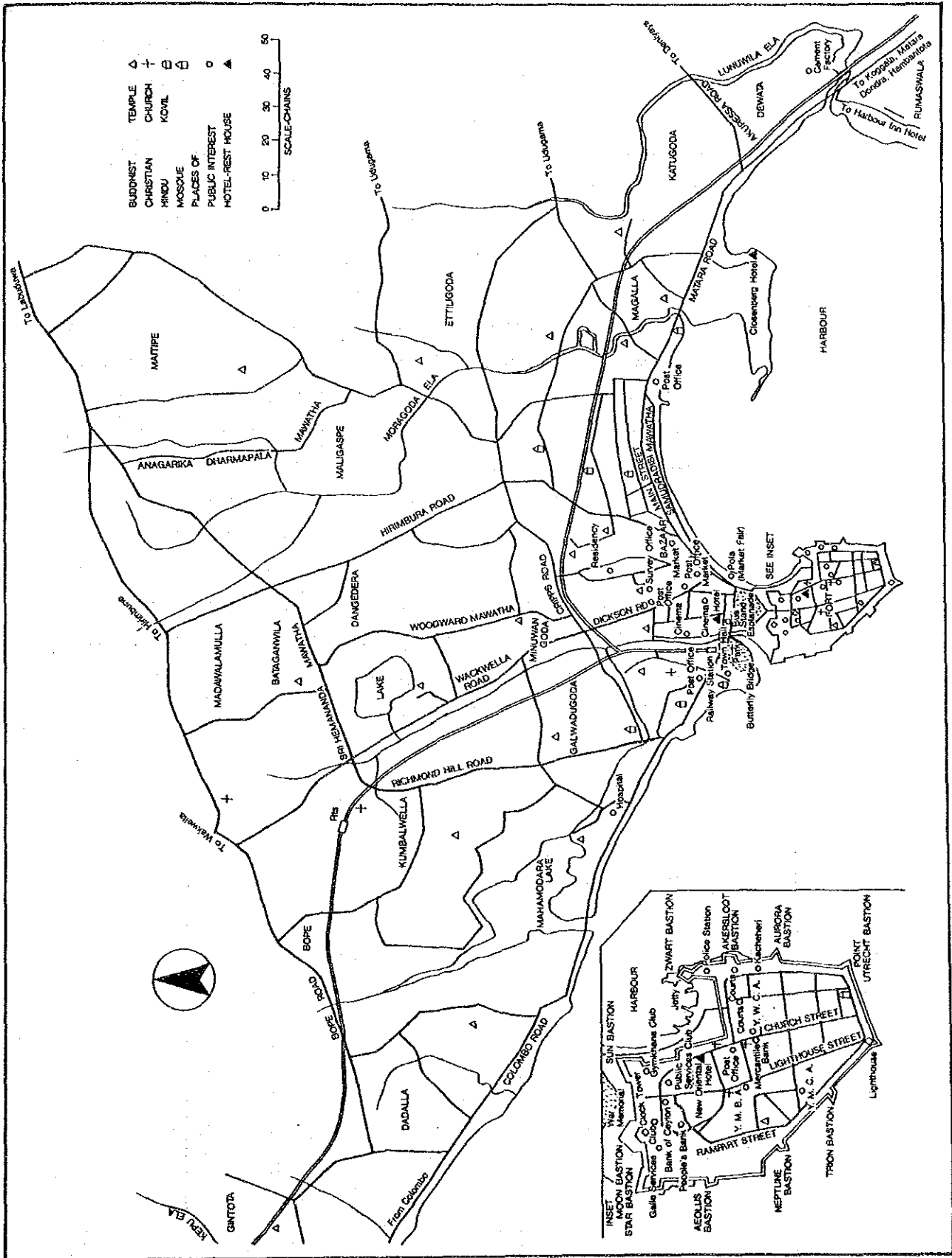


Fig. 1-2-1 Tourism Resources in Galle City

2) Promotion of Yacht Recreation

Galle is a famous harbour for yachtsmen. And also, Galle has a good position on the routes for yachtsmen. Shower facilities and a restroom are provided in the Port of Galle. And there are a caretaker and a travel agent close to the port.

Though the number of yachts arrived in the Port of Galle is decreasing through the last five years (see Table 1-2-7), this phenomenon is concerning not only yacht arrivals but also the whole tourist arrivals. Recreational activities in advanced countries tend towards marine sports, for instance pleasure boats, yachts, skindiving, surfing, wind-surfing and so on. Therefore, promoting yachting is considered important, not only because of the trends in the future but also for the sake of publicity for the port. Fortunately, a major yacht race will include Galle as a stopover, described below. And more effort should be made to increase the number of events and the variety of publicity activities.

The first round the world rally for cruising yachts, Europa 92, will start on 6 January 1991 from Gibraltar. Europa 92 will take the trade wind route around the world by way of the Panama and Suez canals, returning to Europe via the Torres Straits, Singapore, Galle, the Red Sea and the Mediterranean. Europa 92 will return to its starting point in April 1992 having covered a total of 23,000 miles divided into 18 legs.

Table 1-2-7 Yacht Arrivals in Galle Port

	1985	1986	1987	1988	1989	TOTAL
Australian	16	22	18	18	13	87
American	22	17	14	10	19	82
British	13	19	19	12	10	73
French	7	12	5	10	4	38
German	6	6	5	7	5	29
N.Z.	5	3	2	1	0	11
Swiss	0	6	0	4	1	11
Canadian	3	1	3	0	3	10
Swedish	0	0	3	3	3	9
Italian	2	1	1	1	1	6
Danish	1	2	2	0	1	6
Dutch	1	1	2	0	0	4
Norway	0	0	3	1	0	4
Others	4	4	4	4	3	19
TOTAL	80	94	81	71	63	389

3) Brief Examination of Basin Area for Yacht Anchoring

According to data supplied by the SLPA, the statistics regarding yacht arrival in the last 6 years are as follows:

	No. Of Yachts arrived	Average Stay in Port
1985	80	37 Days
1986	94	45 "
1987	81	37 "
1988	71	32 "
1989	63	33 "
1990 (Up to 11 Oct.)	72	19 "

Maximum staying number at a time: 22

Average size of a Yacht: 15m L.O.A.

There are 10 conical buoys in the inner part of the basin. They were installed by the SLPA. The berthing method used by yachts is two-points mooring, i.e., a yacht uses both an anchor and a buoy when berthing. The rope length to the buoys is from 3 to 5 m and the length of the anchor chain is from 20 to 30 m. The berthing area could be assumed to be around 500 m² per yacht considering the present situation. Based on this number, around 20 yachts can berth in 1 ha.

There are around 20 ha of basin area in the existing port. Of this, 5 ha is for fisheries. More should be reserved for future development. Thus, less than 15 ha is for the commercial port. Considering the area required for turning of designed ships, more than 10 ha are necessary for cargo-handling activity. Therefore, a very narrow area is available for yacht berthing.

Compared to the result of the statistical survey showing that the maximum number of yacht staying at any one time is 22, this location can be judged sufficient for yacht berthing at present.

There is also an idea that the yacht berthing area is provided in the old port located in front of the Fort. After construction of the breakwater, this area will become a good area because of improvement of wave conditions.

1-3 Basic Concept of the Coastal Development

1-3-1 Present condition of the coastal area

To begin with, the coastal areas in the vicinity of the port will be divided into 9 zones (indicated by circles on the map) (A ~ I). It is shown in Fig. 1-3-1.

National road A2 and the national railway pass through almost all of the coastal area, (see figures A, G, H, I.). The urban zone (Galle City) and the Fort zone are considered water front-related areas (or port-related areas). The present situation and some features of the zones are described in table 1-3-1, based on site observation. The space to be utilized most are D and a part of E zone for the port and port-related industries.

Zone (I) is expected to be developed as an export processing zone by developing strong links with Galle Port. Zone (H) faces the ocean directly with a long shore line. It could be considered as a future extension area of the export-processing zone if the land area is conserved. Land use plans in the northern part of E zone must be formulated carefully because there are some dwellings close to the coastline.

