JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SRI LANKA PORTS AUTHORITY

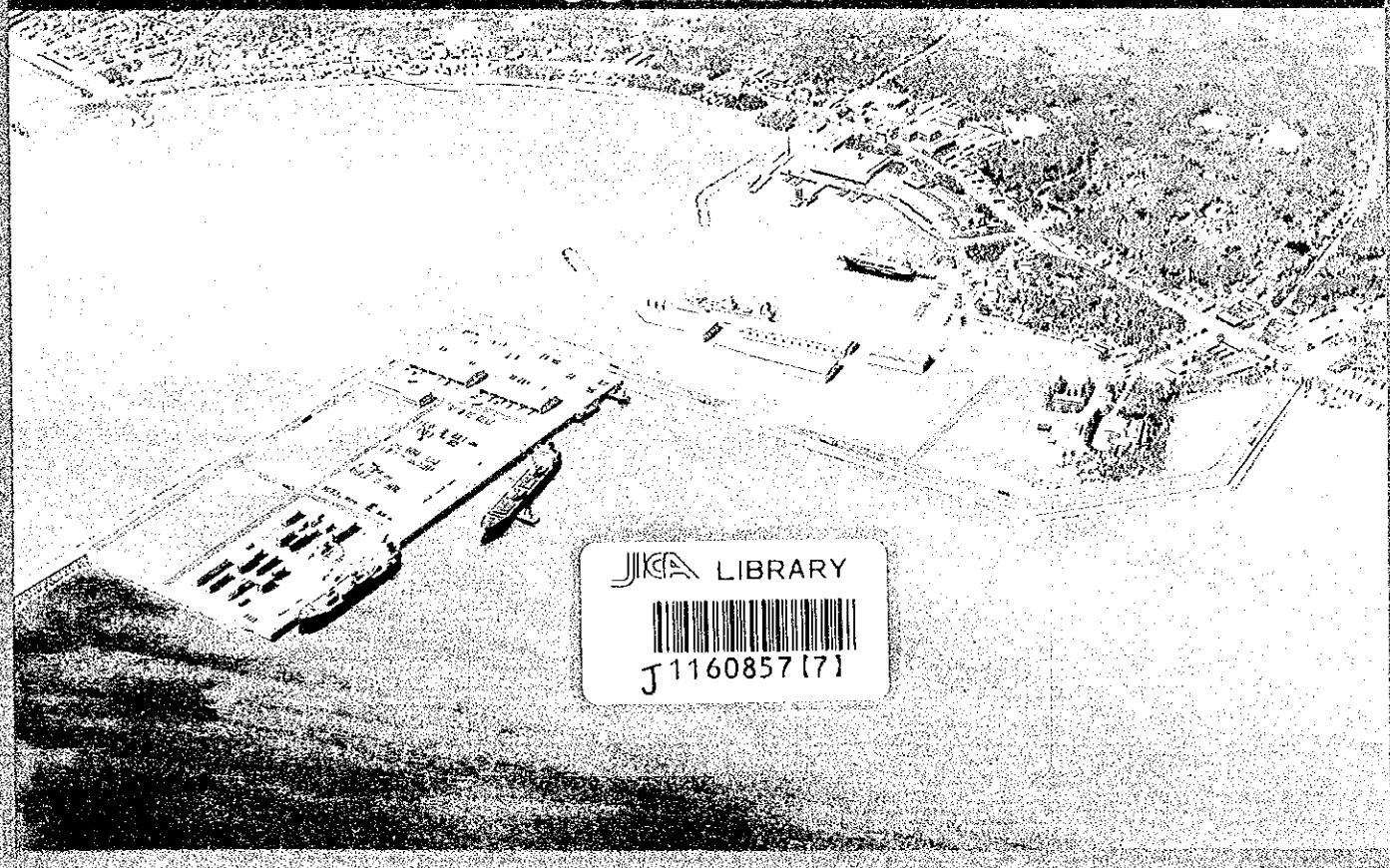
社会開発調査部報告書

NO. 52

FINAL REPORT FOR THE STUDY ON URGENT DEVELOPMENT OF THE PORT OF GALLE AS A REGIONAL PORT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