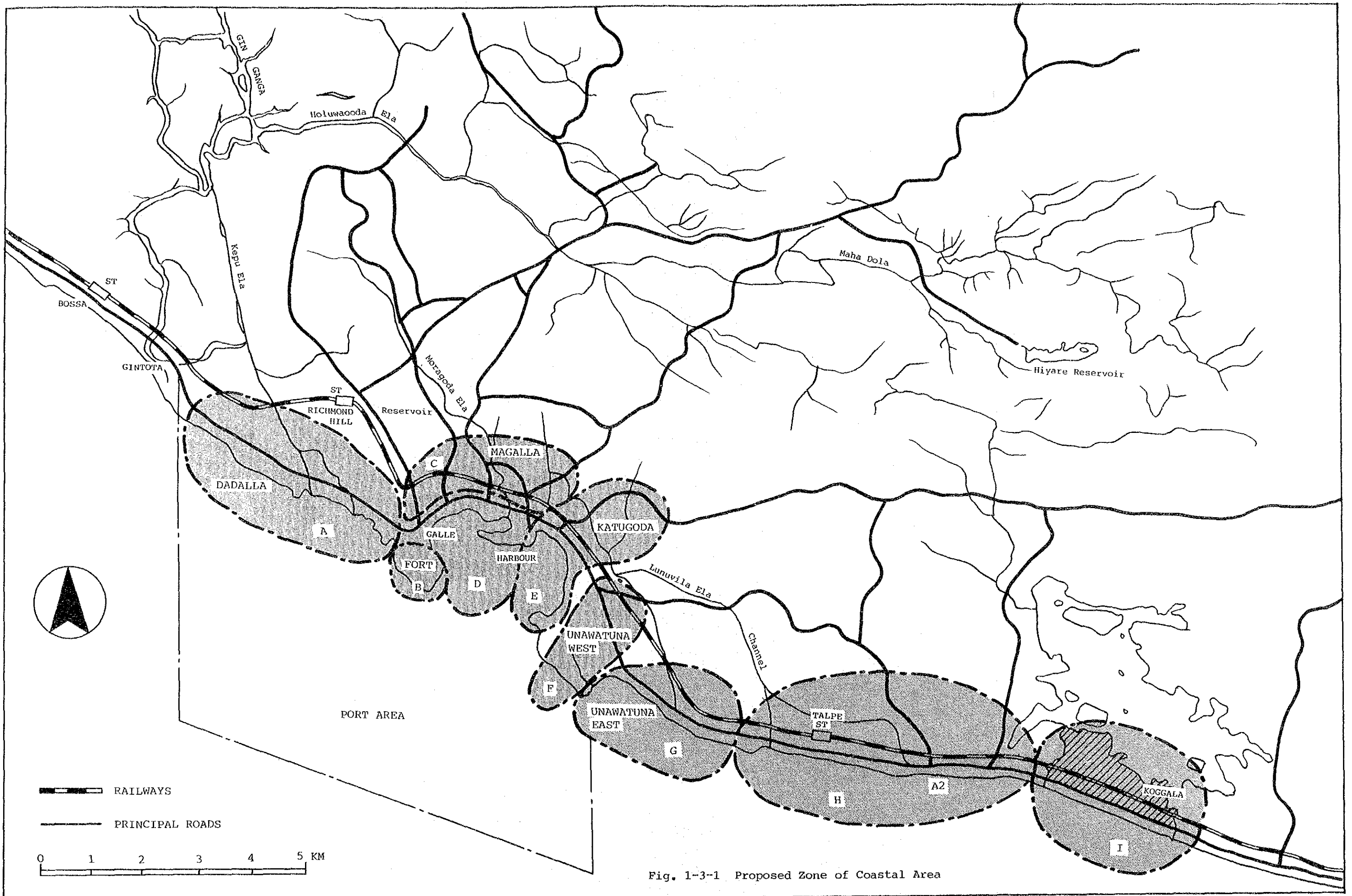


Fig. 1-3-1 Proposed Zone of Coastal Area

Table 1-3-1

Description of Coastal Area
and Land Area Adjacent to Port

District	Present Condition of Water-Front Area	Feature of Topography (Sea)	Possibility of Another Water-Front Activity at Present	Difficulty of Land Reclamation	Possibility of Location of Port Oriented Industry
A	Beach Palm Tree Small Villages	Comparatively deep (Sea)	Impossible	Difficult	Impossible (Engineering Aspect)
B	Old Fort Town	Rock: Sea Slope is steep	Impossible	Difficult	Impossible (Engineering Aspect)
C	City	City	City	City	City
D	Port Fisheries Harbour	Flat	Possible	Easy	Possible
E	Port Villages	Flat	Possible	Easy	Possible
F	Port Mythological Mountain	Steep	Impossible	Difficult	Impossible (Environmental Aspect)
G	Beach Village Palm Tree	Flat	Possible (Land Area)	Easy (Comparatively)	Impossible (Environmental Aspect)
H	Beach Village Palm Tree	Flat	Possible (Land Area)	Difficult	Possible (Land Area)
I	Beach E.P.Z. Palm Tree	Flat	Possible (Land Area)	Difficult	Possible (Land Area)

1-3-2 Future plan of infrastructure

(1) Transportation

1) Road

a) Rehabilitation plan of Colombo - Galle - Hambantota - Wellawaya Road

The third road project in Sri Lanka includes several projects. Two of them are road rehabilitation work and bridge strengthening, rehabilitation and replacement, both of which are cofinanced by World Bank and the Economic Development Cooperation Fund of the Republic of Korea. These projects will be carried out for routes in the Western and Southern provinces. The project will be implemented over a seven-year period and will be completed by December 31, 1997.

It is anticipated that significant impediments to traffic will be eliminated through these projects.

b) Proposed new highway from Colombo to Matara

The Development Authority has prepared a conceptual plan for the development of a system of highways to meet future demand. The southern highway is planned from Kesbewa on the Outer Ring Road to Matara to overcome certain deficiencies in the existing coastal road and to cater to the development of inland areas of the southwestern and southern parts of the country.

The proposed highway development plan is still in the conceptual stage.

2) Railway

The development trend of the railway is as follows:

- * There is a track rehabilitation project between Colombo Fort and Galle
- * The Republic of Korea has agreed to carry out a feasibility study for the southern railway line extension between Matara and Kataragama.

3) Airport

There is a conceptual plan for an international airport at Eraminiyaya.

(2) Utilities

1) Water supply

According to the recent survey conducted by the National Water Supply and Drainage Board, there are sufficient water resources in the Southern Province.

2) Power supply

There is a plan for one hydro-electric power station with a capacity of 49 MW to be built in the Southern Province before 2005.

1-3-3 Future zoning of the coastal area

Through examination of the potential of the coastal area, it is judged better that development be carried out considering the locational advantage of Galle on world shipping routes. Therefore, the development of the port will play the most important role in regional development. Zones D and E are port development zones. Concerning development of other zones, there are several alternatives. They are shown in table 1-3-2.

Table 1-3-2

Alternative Plan of Zone

ZONE	PLAN - 1	PLAN - 2	PLAN - 3	REMARKS
A	Recreational area (Surfing etc.)	Reserved area for future development	Reserved area for future development	High Waves and Swells
B	Residence and sight-seeing	Reserved as it is (Sight-seeing only)	Residence and sight-seeing	Historical Structure
C	GALLE CITY	GALLE CITY	GALLE CITY	
D	Port (Fisheries Port)	Port (Fisheries Port)	Port (Fisheries Port)	
E	Port Industrial land area	Port Industrial land area	Port Industrial land area	There are some houses built on the land
F	Area with Natural Resources	Reserved Zone	Recreational Zone	Religious legends
G	Resort Area	Resort Area	Resort Area	Swimming Yachting Camping
H	Future Extension of Resort Area	Reserved as it is	Extension area of E.P.Z	-
I	Export Processing Zone	Export Processing Zone	Export Processing Zone	-

2 INDUSTRIAL DEVELOPMENT

2-1 General

The development policy of a developing country cannot be the same as any member of the Organization for Economic Cooperation and Development (OECD). The policies of industrial countries are highly individual and have been constructed over a long time.

The first aim of a developing country is to provide jobs for poor people and increase their incomes.

According to the " World Development Report 1990 ", low- and middle-income economies and poor people are defined as follows:

- * low-income economy ----- GNP per capita is not exceeding 545 US\$ 1988
- * middle-income economy --- GNP per capita is less than 6,000 US\$ 1988
- * poor people ----- income is less than 370 US\$ 1985

In the case of Sri Lanka, GNP per capita in 1985 and 1988 were 380 US\$ and 420 US\$ each. Two facts are recognized as follows:

- * Sri Lanka belongs to low-income economies.
- * At least half of the nation's people are considered as being poor.

In this chapter, the present economic activity is evaluated firstly then the industrial developing plan is mentioned.

2-1-1 Industrialization in Developing Countries

Industrialization in the world started in Britain around the middle of the 18th century in what is known as the industrial revolution. At this time, agricultural productivity had increased incomes and the domestic market had expanded. A number of labourers had left the farms and they had to purchase food at the market. Generally output from the farms should be increasing enough to feed city people. Domestic & foreign trade increased owing to the lively economic activity, and also, innovations in production were accelerated by the expansion of demand.

Industrialization from about 1820 to 1870 centered on the production

of steel, railways and steamships. Freight costs dropped by big and reliable ships, and so Europe, the United States of America (USA), Argentina and Australia were linked by foreign trade in industrial products, agricultural products, and natural resources.

Between two world wars, the world's worst-ever economic slump occurred. Several countries that previously had been suppliers of primary products adopted an industrializing strategy. In this case, industry meant an import-substituted industry.

In the postwar period, three patterns of development appeared:

- * First, the appearance of a nonmarket alternative to industrialization in Eastern Europe and elsewhere;
- * Second, decolonization in Asia, Africa, and the Caribbean;
- * Third, the rise of multinational corporations.

In this report, the strategies of the newly independent countries comprise its most interesting theme. Finally, it is clear that export oriented industries are the most strategic industries. But many of the newly independent countries pursued an import substitution strategy. Production usually required imported intermediate and capital goods, and so continuous industrial growth depended on the exports to provide the necessary external earnings. It was very difficult for them to make the transition, but the Newly Industrializing Economies (NIES) sustained their industrial growth.

In case of the NIES, they made an early transition to export expansion. The large consumption rate of the USA played an important part in their trade. According to Table 2-1-1, the economic balances of NIES, the Association of South-East Asian Nations (ASEAN) and JAPAN are clearly influenced by the demand from the USA. The internal markets of these countries do not have enough capacity to absorb their own products.

The other important theme for the development of industry is the necessity of the development of agriculture. Agricultural innovations contribute to the development of industry in several ways as follows:

- * New entrants to the labour force can be employed by the industrial

sector.

- * Improving farm productivity can supply food to labourers without large imports of food.
- * Rising agricultural productivity increases the amount of agricultural raw materials.
- * An increase in agricultural exports adds to external earnings.
- * An increase in farm income means afford to establish funds to be invested in industry.

Table 2-1-1 Trade ratios of NIES (1987)

(unit:%)

		imports									
		NIES	KOREA	TAIWAN	HONG KONG	SINGAPORE	ASEAN	CHINA	USA	JAPAN	EC
e x p o r t s	NIES	9.5	1.3	1.6	4.6	2.0	6.2	6.8	35.1	11.5	13.9
	KOREA	7.8	-	1.2	4.7	2.0	2.2	0.0	39.7	17.8	14.0
	TAIWAN	11.4	1.2	-	7.7	2.5	3.0	0.0	44.2	12.9	13.0
	HONG KONG	8.6	2.6	3.2	-	2.7	3.4	23.3	27.8	5.1	15.8
	SINGAPORE	10.5	1.6	2.5	6.4	-	23.8	2.5	24.4	8.9	12.1
	ASEAN	20.7	3.6	2.5	3.3	11.4	4.0	2.0	20.3	25.8	14.2
	CHINA	38.2	0.0	0.0	34.9	3.4	2.5	-	7.7	16.8	9.8
	USA	9.1	3.3	2.7	1.6	1.6	2.2	1.3	-	11.1	24.1
	JAPAN	17.2	5.8	4.9	3.9	2.6	4.2	3.6	36.5	-	16.4

SOURCE: IMF, International Financial Statistics.

Figure 2-1-1 consists of a flow chart showing the "Developing Steps of Industrialization". The chart suggests that an industrialized country eventually moves from a society that is "self-sufficient" to one that is based on "service & finance". It is very clear that the severest problem for developing countries is in determining how to increase their external earnings.

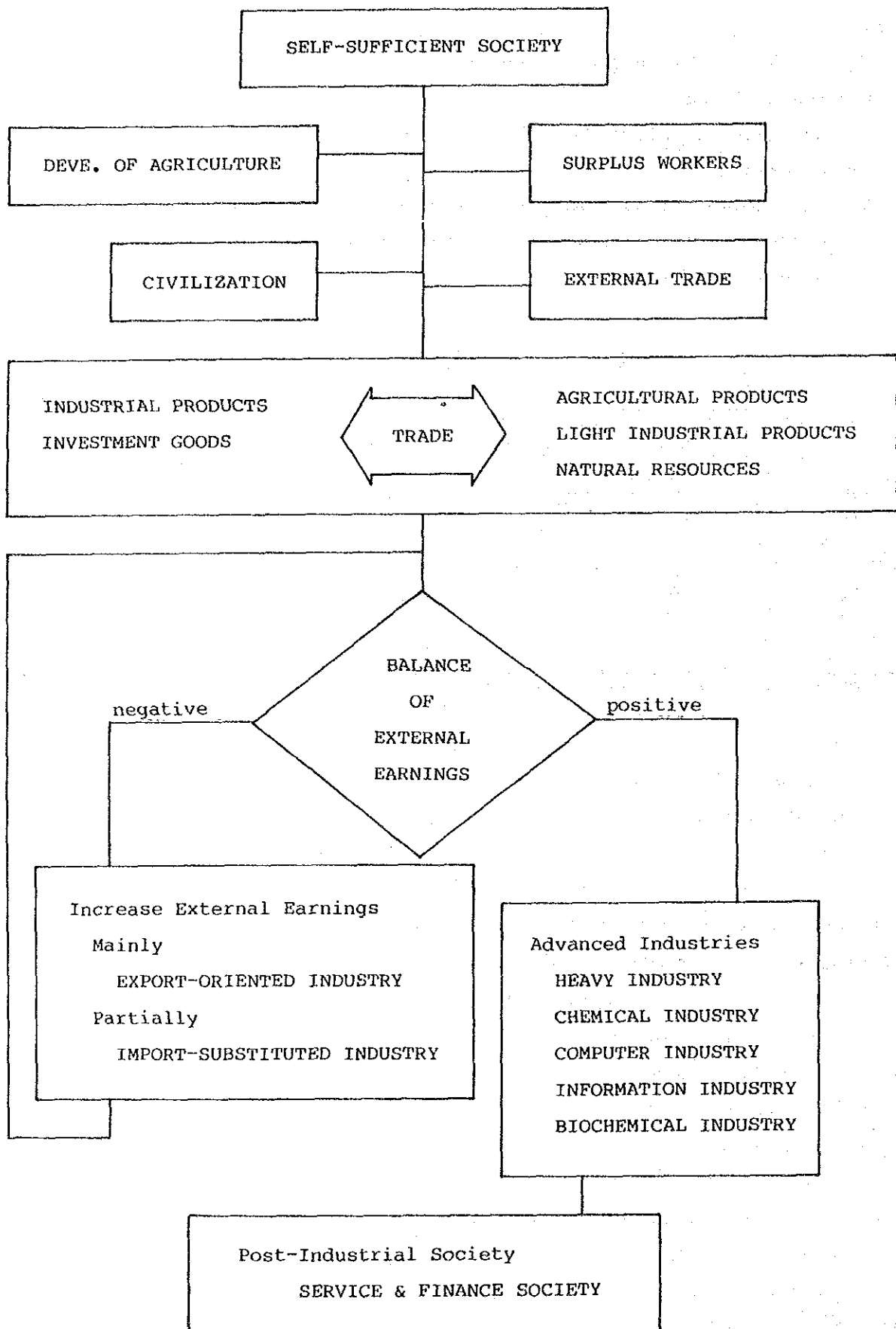


Figure 2-1-1 Developing Steps of Industrialization

2-1-2 Characteristics in Sri Lanka

Sri Lanka is situated to the south of India in the tropics. The weather is suited to agricultural production. The growth rates of Sri Lankan national products reveal how the character of its economy is changing. According to Table 2-1-3, agricultural and manufacturing products are the major and basic industries in Sri Lanka. And, the growth rate of manufacturing (including textile) is undoubtedly leading to a growth in GDP. A concentrated investment in manufacturing has been a valuable contribution to the nation's economy.

On the other hand, marketing research should be done to analyze the needs of markets and consumers. Where are the markets? Who are consumers? Which products can be exported to countries of the South Asian Association of Regional Cooperation (SAARC)?

SAARC countries represent the most attractive market for Sri Lanka, because most of the billion people who live in this region suffer from shortages of many goods. Imported goods by SAARC countries are listed in Table 2-1-4. The trading situation of SAARC countries is shown in Table 2-1-5. The ratios of internal trades of SAARC countries are less than 7.8% (minimum ratio in NIES on Table 2-1-1).

As the back-up industry to the development of manufacturing, agriculture should be rising constantly. But, the annual growth rate of agriculture in the past seven years has been unstable according to Table 2-1-2.

Table 2-1-2 Annual Growth Rate of Agriculture at Constant(1982)
Factor Cost Prices

year	1983	1984	1985	1986	1987	1988	1989
rate	5.3	-0.4	8.6	2.6	-5.8	2.1	-1.1

Table 2-1-3 Basic Economic Indicators at Current Factor Cost Prices

	1983	1989
National product	Rs.Mn.	Rs.Mn.
Agriculture	32,180 (26,212)	59,388 (27,666)
Mining & quarrying	2,799 (2,413)	6,157 (3,576)
Manufacturing	15,958 (13,710)	34,941 (20,488)
Construction	9,807 (8,039)	17,332 (8,514)
Water & energy	1,428 (n.a.)	2,788 (1,526)
Transport & storage	12,554 (n.a.)	23,109 (13,883)
Wholesale & retail trade	21,759 (20,738)	46,625 (25,588)
Banking & insurance	2,281 (4,130)	10,496 (6,168)
Ownership of dwellings	3,696 (n.a.)	5,850 (3,650)
Public admn. & defense	4,100 (3,786)	13,039 (6,140)
Services (n.e.s.)	5,414 (4,590)	8,648 (4,530)
GDP	111,976 (99,375)	228,373 (121,729)
Sectoral growth rates	%	%
Agriculture	n.a.(5.3)	n.a.(-1.1)
Mining & quarrying	n.a.(7.8)	n.a.(5.4)
Manufacturing	n.a.(0.8)	n.a.(4.4)
Construction	n.a.(1.0)	n.a.(0.6)
Services (n.e.s.)	n.a.(6.8)	n.a.(3.2)
GDP	20.2 (5.0)	12.2 (2.3)
Trade	Rs.Mn.	Rs.Mn.
Imports	45,558	80,225
Exports	25,096	56,175
Tea	8,295	13,663
Rubber	2,852	3,112
Coconut	1,921	2,864
Garments & textiles	4,738	17,631
Petroleum	2,682	2,241
Other industrial exports	1,401	8,596

Source: Central Bank of Sri Lanka Annual Report

Public Investment 1989-1993

Note:() means data at Constant(1982) Factor Cost Prices

Table 2-1-4 Imports by Commodity Groups

Commodity	India Mn.Rs. 1985-86	Pakistan Mn.Rs. 1987-88	Bangladesh Mn.taka 1987-88	Sri Lanka Mn.US\$ 1986	Nepal Mn.US\$ 1985
Food and live animals chiefly for food	8,780	7,670	18,247	308	48
Beverage and tobacco	36	36	305	7	3
Crude materials, inedible except fuels	15,023	8,141	5,360	37	13
Minerals, fuels, lubricants and related materials	52,130	18,057	13,091	230	51
Animal and vegetable oils, fats and waxes	7,701	8,977	6,395	8	7
Chemicals and related products n.e.c.	28,728	17,612	7,827	203	59
Manufactured goods classified chiefly by material	37,811	13,914	22,152	530	146
Machinery and transport equipment	40,839	32,869	14,844	415	86
Miscellaneous manufactured articles	5,009	3,768	3,073	87	24
Commodities and transaction not classified	519	334	294	2	-
Total	(21,877) 196,576	(7,749) 111,381	(3,173) 91,588	(2,242) 1,831	(663) 442

SOURCE: Statistical Yearbook of Bangladesh 1989
 Statistical Yearbook 1989 of Pakistan
 Yearbook of International Trade Statistics 1987
 Sri Lanka Socio-Economic Data 1990

NOTE: () means values of imports 1989: Millions of US dollars

Table 2-1-5 Direction of Imports of SAARC Countries

country	India	Pakistan	Bangladesh	Sri Lanka	Nepal	Maldives	Bhutan	(a) Sub Total	(b) Grand Total	(a)/(b) Percentage
India (Mn.Rs) 1985-86		265	158	80	476	n.a.	n.a.	979	196,576	0.5
Pakistan (Mn.Rs) 1987-88	340	-	856	833	20	-	11	2,093	111,381	1.9
Bangladesh (Mn.taka) 1987-88	4,106	2,400	-	297	-	-	-	6,803	91,588	7.4
Sri Lank (Mn.Rs) 1987	2,459	1,373	6	-	89	159	n.a.	4,086	60,528	6.8

SOURCE: Statistical Yearbook 1989 of Pakistan
 Statistical Yearbook Bangladesh 1989
 CENTRAL BANK OF SRI LANKA ANNUAL REPORT 1989
 Statistical Abstract INDIA 1987

The average annual growth rate in agriculture during 1982-1989 was 1.6 %. In connection with economic growth, average growth rates of GDP and industry during 1982-1989 were reported as 3.7 % and 6.0 %. Both rates are more than twice the agricultural rate.

The distribution of agricultural machinery and proper fertilization should be promoted in farms area by public policy. In particular, the southwestern part of Sri Lanka is in the wet zone, and so 30 % of the Southern Province's GDP came from agriculture in 1982. Undoubtedly, the two above-mentioned policies will result in a larger rate of agricultural growth.

The following tables list available employment data from 1953 onwards. From these data, it is clear that there is a surplus of labour which could be employed by public and private investors.

Table 2-1-6 Labour Force Estimates

	1953	1963	1971	1981
Male	2,269,000	2,742,000	3,312,000	3,767,000
Female	724,000	722,000	1,176,000	1,248,000
Total	2,993,000	3,464,000	4,488,000	5,015,000

Table 2-1-7 Employment Estimates

	1953	1963	1971	1981
Male	2,269,000	2,543,000	2,838,000	3,268,000
Female	724,000	657,000	811,000	851,000
Total	2,993,000	3,200,000	3,649,000	4,119,000

Table 2-1-8 Unemployment Calculated

	1953	1963	1971	1981
Male	000	199,000	474,000	499,000
Female	000	65,000	365,000	397,000
Total	000	264,000	839,000	896,000

Table 2-1-9 Distribution of Employed Population by Industry Sectors

	1953	1963	1971	1981
Agriculture, hunting, forestry & fishing	52.9	52.6	50.1	45.2
Mining and quarrying	0.5	0.3	0.4	0.9
Manufacturing	9.7	9.2	9.3	10.1
Elec., gas and water	0.1	0.2	0.3	0.4
Construction	1.9	2.7	2.2	3.9
Wholesale and retail trade	9.4	10.9	9.4	10.5
Transport, storage & communi.	3.5	4.3	4.9	4.8
Finance, insurance, real estate and business servi.	2.2	0.5	0.7	1.1
Community, social and personal services	13.2	13.8	13.5	14.5
Activities not described	6.6	5.5	8.6	9.4

Unit: percent

Table 2-1-10 Migration for Employment Purposes to All Countries 1981

	Male	Female	Total
High level	1,725	265	1,990
Middle level	3,080	280	3,360
Skilled	10,960	240	11,200
Unskilled	7,400	24,500	31,900
Not classified	4,100	4,800	8,900
Total	27,265	30,085	57,350

Source: Table 2-1-6, 2-1-7, 2-1-9, 2-1-10-----

Employment and the labour market in Sri Lanka Aug. 1987

According to Table 2-1-10, there are large numbers of people working outside Sri Lanka who could be induced to return for domestic employment as skilled or unskilled labour.