October 2000

SUMMARY



THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN (OCDI)
JAPAN PORT CONSULTANTS, LTD. (JPC)

The following foreign exchange rate are applied in the study

US$ 1.00 = Rs. 78.90 = ¥ 104.80 as of 23rd Jun 2000

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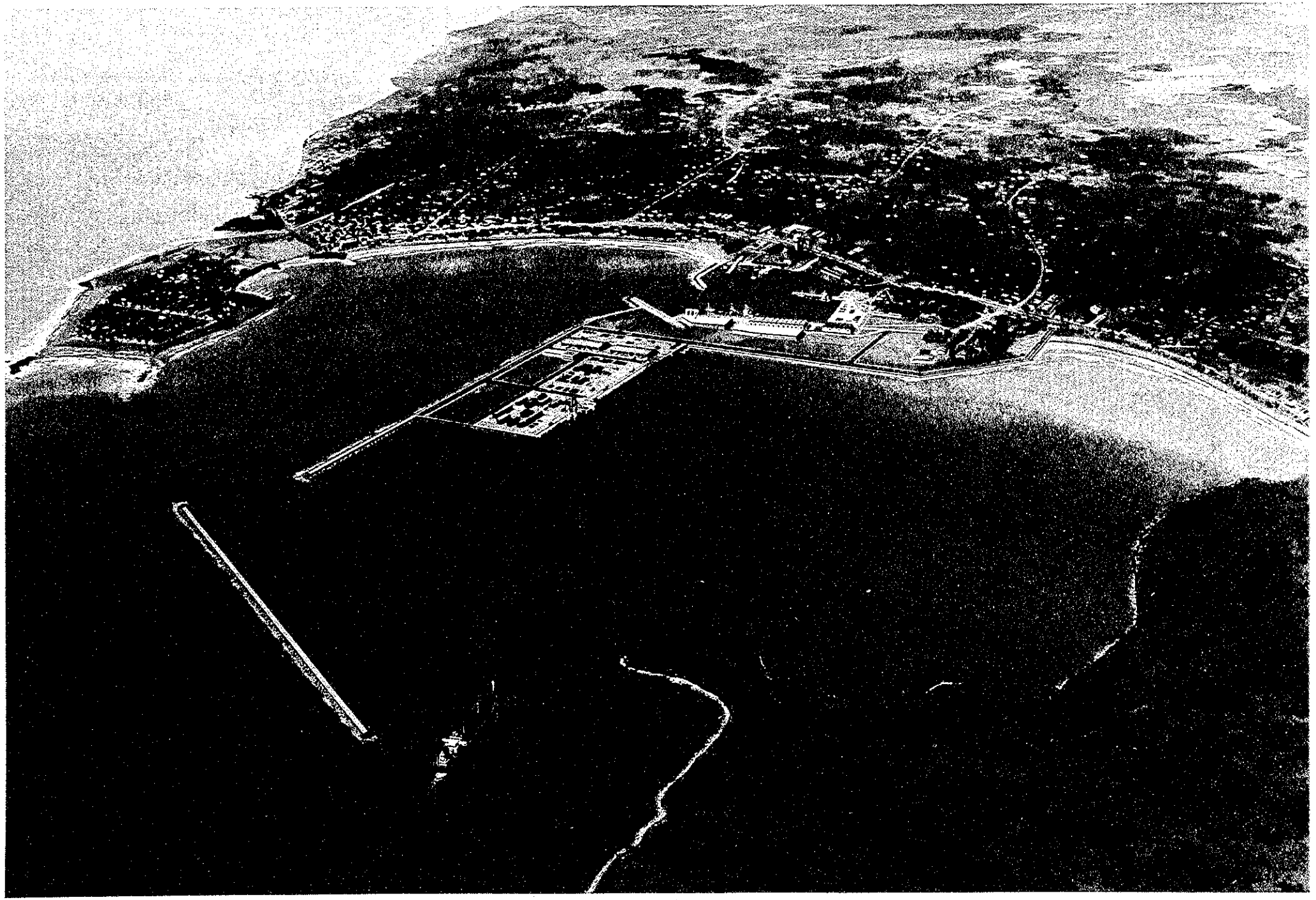
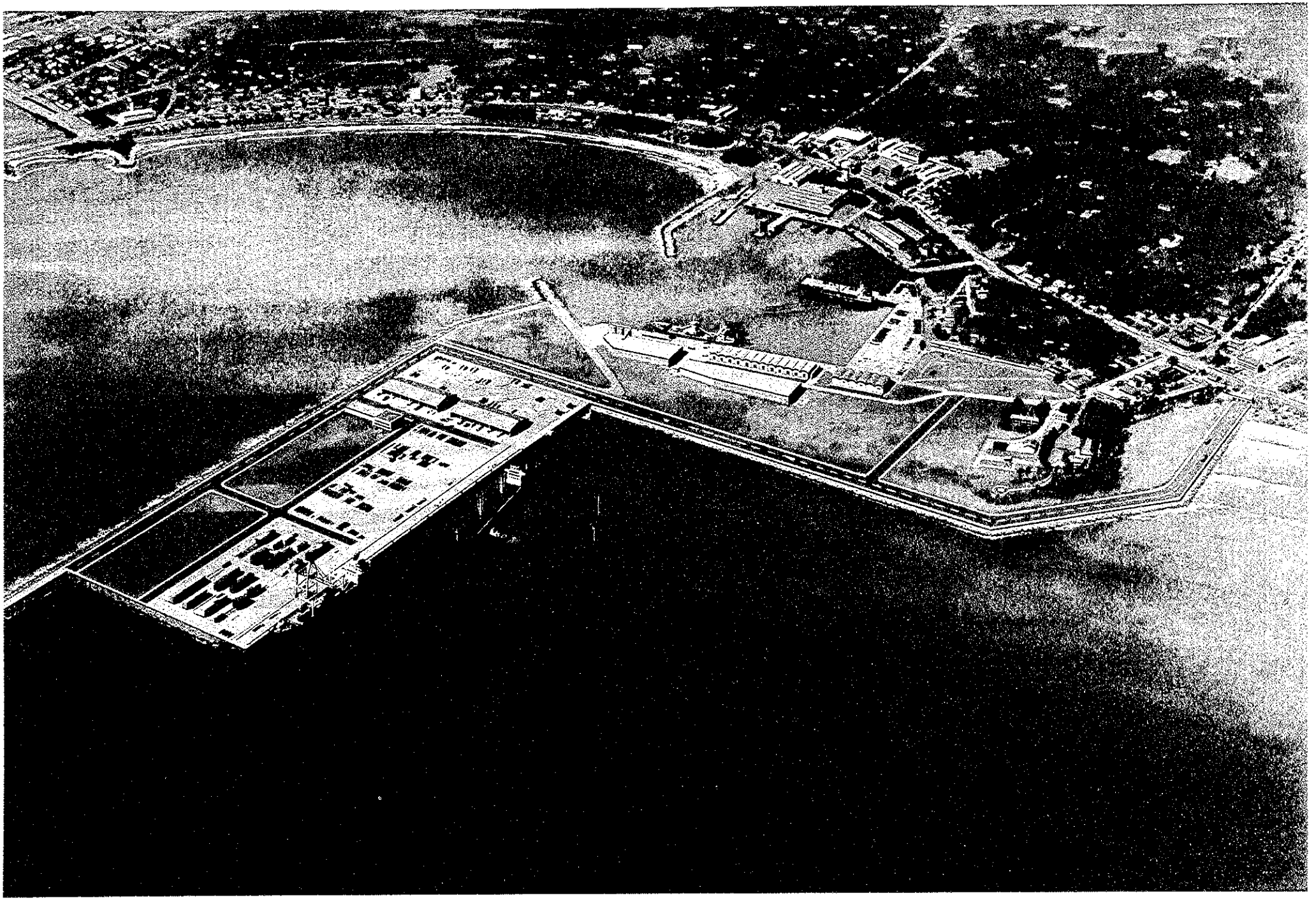




PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to 'GOSL'), the Government of Japan decided to conduct a study on Urgent Development of the Port of Galle as a Regional Port in the Democratic Socialist Republic of Sri Lanka and entrusted the study to the Japan International Cooperation Agency (JICA).