From the point of view of government policy, Sri Lanka's 1977 trade liberalization represents the most remarkable trade reform. The government hoped to reintegrate Sri Lanka into the world economy after more than a decade and a half of heavy protectionism. It replaced most of the quantitative restrictions with tariffs. And repatriation of profits was allowed in order to encourage direct investment from private foreign sources. As a result, GDP growth averaged 5.2 % a year from 1978 to 1985, against 3.8 % from 1970 to 1977. But the program's initial successes were beginning to wane because of poor macro-economic management and deteriorating external conditions by 1980. The government made efforts to get back onto the path of trade policy reform in late 1984. Indeed, current trade policy is continuing along these lines as well.

2-1-3 Future Trends in Sri Lanka and the Southern Province

In respect to " Public Investment 1990-1994 ", the public investment program concentrates basically on the timely completion of ongoing projects in priority areas such as power, irrigation, road rehabilitation, water supply and telecommunications.

As for the agricultural sector, the major goals are:

- * moving towards a higher degree of self-reliance in basic food commodities, viz. rice, fish, sugar, pulses and milk;
- * increasing the productivity of the tree crop sector to expand export earnings;
- * promoting diversification and encouraging the establishment of agricultural-industries and increasing incomes and employment opportunities in the rural areas.

The new strategy of industrialization aims at accelerating export oriented industrial growth, and doubling the rate of export growth of industrial products, which has been around 6 percent per year during the last five years. The real growth rate of the manufacturing industry has been projected at 8 percent for 1990, 12 percent for 1991 and 13 percent for 1992. Growth in the value of the output in the public sector will continue to be negative at around 2 percent annually during 1991-1992. The increase in output is expected to come from the private sector.

To complete future industrialization, profitable enterprises must be established and then their economic activities must be expanded. Firstly, industries that can be located adjacent to the port are considered based on three types of selections as shown in Table 2-1-11.

1st selection: Condition of location

Industries to be located in the coastal area are listed in the table. The establishment of a large-scale power plant and heavy industries like steel and iron works and a chemical complex are not appropriate for this coastal area because of environmental or economical factors. In table 2-1-11, an industry which is underlined is liable for this area.

2nd selection: Trend of market

There are advantages in situating the assembling or processing industries for goods destined for SAARC countries in the coastal area in Galle, because Galle is on the international ship route. Principal imported goods of each country are listed. Jewel and foodstuffs are recommended industries. Also, consumer goods should be produced in the Southern Province if raw materials are at hand or can easily be provided.

3rd selection: Possibility of investment

The investment shall be finally decided after checking raw materials available in the Southern Province, levels of production technology and skilled labour, infrastructure and government policy. At the same time a verification of the basic estimation regarding industries and resources should be executed by using Table 2-1-12.

Table 2-1-11 Selecting Type of Size of Industries to be Located

1st selection - Condition of Location	
Industries to be located in the coastal area	
Mass-product industry	--- <u>cement, steel & iron,</u> <u>chemical complex (petrol, fertilizer),</u> <u>food (grain, wheat)</u>
Fishery-applied industry	--- <u>canning</u>
Coastal area applied industry	--- shipbuilding, large-scale power plant
Port applied industry	--- <u>assembling or processing industry</u> <u>E.P.Z.</u>
2nd selection - Trend of Market	
Imported goods of SAARC	
India	--- capital goods (elec. & non-elec. machinery, transport equip.) petroleum oil & lubricants <u>pearls, precious & semi-precious stones</u> iron & steel chemical elements & compounds <u>edible oils</u> non-ferrous metals plastic material, regenerated cellulose & artificial resins fertilizer
Pakistan	--- machinery (non-elec., elec. and transport equip.) petroleum & products chemicals <u>oil vegetables</u> iron, steel & manufactures thereof fertilizers paper, board & stationery <u>grains pulses & flour</u>
Bangladesh	--- <u>wheat</u> petroleum oil crude & products refined crude materials, inedible except fuel iron universals plates & sheets <u>vegetable oils refined</u> fabrics woven man-made fibre rice miscellaneous manufactured articles <u>cotton fabrics woven</u>

Consumer goods in the Southern Province

Construction goods	---	<u>cement</u> , steel, timber, brick
Living goods	---	cloth, electrical appliance, furniture, <u>food</u> sanitation, medicine, stationery
Agricultural goods	---	<u>fertilizer</u> , agricultural machine
Energy	---	<u>petroleum</u> , gas, electricity

3rd selection - Possibility of Investment

Check point

Available raw materials in the southern province	---	Agro (rubber, coconuts, animals, fruits) Minerals (kaolin, granite), Fish
Level of production technology		
Level of skilled labour		
Level of infrastructure		
Government policy		

Table 2-1-12 Industries and Resources

industry \ resource	energy consumption	technology	investment	market of raw material
labour intensive industry	low	low	low	near
primary materials industry	high	middle	high	near
softwear industry	low	high	low	distant
assembly industry	low	high	high	distant

2-2 Present Evaluation

2-2-1 EPZ

Many developing countries have adopted a policy of establishing Export Processing Zones (EPZ) at a relatively early stage in order to attract foreign capital and technology transfers even if domestic industries are still in a primary stage of development.

In this way, effective absorption of abundant labour forces can be achieved, foreign currency can be earned, technology transfer can be achieved, and so will regional development and organizing inter-linkage with domestic industries. When an EPZ is organized and managed well, it will result in the expected effects for the national economy moving into a further stage of development.

In 1974, an Irish Study Team suggested that the Government of Sri Lanka establish four EPZs. The proposed locations were Katunayake, Boosa, Pallekele and Trincomalee.

The Greater Colombo Economic Commission (GCEC) was founded in March 1978 for the purpose of promoting export-oriented economic growth. Annual data like employment and external earnings of the GCEC are listed on Table 2-2-1.

In July 1978, the foundation stone of Katunayake's first factory was laid, and production commenced in January 1979.

The location of the second EPZ was chosen as Biyagama instead of Boosa. In 1982, the GCEC commenced construction of a road. Biyagama EPZ will be fully occupied in 1992.

The Government of Sri Lanka has already decided that the third EPZ should be located in the Southern Province. Koggala is the preferred site for the third EPZ. The GCEC and the Asian Development Bank (ADB) are going to study the development of the Southern Province.

Table 2-2-1 Employment and External Earnings of the GCEC

year	no. of employees	external earnings Rs.Mn.(current)
1979	5,876	157
1980	10,536	529
1981	19,729	1,163
1982	24,726	1,653
1983	28,705	2,419
1984	32,725	3,537
1985	35,786	3,802
1986	45,047	5,356
1987	50,744	7,630
1988	54,726	9,546
1989	61,429	12,805

According to Table 2-2-1, the increasing trend of employment and external earnings of the GCEC is recognized.

Notable and outstanding enterprises are listed in Tables 2-2-3 and 2-2-4. In terms of products of labour-intensive industries, garments, textiles and shoes are the most advantageous, and as for products of high-technical industries, jewellery and computers are the most beneficial.

Table 2-2-2 Details of EPZ

	Katunayake	Biyagama
Date of Establishment (1st products)	1979	1986
Space (acres)	550	450 +71 (future)
No. of Employees	44000	12000
Factories	78 (occupied) 72 (operating) 6 (closed)	33 (occupied) 23 (operating) 60 (target)
Major Materials	cloth, yarn steel, leather diamonds fishing materials electric parts	thread chemical products ceramics(domestic) rubber(domestic)
Major Product	garments bolts & nuts hand tools electric goods	garments, towels photo albums toilet paper condoms, rubber gloves polished granite ceramic dolls ceramic dinner sets
Cargo	10 containers/day 250 containers/month	5-6 containers/day

Table 2-2-3: Notable Enterprises in Terms of External Earnings

b 1.A J ELECTRONICS PRIVATE LTD	k31.COLANDIUM (PRIVATE) LTD
k 2.A J MILTON LANKA LTD	o32.COLOMBO DRY DOCKS LTD
o 3.ABANS JUNGPOONG PVT LTD	33.COLOMBO KNITTING CO.LTD
4.ACTIVATED CARBON PROJECT	34.COMMERCIAL ENGINEERING LTD
b 5.AGIO TOBACCO PROC CO PVT LTD	35.COMMONWEALTH GARMENT LTD
o 6.AIR LANKA CATERING SERV. LTD	36.COMPUTER AUTOMATION INDIA LTD
o 7.AIR LANKA LTD	37.COMPUTER SOFTWARE PROJECT
b 8.ANSELL LANKA PVT LTD	k38.COSMOS MACKY IND LTD
k 9.ASIA LTD	39.DASA GROUP FOOTWEAR FAC LTD
10.ASSOCIATED MOTORWAYS LTD	k40.DAVIDOV (PRIVATE) LIMITED
k11.ATLAS GLOVE COLOMBO PVT LTD	k41.DIAL TEXTILES IND.LTD
k12.ATLAS GLOVES LTD	o42.DIANUS LANKA LTD
o13.BERGOUGNAN LANKA LTD	43.DIUNUWA COIR LTD
14.BHUTANI EXPORT PROJECT	44.DURAI PANEL LANKA LTD
15.BOLAND MARINE LTD	o45.EAST WEST RES. & DES. PVT LTD
k16.BONAVENTURE TEXTILES LANKA LTD	o46.ESKIMO FASHION KNITWEAR LTD
17.BOSEANG CEY-LATEX PVT LTD	k47.ESQUIRE GARMENTS LTD
b18.BRADBURY WILKINSON LANKA P LTD	48.FIBRETEX LTD
19.C & H LANKA PVT LTD	k49.FLORAL GREENS MFG PVT LTD
20.C & H LANKA (PRIVATE) LIMITED	50.FOWNES BROTHERS INC
k21.C N A LTD	b51.FREE LANKA GRANITE & M EXP LTD
b22.CARNIVAL WORLD KO-LANKA P LTD	b52.FRIEND COLOMBO MANUF.(PVT) LTD
23.CERAMIC DEVELOPMENT CORP LTD	o53.FRITZPICKLE (PVT) LTD
b24.CERAMIC WORLD PRIVATE LTD	b54.GARTEX IND. LANKA PVT LTD
o25.CEYLON FLORAL CREATIONS P LTD	k55.GENIUS LANKA (PVT) LTD
o26.CEYLON MID-WEST PRIVATE LTD	b56.GOLDEN LANKA (PVT) LTD
b27.CHINEX PRIVATE LTD	57.GUTHRIE INT PLANTATION SERVICE
28.CHUEN JING LTD	58.HARRIS CORP (BERMUDA) LTD
29.CITY OF JEWELLERY CRAFTSMAN	k59.INDUSTRIAL CLOTHING LTD
30.CITY SILK SYNTHETIC MILLS LTD	k60.INT COSMETIC ACCESSORIES LTD

o61. INTER FASHION CO LTD	b75. LANKA WORLD (PVT) LTD
62. INTERBIKE LANKA PVT LTD	k76. LAWS EUROTEx APPAREL (PVT) LTD
63. INTL COSMETIC APPLICATORS LTD	k77. LAWS GARMENTS KNITWEAR LTD
k64. ISABELLA PVT LTD	78. MACHINERY MANUFAC. CORP. LTD
k65. JEWELARTS EXPORTS LTD	k79. MANDARIN KNIT GARMENTS LTD
k66. JINADASA BROS. LAPIDARY LTD	80. MANF. OF ALL TYPE OF BAGS
o67. KABOOL TEXTILE CO LTD	81. MANF. OF LEATHER SHOES
o68. KANEKO LANKA MARINE PVT LTD	82. MANSEL GARMENTS LTD
69. KOLBUL SPINNING & TEX. CO LTD	83. MARK SAILS LTD
k70. KOR CEY FOOTWEAR MFG CO LTD	84. MEDISON PRIVATE LTD
k71. KUNDANMAL GARMENTS LTD	85. MEENA INTERNATIONAL INC
k72. LANKA HIQU LTD	86. MERCANTILE ENTERPRISES LTD
k73. LANKA METAL INDUSTRIES LTD	87. MFG OF ALL TYPES OF BAGS
74. LANKA MULTI MOULDS (PVT) LTD	88. MFG OF DIA. SHTUDED JEWELLARY

*A company is listed if it fits one of the following standards:

- (1) Its total investment is equal to or more than 100 Rs.Mn.
- (2) Its no. of employees is equal to or more than 500.
- (3) Its export capacity is equal to or more than 100 Rs.Mn.

*Basic data are reported in an appendix II-2-1.

*The meanings of the small characters are as follows:

b: situated in the Biyagama EPZ

t: situated in the Katunayate EPZ

o: situated outside EPZ

non: out of the purview of the GCEC at the end of February 1990

Table 2-2-4 Outstanding Enterprises

No	Value of Investment Rs. Mn.	No. of Employment	Export Earnings Rs. Mn.	Exp. Earn. per Investment	Exp. Earn. per Employee
1	o 7--1,611 Airline	69--3,126 Textile	o 7--2,485 Airline	82--60.25 Garments	88--21.30 Jewel
2	o32--1,015 Heavy Ind	o67--3,126 Textile	88--2,280 Jewel	83--54.97 -----	b 8-- 2.43 ChemiRub
3	69-- 897 Textile	k77--3,056 Garments	69--1,612 Textile	o42--28.88 Jewel	86-- 2.30 -----
4	o67-- 857 Textile	19--2,430 -----	o67--1,612 Textile	36--23.39 Computer	4-- 2.22 Carbon
5	b 8-- 857 ChemiRub	o61--2,104 Garments	b 8--1,520 ChemiRub	k21--17.94 -----	o42-- 1.92 Jewel
6	57-- 453 Plantation	33--2,053 Textile	o42--1,032 Jewel	k59--17.93 Garments	k40-- 1.89 Jewel
7	58-- 404 -----	o 7--2,025 Airline	58-- 975 -----	k66--16.21 Jewel	37-- 1.88 Computer
8	88-- 308 Jewel	k16--1,965 Textile	k77-- 526 Garments	k65--14.09 Jewel	81-- 1.84 Shoes
9	19-- 211 -----	58--1,851 -----	61-- 405 Garments	37--12.97 Computer	83-- 1.51 -----
10	o68-- 188 Pearl	57--1,651 Plantation	o32-- 396 Heavy Ind	84--12.03 -----	74-- 1.26 Mould

* The first no. in the datum zone means the no. of company listed in Table 2-2-3

* Kind of industry or product is added in the datum zone

2-2-2 Factories in the Southern Province

Major factories close to the Port of Galle are the cement factory within the city limits, the plywood factory at Gintota just outside the city and the timber mill at Boosa about 3 miles away.

In addition there are some privately owned smaller factories close to the Port of Galle: an agricultural tool factory at Katugoda, a garment factory and some coconut fibre mills.

A fertilizer complex is in operation at Weligama in Matara District.

(1) Fertilizer

The National Fertilizer Secretariat (NFS) controls the nationwide supply and distribution of fertilizer.

The Regional Fertilizer Warehouse Complex belongs to the Ceylon Fertilizer Corporation (CFC) and obtains its quota from the NFS. Several types of fertilizer and raw materials brought to the Complex are mixed in a plant according to various specifications. After mixing they are packed in various-sized bags.

The fertilizer industry has a weak point in terms of timely transportation from Colombo to the Southern Province.

Table 2-2-5 Issues of Fertilizer by Wholesalers 1988-1989

sector	quantity(ton)		share(%)	
	1988	1989	1988	1989
Ceylon Fertilizer Corporation	217,106	232,574	41	46
Janatha Estates Development Board	125,632	105,325	24	21
Colombo Commercial Co. (Fertilizer) Ltd	82,060	82,912	16	16
A.Baur & Co.Ltd	66,476	57,051	13	11
Others	33,896	28,016	06	06
Total	525,170	505,878	100	100

Source: Central bank of Sri Lanka annual report 1989

Table 2-2-6 Weligama Fertilizer Complex

Establishment (by Germany)	4.2 million rupees grant	
Land area	13 acres	
existing (future) plant	8 acres (4 acres)	
housing	1 acre	
Capacity		
mixing	30,000 ton/year	
warehouse	12,000 ton	
max. (mean) storage duration	4 years (4 months)	
No. of employees	370	
permanent / temporary	120 / 250	
Raw materials		
kinds of raw materials	10	
imported material	95 % of whole	
(from Iraq, Germany, Egypt, Singapore, USSR, Japan, etc.)		
domestic material	5 % of whole	
(from Eppawala)		
Transportation from Colombo by bag		
railway (cost: 140 Rs/ton)	60%	
lorry (cost: 300 Rs/ton)	40%	
Customer		
no. of factories	144	
mainly situated in 3 districts in the Southern Province		
no. of crops	50	
Price of Fertilizer		
CFC at Weligama	280	Rs/bag
Pvt. Company in the Southern Province	360	Rs/bag

(2) Cement

The consumption of cement in Sri Lanka is about 1.0 million tons per year. Recently, demand has been increasing because big projects like the Mahaweli Project or the Million Houses Programme, are now in progress. But, supply is not successful owing to Sri Lanka's civil disturbances and the shortage of clinker.

There are several cement suppliers in Sri Lanka. The Sri Lanka Cement Corporation (C.C.) is the main producer of cement, and has three plants. These are situated at Jaffna, Puttalam, and Galle.

Lanka Cement at Jaffna has plenty of production capacity but the factory is now closed.

The Tokyo Cement Company commenced operations in September 1984 in Trincomalee.

Table 2-2-7 Capacity of Cement Suppliers

Factory	Operation	Capacity(tons/month)
C.C. KKS (Jaffna)	closure	12,000 t/m
C.C. Galle	work	20,000 t/m (imported clinker)
C.C. Puttalam	work	35,000 t/m
Lanka Cement	closure	30,000 t/m
Tokyo Cement	work	16,000 t/m (imported clinker)

If all factories produce cement at full power, the total production volume is approximately 1.3 million tons per year, which is almost equal to the total demand of Sri Lanka. The resulting shortage is imported in the form of finished products. The product volume of the cement factory at Galle is sufficient for the consumption of the Southern Province in the first half of the 90s.

Table 2-2-8 Detail of C.C. Galle Factory

Establishment	1967	by USSR
Capacity	20,000	tons/month
Land area	42 acres	
No. of employees	318	
Raw material	Imported Clinker from Malaysia, Indonesia, Pakistan, Middle East, Japan etc.	
Storage capacity	open yard	25,000 tons
	house	20,000 tons
Electricity consumption	30 KW/ton	
Silos for products	4 x 2200 tons	
Packing		
style	50kg - bag	
efficiency	30 packs/min.	

(3) Plywood

The State Plywood Corporation produced 1,208,000 sq. meters of plywood in 1988. Plywood is used for making chests, desk, tea box, door, etc. Soft wood like rubber trees is abundant in Sri Lanka, but hard wood is scarce and must be imported. So, building a house with timber is not popular, and making furniture using imported materials is expensive. Therefore, wood-based industries are not successful in Sri Lanka. The plywood factory at Gintota was halting its operations at the time of the survey, and looking for a foreign investor.

2-2-3 Factories in Other Provinces

(1) Flour

The recent consumption of flour in Sri Lanka is as follows:

Table 2-2-9 Consumption of Flour

year	Southern Province	Sri Lanka
1980	20,284 tons	377,971 tons
1983	36,720	422,949
1986	41,474	462,617
1989	51,926	569,141

Flour is imported to Trincomalee as wheat by Prima (foreign investor), and it is ground at the flour mill. Prima's present capacity is as follows:

Milling (wheat)	2,200 tons/day
Storage (silo)	120,000 tons
Present Production	45,000 tons/month

The increasing trend of consumption will continue, and overall consumption will exceed the present production capacity soon.

Some foreign enterprises are now studying the feasibility of promoting a flour mill at the Port of Galle. In this case, the targeted market is not domestic. It may be the Middle-East Asia or the South Asia. It seems very feasible for a flour company to establish a factory at the Port of Galle.

(2) Petroleum

Generally, crude oil is imported from Iran to the port of Colombo. After refining, oil products are delivered to each province. From Colombo to Galle it is transported by railway.