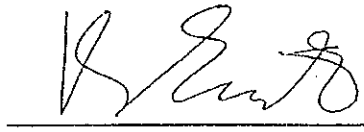
JICA sent a study team to Sri Lanka between February 2000 and August 2000, which was headed by Mr. Yugo OTSUKI and was composed of members from the Overseas Coastal Area Development Institute of Japan (OCDI) and Japan Port Consultants, Ltd. (JPC).

The team held discussions with the officials concerned of GOSL and Sri Lanka Ports Authority (SLPA) and conducted field surveys at the study area. Upon returning to Japan, the study team conducted further studies and prepared this final report.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the GOSL and SLPA for their close cooperation extended to the study.

October 2000



Kunihiko Saito
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

October 2000

Mr Kunihiko SAITO
President
Japan International Cooperation Agency

Dear Mr. Saito:

It is my great pleasure to submit herewith the Final Report of the Study on Urgent Development of the Port of Galle as a Regional Port in the Democratic Socialist Republic of Sri Lanka (hereinafter referred to 'Sri Lanka').

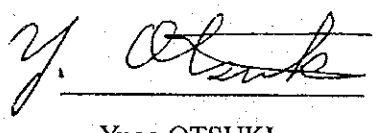
The study team of the Overseas Coastal Area Development Institute of Japan (OCDI) and Japan Port Consultants Ltd., (JPC) conducted surveys in Sri Lanka over the period between February 2000 and October 2000 as per the contract with the Japan International Cooperation Agency (JICA).

The findings of this study, which are compiled in this report, were fully discussed with the officials concerned of the Government of Sri Lanka and Sri Lanka Ports Authority (SLPA) to formulate the Urgent Development of the Port of Galle as a Regional Port in Sri Lanka for the period up to the year 2005

On behalf of the study team. I would like to express my heartfelt appreciation to the Government of Sri Lanka and SLPA for their diligent cooperation and assistance and for the heartfelt hospitality, which they extended to the study team during our stay in Sri Lanka.

I am also greatly indebted to the JICA, the Ministry of Foreign Affairs, the Ministry of Transport and the Embassy of Japan in Sri Lanka for giving us valuable suggestions and assistance during the preparation of this report

Yours faithfully,



Yugo OTSUKI
Team Leader for the Study
Urgent Development of the Port of Galle
as a Regional port in
the Democratic Socialist Republic of Sri Lanka

ABBREVIATION LIST

Abbreviation		Meaning
ADB	:	Asis Development Bank
ASTM	:	American srandard test method
B.H	:	Bore Hole
B.M	:	Bench Mark
B/C	:	Benefit / Cost
BOI	:	Board of Investment
BOO	:	Built, Own, Operate
BOT	:	Built, Operate and Transfer
CCD	:	Coast Conservation Department
CFC	:	Conversion Factor for Consumption
CFS	:	Container Freight Station
CFSL	:	Conversion Factor for Skilled Labor
CFUL	:	Conversion Factor for Unskilled Labor
CIF	:	Cost, Insurance, and Freight
CIS	:	Commonwealth of Independent States
D.L	:	Datum level
DIR	:	Overall wave direction (no separation between sea and swell))
DIRL	:	Energy weighted mean direction of swell
DIRR	:	Energy weighted mean direction of swell
DWT	:	Deadweight tonnage
EIRR	:	Economic Internal Rate of Return
EPZ	:	Export Processing Zone
FIRR	:	Financial Internal Rate of Return
FOB	:	Free on Board
GDP	:	Gross Domestic Product
GRDP	:	Gross Regional Domestic Product
GST	:	The Goods and Service tax
H.W.L	:	Hight water level
H1/3	:	Significant wave height
HMOL	:	Swell significant wave height in water
HMOP	:	Sea significant wave height in water
HOM	:	Overall significant wave height in water
IMO	:	International Maritime Organization
JBIC	:	Japan Bank for International Cooperation
JICA	:	Japan International Cooperation Agency
L.W.L	:	Low water level
LHI	:	Lanka Hydraulic Institute
M.S.L	:	Mean sea level
MPDRR	:	Ministry of Port Development, Rehabilitation and Reconstruction
NORAD	:	Norwegian Agency for Development Cooperation
NPV	:	Net Present Value
PKL	:	Mean wave frequency 1/To2 of swell in Hz
PKR	:	Mean wave frequency 1/To2 of seal in Hz
QEQ	:	Queen Elizabeth Quay
RDA	:	Road Development Authority
SAGT	:	South Asia Gateway Terminal
SCF	:	Standard Conversion Factor
SDA	:	Southern Development Authority

SIDA	: Swedish International Development Cooperation Agency
SLPA	: Sri Lanka Ports Authority
SLR	: Sri Lanka Railway
SW	: South West
T1/3	: Significant wave period (Composit wave period)
TEU	: Twenty Foot Equivalent Unit
UNDP	: United Nations Development Program
W.D.L	: Work datum level
WSW	: West south west

Contents

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Background of the Study

The foreign trade of Sri Lanka has been increasing in line with the economic development of the country. Colombo Port is located close to world trade trunk routes between the east and west and plays an important role in maritime transport, particularly in container transshipment. Galle Port, which is located 120 km south of Colombo Port, is also very close to the main trunk routes and has the potential to play an important role in maritime transportation in Sri Lanka and to contribute to regional development in the Southern Area of the country.

" The Study on the Development of the Port of Galle " was conducted by JICA in 1991. The Study proposed to develop Galle Port as a supplementary port of Colombo Port to alleviate the burden on Colombo Port, but the plan was not implemented.

The Government of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "GOSL") attaches importance to Southern Area Development and regards the Galle Port Development project as one of the leading projects for the development. The development principle of GOSL is to develop Galle Port as a regional port to contribute to Southern Area Development rather than as an international hub port.

In this context, GOSL requested the Government of Japan to conduct the study on urgent development of Port of Galle as a regional port. In response to the request, the Government of Japan entrusted the study to JICA. On November 12th, 1999, both sides agreed on the Scope of Work for the study. The study was conducted from February 2000 to October 2000 and the results of the study are incorporated in this report.

2. Objectives of the Study

The objectives of the Study are as follows:

(1) To review and revise the short-term development plan of Galle Port proposed in the "STUDY ON THE DEVELOPMENT OF THE PORT OF GALLE" conducted by JICA in 1991 considering the results of "The Master Plan Study for Southern Area Development in the Democratic Socialist Republic of Sri Lanka" conducted by JICA in 1997. The target year of the new short-term development plan is 2005.

(2) To investigate the viability of developing Galle Port as a multipurpose port for the regional needs.