The oil storage capacities in the Southern Province are as follows:

at Galle	1200	tons
at Matara	500-600	tons

(3) Steel

The Ceylon Steel Corporation was set up with assistance from the USSR. Production commenced in 1967.

The Rolling Mill has a production capacity of 90,000 tons per year. Production at present is about 40,000 tons per year. Billets are imported from other countries, and round iron, flat iron, etc., are produced from these billets. Importing scrap iron from outside and producing billets here are not economical by reason of the small scale of production.

The electric arc furnace, which can make billets from scrap iron, is now shut down because it is cheaper to import billets from abroad than to produce them here. The furnace has a 25-ton capacity and it can produce 60,000 tons of billets per year.

The first drawback in terms of starting a steel plant in Galle is the low demand. National demand at present is only 100,000 tons. A small plant will not be economical. To be economical it has to have a capacity of at least 250,000 tons per year.

2-2-4 Evaluation

Industries should be evaluated from two points of views. One is the capacity of employment to contribute to a decline in the unemployment rate. A severe problem occurred when people returned in a mass from the Gulf. The other is the volume of external earnings being generated. The trade balance of Sri Lanka was at a deficit of 542 SDR millions in 1989.

The basic trend of Sri Lanka's economy is shown in Table 2-2-10, and it can be seen that the GCEC's members play a leading role in the nation's economy.

Table 2-2-11 indicates the conditions of the factories to be studied. In this table the contribution of each factory can be clearly seen.

Table 2-2-10 Per Capita External Earnings

		employment	external earnings Rs.Mn. (current)	per capita external earnings Rs.
Agriculture	1981	1,863,000	10,751	5,770
	1985	2,430,000	19,026	7,829
	1989	n.a.	22,049	n.a.
GCEC	1981	19,729	1,163	58,948
	1985	35,786	3,802	106,242
	1989	61,429	12,805	208,452
Migrant	1981	57,350	4,429	77,227

Source: Central bank of Sri Lanka annual report

Census

Labour force and socioeconomic survey 1985/86 Sri Lanka-

Preliminary Report

Table 2-2-11 Contribution to National Economy by Industry

Factory year (place)	Item	No. of employees	external earnings Rs.Mn. (current)	annual products capacity ,000 tons	contribution to national economy
Fertilizer 1990 (Weligama)		370	non	40	high
Cement 1990 (Galle)		318	non	200	high
Plywood 1990 (Gintota)		1050	n.a.	n.a.	low
Flour 1990 (Trincomalee)		n.a.	n.a.	700	high
Petroleum 1985		5,842	3,887	n.a.	high
Steel 1990		n.a.	non	90	middle
EPZ 1989		61,429	12,805	n.a.	high

Source: Interviews

2-3 Future Development Plan

2-3-1 Proposition of the Type of Industry to be located

According to the selecting policy mentioned in paragraph 2-1-3 and the recognition of the present evaluation in section 2-2, several industries to be located at the coastal area adjacent to the port are proposed, for example those listed in Table 2-3-1.

Table 2-3-1 Types of the Proposed Industries to be Located in the Industrial Zone

Factory	Base of establishment
Flour Mill	Flour is a major import of SAARC
Petroleum Tank Yard	Augmentation of supply of petroleum products for the Southern Province
Fertilizer Plant	Augmentation of supply of fertilizer for the Southern Province
Energy Center	Improvement of electric and steam supplies by thermal power
Agricultural Factory	Proposed products are canned fishery and fruit-products and the major imports of SAARC like edible oils
Inland Container Depot	Effectiveness of access between container terminal and inland customers
Future Industrial Zone	Advanced industries shall be attracted

2-3-2 EPZ

It is proposed that the third EPZ in Sri Lanka is located at Koggala. Koggala is situated about 10km east of Galle. The outline of the planned EPZ is shown in Table 2-3-2.

Table 2-3-2 Outline of Koggala EPZ

Area	246	acres
No. of Employees	20,000	(direct)
	15,000	(indirect)
No. of factory	50	
Cargo volume	1997	75 containers/month
	2002	150 containers/month
	2005	200 containers/month

Outstanding enterprises in the existing EPZs are listed in Table 2-2-4. According to Table 2-2-4, from the view point of cost-performance, production of garments, jewel, computers, chemical rubber, carbon, shoes and moulds are preferable. And so from the view point of employment efficiency, production of textiles and garments are the most valuable industry. Cargo volume is estimated by data of existing EPZs.

2-3-3 Industrial Zone

The proposed area for industrial development is to the east of the town and adjacent to the cement factory on the Galle-Matara road. The reasons for selecting this area as an industrial zone are as follows:

- * The proposed industrial zone is located in an advantageously accessible place to the proposed port.
- * Factories, which will be established in this area, can easily access the existing railway.
- * This area neighbours the Municipal Council, which is an ideal location for attracting and transporting inexpensive labour.

* An unused area of about 130 ha will be left for future industrial development with green belt zones. But a small population will have to be relocated.

Now, it is necessary to win the approval and assistance of the Low Lying Areas Reclamation and Development Board. Because in transforming this marshy land into developable property, certain technical requirements must be satisfied; for example, providing drainage for the accumulated water in the area.

Table 2-3-3 Estimated Plant Area in the Industrial Zone

Flour mill	16 ha
Petroleum tank yard	8 ha
Fertilizer plant	8 ha
Energy Center	20 ha
Agricultural factory	7 ha
Inland container depot	8 ha
Infrastructure	8 ha
Total	75 ha
Future industrial zone	55 ha

(1) Flour mill

The major SAARC countries imported a total of 4.7 million tons of flour in 1989 and 7.1 million tons in 1988.

If the flour mill established in Sri Lanka receives wheat as bulk cargo and ships flour, transportation costs for SAARC will be reduced sharply.

Table 2-3-4 Consumption of Flour in SAARC

	Products		Imports		Total	
	Mn.Ton		Mn.Ton		Mn.Ton	
	1988	1989	1988	1989	1988	1989
India	46.2	54.0	1.9	0.1	48.1	54.1
Pakistan	12.7	14.4	2.2	2.1	14.9	16.5
Bangladesh	1.0	1.1	2.4	1.7	3.4	2.8
Sri Lanka	-	-	0.6	0.8	0.6	0.8
Total	59.9	69.5	7.1	4.7	67.0	74.7

Production capacity at the flour mill will ultimately total 700,000 tons per year. Capacity will be added in three phases. No. of employees will roughly total 250.

Table 2-3-5 Trend of Production Capacity

Phase	newly established plant			total capacity
	place	year	capacity	
1st	inside of port	1997	100,000	100,000
2nd	industrial zone	2001	300,000	400,000
3rd	industrial zone	2005	300,000	700,000

(2) Petroleum tank yard

The consumption of petroleum in the southern province will increase in accordance with growth in GDP, establishment of EPZ and an industrial zone, and the development of the port of Galle. The volume of consumption is estimated about two hundred thousands (200,000) tons per year, and it includes supplies for bunkering and energy center.

The outline of future petroleum facilities planned by the Ceylon Petroleum Corporation (CPC) based on the development of the Port of Galle are as follows:

Table 2-3-6 Outline of Petroleum Tank Yard

Area	8 ha	
Tank		
Furnace Oil(heavy)	2x5000	ton
Marine Diesel	1x1000	ton
Gas Oil	2x1000	ton
Kerosene	2x1500	ton
Gasoline	2x 500	ton
Bunker Furnace(light)	1x1000	ton
LPG	2x 75	ton
Loading & Unloading Lines		
Bunkering	----	Gas Oil, Furnace, Marine Diesel
Receiving	----	Furnace, Kerosene, LPG
Handling Pump Capacity		
Heavy Oil	----	250 ton/hour
Light Oil	----	150 ton/hour

As there is not a large market for oil in Sri Lanka, nor is there an oil field, the construction of a new refinery at Galle is not desirable.

(3) Fertilizer

Fertilizer consumption shall increase correspondingly with the development of agriculture. Fertilizer will be imported from foreign countries. At a future stage, after improving inland transportation it will be possible to unload most of the imported fertilizer at the port of Galle as costs decline. But at the early stage, half of the demand in the Southern Province will be met by the Weligama complex of the State Fertilizer Corporation. And the remainder will be supplied by a mixing plant near the port. It is to be desired that the importers themselves would establish a joint mixing plant.

An area of about 8 ha, slightly larger than the Weligama complex, would be required.

(4) Energy center

Currently no power station is situated in the Southern Province. In the year 2002, one hydraulic power station is expected to be completed on Ging Gange with a capacity of 49 MW. But the ratio of hydraulic power to whole electric capacity is extremely high.

Thus, the necessity of a thermal power station near Galle, like Kelanitissa in Colombo, will increase annually.

Planned capacity of electric power should be 60 MW.

The generators should be able to use both oil and gas.

Estimated oil consumption is 50,000 tons per year.

Steam shall be supplied from an energy center to factories in this zone.

About 700 people will be employed.

(5) Agricultural factory

Several small agricultural factories will likely be located in this area. Namely, the sugar cane, fruit canning, fish canning and rubber-based-industry are expected to establish factories here.

Employment is expected to total 700.

(6) Cement factory

Holderbank Management & Consulting Ltd. in Switzerland has started a modernization strategy study on the cement industry in Sri Lanka with the assistance of the Sri Lanka Cement Corporation Technical Team. Details are not clear, but this cement plant will be surely rehabilitated.

Future production capacity is estimated at 300,000 ton per year.

Employment is estimated at 400.

(7) Inland container depot

The inland container depot is to be prepared somewhere in the hinterland, away from the container marine terminal. Generally, after importers have removed the goods, empty containers are returned to a container yard or a place designated by the shipping company in the port area. However, it is more convenient and saves transportation costs to return the empty containers to an inland depot instead of to a container marine terminal. For exporters in the hinterland, the logic is equally sound. In the case of the port of Colombo there are thirteen (13) inland container depots in the hinterland of the port. Using Colombo as a model case, an inland container depot typically requires 16 ha. As the space of the inland container depot is half of 16 ha, it will be prepared in this industrial zone.

(8) Future industrial zone

Depending on the theory of industrial management, if core industry has been developed, the focus will shift to developing upstream and downstream business to reduce costs. Chemical and assembling companies can be expected to promote this type of investment.

And so some businesses based on local raw materials will be established in this zone; for example, salt based and granite polishing companies. Also glass and metal companies are likely to expand existing operations here.