3. Study Implementation

3.1 Study Period

February 2000 – October 2000

3.2 Organization of the Study

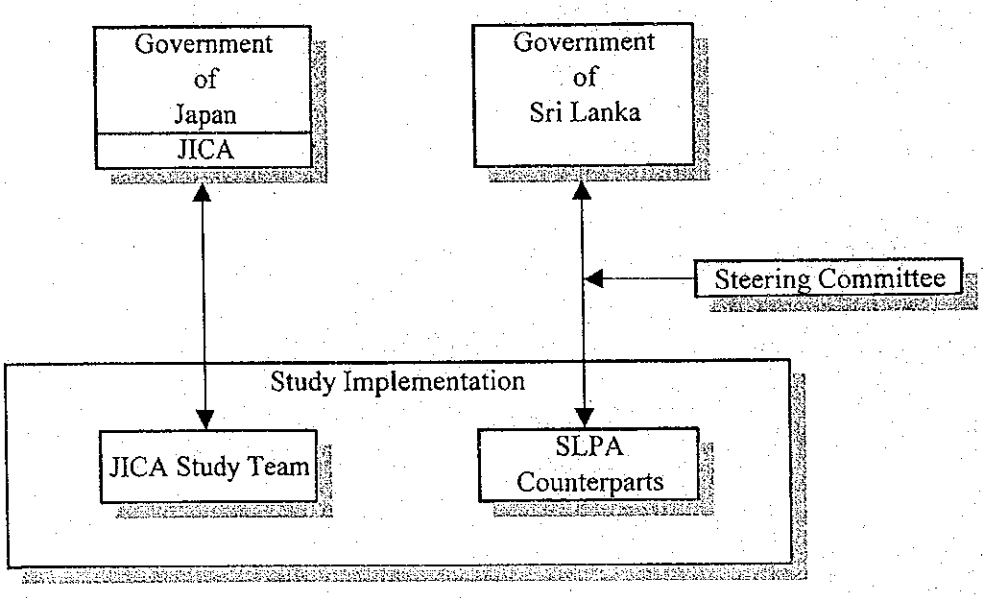
(1) Counterpart Agency in Sri Lanka

Sri Lanka Ports Authority

(2) Organization of the Study Team

Name	Responsibility
Yugo OTSUKI	Team Leader/Port Development Strategy
Yoshihisa FUJITA	Port Planning/Investment Planning
Katsuhiko OSHIMA	Regional Development
Hideki YOKOMOTO	Demand Forecast
Arata ICHIHASHI	Financial Analysis
Toshihiko KAMEMURA	Management and Operation/Port Promotion
Kunimasa NISHIGAYA	Economic Analysis
Toshiro ICHIZONO	Design of Port Facility(1)
Koji SUZUKI	Design of Port Facility(2)
Mitsutaka IMAMURA	Construction Planning/Cost Estimation(1)
Masakiyo MURAOKA	Construction Planning/Cost Estimation(2)
Mahesh W. JAYAWEERA	Natural Condition/Environmental Survey
Hiroto SUZUKI	Coordination

(3) Organization Chart



3.3 Flow Chart of Study

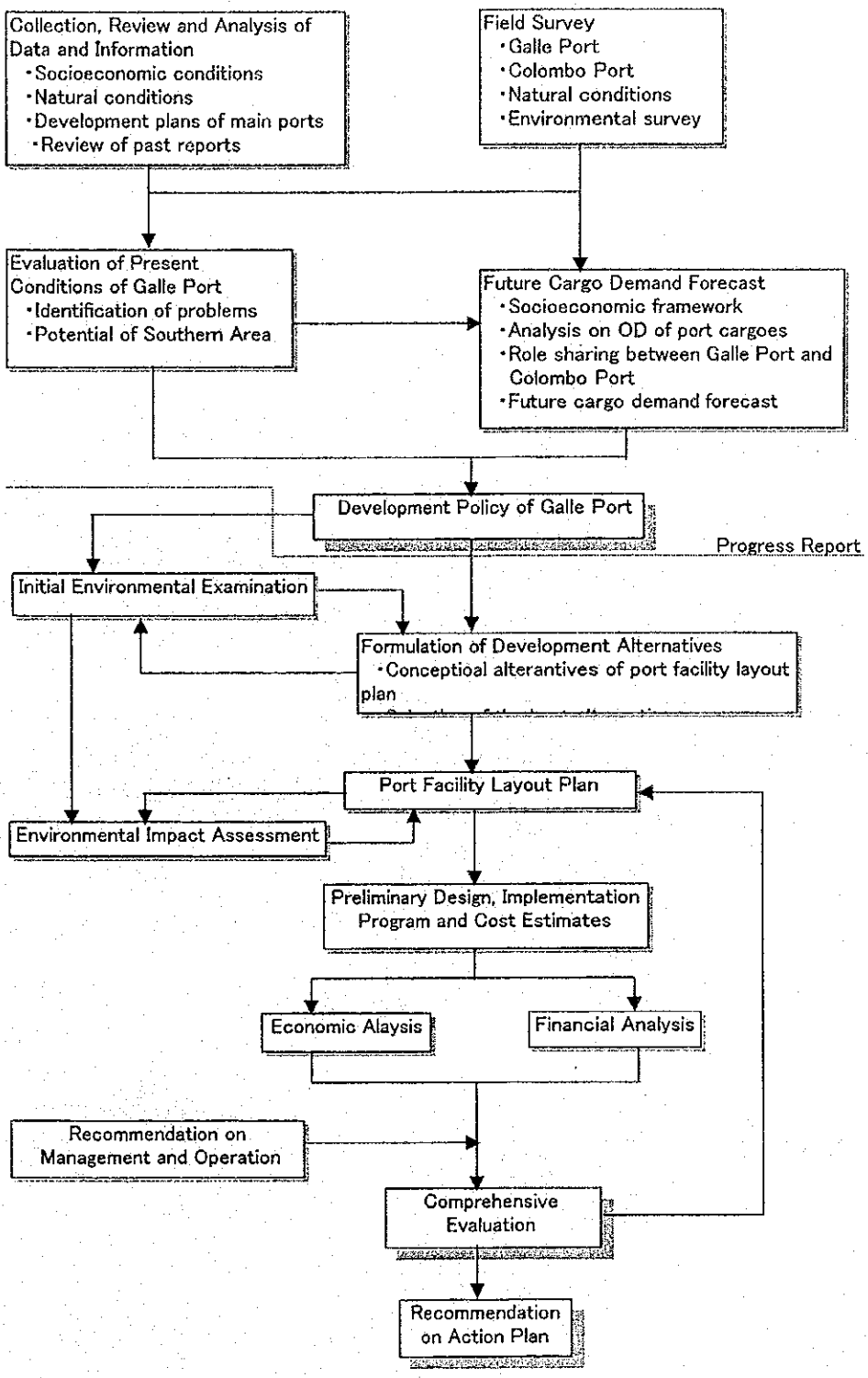


Figure Flow Chart of the Study

4. Short-term Development Plan

4.1 Demand Forecast

Future cargo demand is estimated in Sri Lanka as a whole and then future cargo is allocated based on the roles/functions of Colombo Port and Galle Port. As for container cargoes, the possibility of container vessels' calling at Galle Port is investigated by analyzing container cargo movement at Colombo Port in detail. The forecast result of the future cargo volume at Galle Port is as follows:

Future Cargo Forecast

(thousand tons)

	2005	2010
Discharged	1,552	2,353
Conventional	1,394	2,148
Container	158	205
Loaded	113	149
Conventional	1	1
Container	112	148
Total	1,665	2,502

4.2 Development Principle

The development principles of Galle Port are as follows:

(1) To meet the cargo traffic demand by providing an optimum transportation service in the Southern Area in a manner beneficial to the whole nation.

(2) To function as a catalyst to energize the economic and social development of the Southern Area.

4.3 Main Facilities of Short-term Development Plan

Based on field surveys, future cargo demand forecast and other study results, a port facility layout plan that is cost effective and environmentally friendly is selected. Main facilities of the short-term development plan are described as follows:

List of Main Facilities

Facility	No.	Dimension / Capacity
Multipurpose berths	2	Length 240m, depth 12m
Approach channel	1	One way, width 160m
Turning basin	1	Diameter 240m, depth 12m
Navigational Aids	1	5 Buoys, 4 Beacons, 2 Leading light
Berth for small crafts	1	Length 170m, depth 4.5m
Shed	2	4,000 m^2, one story
Open yard	1	10,000 m^2
Container yard	1	2.9 ha
CFS	—	A part of shed is allocated
Outer breakwater	1	Length 800m
Inner breakwater	1	Length 350m
Revetment	4	Length 500m, 350m, 470m, 1,050m
Main road	1	4-lane, 1.2 km
Connecting road	1	2-lane, 300m
Multipurpose crane	1	35 tons
Top lifter	3	2 x 35 tons, 1 x 15 tons
Folk lift	8	4 x 8 tons, 2 x 2 tons
Tractor head	10	For container cargo
Trailer	14	For container cargo