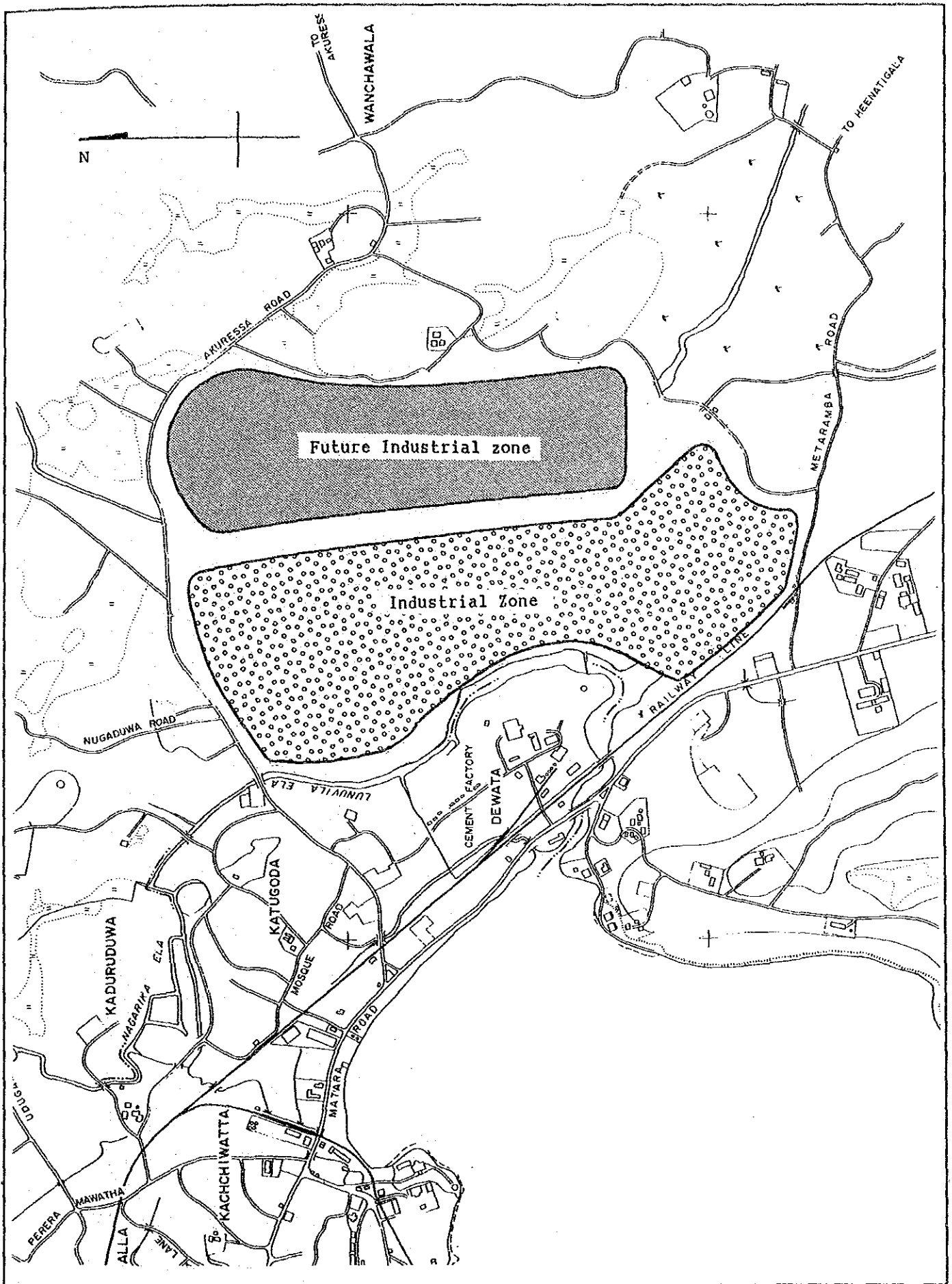


Figure 2-3-1 Zoning of Industrial Development Plan

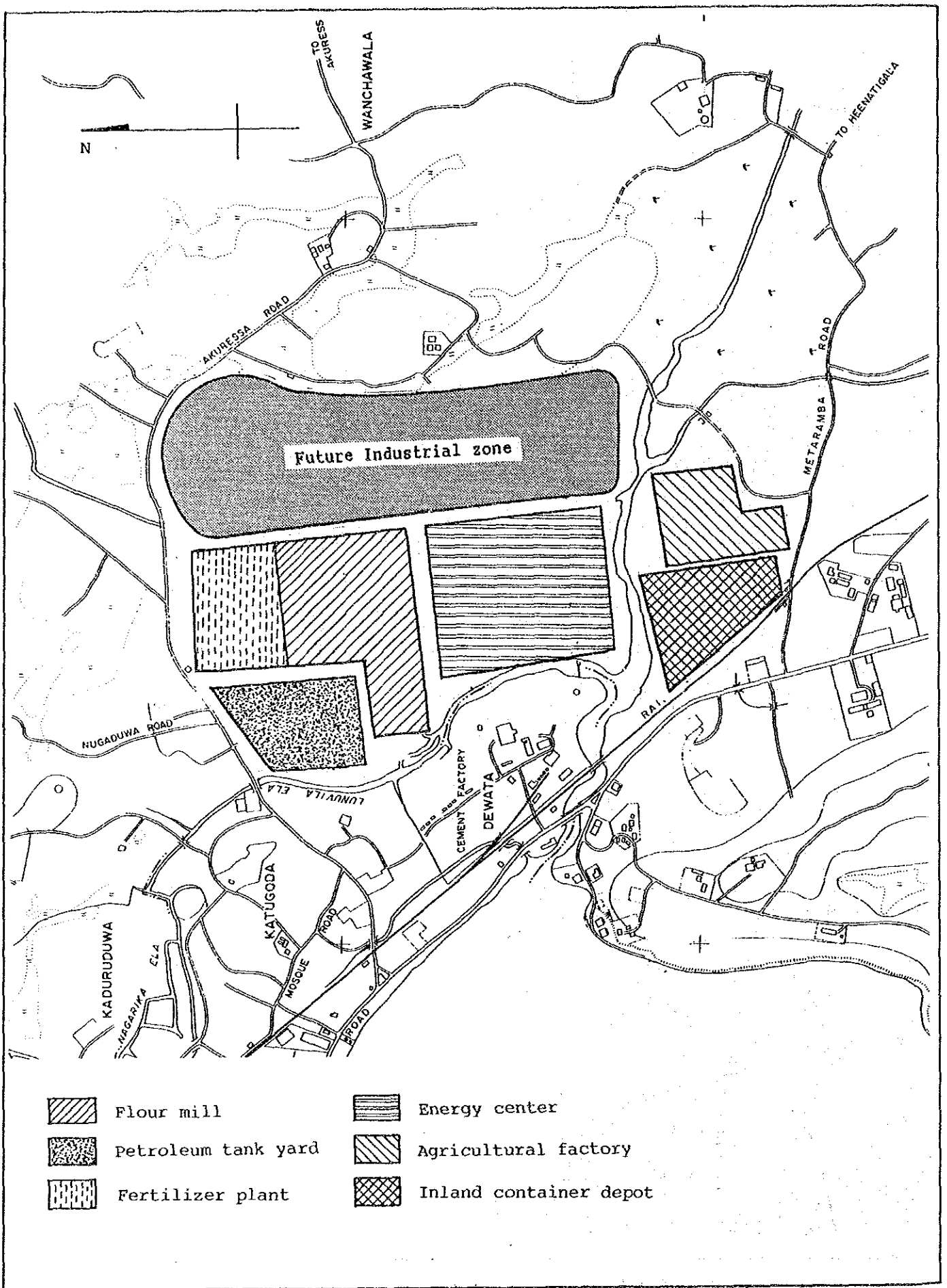


Figure 2-3-2 Plant Arrangement of Industrial Zone

2-4 Summary

As a result of the study on the potential of industrialization adjacent to the port of Galle, Sri Lanka's surplus of labour and low wages have not led to industrial development. Disadvantages against Sri Lanka's labour strengths were a lack of infrastructure and low domestic consumption. However, a container terminal is planned for construction, so future developments in the processing trade or transit trade can be expected. As the results of the study, employment and cargo volume by industrial activity are estimated in Table 2-4-1.

Table 2-4-1 Employment and Cargo Volume by Industrial Activity

	Employment (final)	Output (Input) Cargo	
		1997	2005
EPZ	20,000	(TEU / month) 75	200
Industrial zone		(,000 tons / year)	
Flour mill	250	100	700
Fertilizer	300	non	(65)
Petroleum tank yard	400	(60)	(200)
Energy center	700	ABOVE	ABOVE
Agricultural factory	700	50	300
Inland Container depot	150	n.a.	n.a.
Cement plant (rehabili.)	400	(200)	(300)
Sub total	2,900		
Future industrial zone	2,100		
Total	25,000		

Note: ABOVE means volume is already counted with above item.

The most important matter in industrialization is to raise product quality. If foreign investors recognize that Sri Lanka offers not only low wages but also the ability to ensure quality control, they will make every kind of plan for industrial development. Indeed, demand for Sri Lankan production could become so great that volume of orders could exceed the nation's overall capacity. At that time, a neighboring bay shall be the core of the infrastructure required for industrial development.

3 DEMAND FORECAST

To prepare the Masterplan up to the year of 2005 and to conduct a Feasibility Study of the Short-term Development Plan up to the year of 1997 of the Port of Galle, a "Demand Forecast" is carried out to determine the cargo volume handled at the Port of Galle in the target years. An analysis of the share and the shift of traffic from the Port of Colombo is to be included.

3-1 Future Socioeconomic Framework

Present socioeconomic situations in Sri Lanka and the Southern Province are described in Section 3 of Chapter 2 and Section 1 of Chapter 3 of Part I, respectively. In this Section, only the future socioeconomic frame, in particular population and GDP (value added), which are necessary to carry out the demand forecast, are to be covered.

3-1-1 Population

(1) Sri Lanka

A population projection can be carried out based on mortality and fertility rates and external migration. However, these elements are governed by many functions, for instance, human behaviour patterns, social, cultural and environmental factors, government policies and so on. Therefore, it is difficult to predict trends in these components of population growth.

In the report of "Census of Population and Housing 1981" issued by the Department of Census and Statistics, the future population was predicted. However, the estimation does not fit in with present conditions, as the growth rate is relatively high to the actualities. Further, no recent authorized data exists on population growth.

The Study Team, therefore, adopted annual growth rate of; 1.4% from 1990 to 1995, 1.35% from 1996 to 2000 and 1.3% from 2001 to 2005, in consideration of the particulars mentioned below:

- The average annual growth rate from 1980 to 1989 was 1.46%;
- The annual growth rate has been on a general decline for the past 40 years;
- The Government considers that the current level of fertility should come down by at least 20% by the year of 2001.

The future population in 1997, 2000 and 2005 can be calculated based on the growth rate adopted.

Table 3-1-1 Population in 1997, 2000 and 2005

(In thousands)

Year	1997	2000	2005
Population	18,765	19,535	20,838

(2) Southern Province

The prediction of future populations at the district level is more difficult than at the national level. Before deciding the annual growth rate of population in the Southern Province, the particulars mentioned below must be taken into consideration.

- 1) The average annual growth rate in the Southern Province from 1981 to 1989 was 1.35%, compared with 1.44% in Sri Lanka during the same period.
- 2) The assumption of the future average annual growth rates of population in Sri Lanka are as follows:
 - 1.4 % from 1990 to 1995;
 - 1.35% from 1996 to 2000;
 - 1.3 % from 2001 to 2005.
- 3) The annual growth rate of fertility in the Southern Province was almost the same as the nation, and the ratio of migration decrease (out of the Southern Province) to fertility increase (in the Southern Province) was rather large, at about one third, according to the Census 1981.

The magnitude of migration seems to gradually decrease according to the development of the Southern Province. The Study Team, therefore, adopted an annual growth rate of 1.3% from 1991 to 2005. The future population of the Southern Province in 1997, 2000 and 2005 can be calculated based on the above assumption.

Table 3-1-2 Future Population in the Southern Province
in 1997, 2000 and 2005

(in thousands)			
Year	1997	2000	2005
Population	2,326	2,418	2,579

3-1-2 Gross Domestic Product (GDP)

(1) Sri Lanka

The future annual growth rate of GDP was predicted in "Public Investment 1989-1993" published in 1989 and "1990-1994" in 1990 by the Department of National Planning, Ministry of Policy Planning & Implementation, as shown in Table 3-1-3. There is a considerable difference between the two predictions. The Government explains the reason it changed the value of the annual growth rate of GDP as follows:

- Investment was maintained at satisfactory levels even during the civil disturbances;
- Considerable under-utilized capacity exists in the economy;
- Except for the northern provinces, a state of peace is already a reality in the country.

Table 3-1-3 Annual Growth Rate of GDP
 Predicted by the Government (%)

Year	1990	1991	1992	1993	1994
1989-1993	3.0	3.0	4.0	4.5	---
1990-1994	5.0	5.2	5.5	5.5	5.6

However, the above projection was prepared before the onset of the Gulf Crisis in August 1990. It is clear that the Gulf Crisis has an important effect upon Sri Lanka's economy, such as:

- The rise in the price of crude oil and related oil products;
- A reduction in export earnings from tea; in 1989, on a volume basis about 55% of tea exports were shipped to the Middle East, with Iraq and Kuwait, accounting for 12%;
- Sharp drop in private remittances from migrant workers in these areas.

Taking such items into consideration, the Study Team estimated the annual growth rate of GDP of Sri Lanka as shown in Table 3-1-4. Moreover, GDP at 1982 constant prices in 1997, 2000 and 2005 are shown in Table 3-1-5.

Table 3-1-4 Future Annual Growth Rate of GDP (%)

Year	1990	1991	1992	1993	1994	>1995
Growth Rate	4.0	3.5	4.0	4.5	5.0	5.5

Table 3-1-5 Future GDP at 1982 Constant Prices

(Rs. Million)

Year	1997	2000	2005
GDP	175,576	206,168	269,453

The future sectoral GDP (value added) at 1982 constant prices in 1997, 2000, and 2005 is also estimated based on "Public Investment 1990-1994", and adjusted in consideration of the Gulf Crisis. They are shown in Table 3-1-6.

Table 3-1-6 Future Sectoral GDPs at 1982 Constant Prices

(Rs. Million)

Sector \ Year	1997	2000	2005
Plantation Agriculture	7,352	7,676	8,171
Non-Plantation Agriculture	26,833	29,613	34,580
Manufacturing/Construction	58,102	74,271	110,791
Services	83,289	94,608	115,911

(2) Southern Province

The future annual growth rate of the GDP of the Southern Province was predicted at 7.0% by the Marga Institute for planning purposes. However, this rate will be also affected by the Gulf Crisis. Taking that into consideration, the Study Team adopted the annual growth rate of the provincial GDP as shown in Table 3-1-7.

Table 3-1-7 Future Annual Growth Rate of the GDP
of the Southern Province (%)

Year	1990	1991	1992	1993	1994	>1995
Growth Rate	5.5	4.5	5.0	5.5	6.0	7.0

The data of the provincial GDP are not available except in 1982. So, the provincial GDP at 1982 constant prices in 1997, 2000 and 2005 is to be calculated on the assumption that the annual growth rate of the provincial GDP is the same as that of the national GDP during the period from 1982 to 1989. The estimates are shown in Table 3-1-8.

Table 3-1-8 Future Provincial GDP at 1982 Constant Prices
in 1997, 2000 and 2005

(Rs. Million)			
Year	1997	2000	2005
GDP	19,026	23,307	32,689

The share of the provincial GDP against the national GDP in 1997, 2000 and 2005 is 10.8%, 11.3% and 12.1%, respectively.

The sectoral GDPs of the Southern Province are not available.

3-2 Methodology of Demand Forecast

Flow Chart of the demand forecast is shown on Figure 3-2-1.

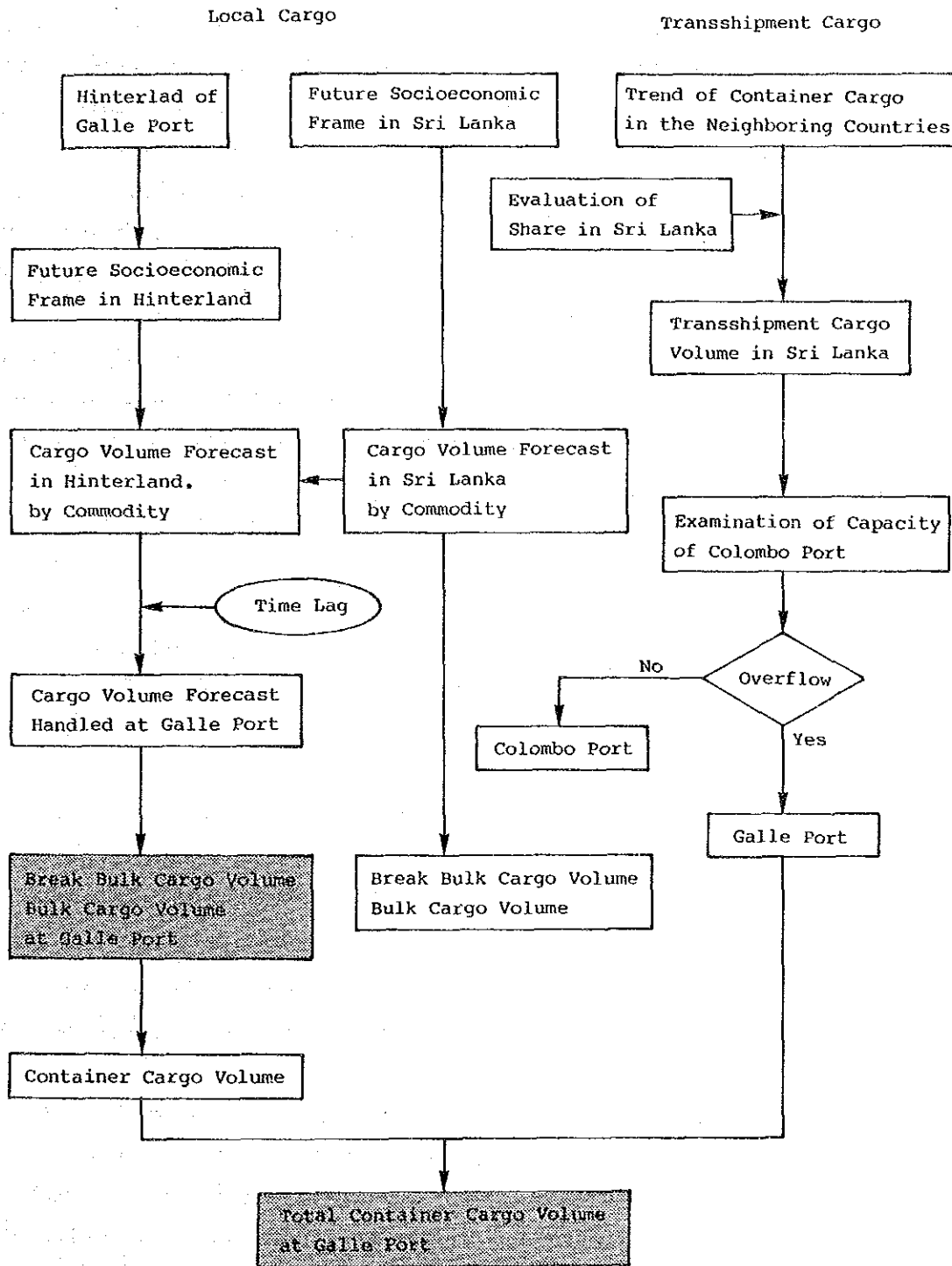


Figure 3-2-1 Flow Chart of Demand Forecast

(1) Import/Export Cargoes

Generally, two methods are used to forecast the cargo volume to be handled at ports.

The first method is to forecast the total volume as a whole by statistical correlation between the cargo volume and socioeconomic indices of the hinterland or of the nation, or by the time series analysis (hereinafter, this method is called the "total demand forecast").

The second method is a cumulative method, which forecasts the volume of each major commodity group individually based upon the forecast of supply and demand in the hinterland, or based upon analysis of the past cargo volume trend. It is necessary to consider the information about industries to be located in the hinterland. The total cargo volume is then forecast by a summation of the forecast volumes for each commodity (hereinafter, this method is called the "commoditywise demand forecast").

In this Study, the commoditywise demand forecast is only used to predict the local trade cargo (imports/exports) because the cargo volume handled at the Port of Galle has been small; the exceptions have been clinker for cement production, and flour coming from Trincomalee.

(2) Transshipment Cargoes

In this Study, the total demand forecast is only applied to the transshipment cargo, of which the breakdown by commodity is not available.

At present, transshipment cargo is handled only at the Port of Colombo in Sri Lanka. Therefore, the forecast is carried out based upon the cargo volume of the Port of Colombo.

The majority of transshipment container cargo at the Port of Colombo consists of the traffic between developed countries and Sri Lanka's neighbouring countries (feeder areas) such as Bangladesh, India, Pakistan and Middle East nations. For calculation purposes, the feeder areas can be separated into five categories: Bangladesh, East India, West India, Pakistan and Gulf and Red Sea.