4.4 Cost Estimates

The total construction cost is ¥ 15,538 million (Rs. 11,654 million), of which the foreign portion is ¥ 11,830 million (76.1%) and local portion is Rs. 2,781 million (23.9%).

4.5 Management and Operation Plan and Port Promotion

(1) It is recommended that the new wharf of Galle Port be managed and operated by SLPA directly so as to serve unspecified users fairly given the limited number of berths and provide job opportunities within SLPA.

(2) Efficient and reliable operation is the best means of port promotion.

4.6 Environmental Impact Assessment (EIA)

EIA is conducted in accordance with JICA guideline. It is noted that there are no decisive factors to rule out the implementation of the project in terms of EIA if adequate mitigation measures are taken in the following matters:

(1) Coral reef and its associated fauna
(2) Fishing in the Dewata area
(3) Transportation of quarry products

5 Appraisal of the Short-term development Plan

5.1 Economic Appraisal

The economic rate of return (EIRR), benefit cost ratio (B/C), and net present value (NPV) for the project are 17.3%, 2.52 and Rs.8,113 million respectively and consequently the project is considered to be economically feasible from the viewpoint of the national economy of Sri Lanka.

5.2 Financial Appraisal

The financial rate of return (FIRR) for the project is 5.1%, exceeding the weighted average interest rate (3.5%) of assumed fund raising plans and hence the project is considered to be financially feasible.

RECOMMENDATIONS

RECOMMENDATIONS

Based on the results of the Study, it is recommended that the Government of Sri Lanka implement the short-term development plan of Galle Port as the urgent development plan. The development of Galle Port will have a positive impact on the Sri Lankan economy.

1. The Short-term Development Plan

The objectives of the short-term development plan are to construct a new multipurpose Terminal at the south of Gibbet Island, to provide high quality services to meet the future demand for cargo traffic in the southern area, and to accelerate Southern Area Development. The main components of the plan are summarized as follows:

Main Facilities of the Short-term Development Plan

Facility	No.	Dimension / Capacity
Multipurpose berths	2	Length 240m, depth 12m
Approach channel	1	One way, width 160m
Turning basin	1	Diameter 240m, depth 12m
Navigational Aids	1	5 Buoys, 4 Beacons, 2 Leading light
Berth for small crafts	1	Length 170m, depth 4.5m
Shed	2	4000 m^2, one story
Open yard	1	10,000 m^2
Container yard	1	2.9 ha
CFS	—	A part of shed is allocated
Outer breakwater	1	Length 800m
Inner breakwater	1	Length 350m
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Main road	1	4-lane, 1.2 km
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2. Enhancement of Cargo Handling Productivity

Measures to enhance the cargo handling productivity such as improvement of cargo handling operation, introduction of information system, vitalization of organization and improvement of personnel management system should be adopted.

3. Necessity of Government Initiatives in Galle Port Promotion

It is recommended that the Government take initiatives to promote the usage of Galle Port until the handing volume at the Port reaches a satisfactory level. This is because, although the future cargo demand of Galle Port is high, at the initial stage users of Galle Port would be limited due to the limited awareness of the new Galle Port among maritime industries and shippers.

4. Environment Conservation Measures

It is recommended that mitigation measures and monitoring works be conducted for coral reef and its associated fauna, fishing in the Dewata area, and transportation of quarry products to harmonize the project with the environment.

5. Promotion of Understanding of Galle Port Development

Publicity work on the significance of the project for the southern area development is necessary to get support from people in the area and consequently to ease implementation of the project.

6. Depth of Berths

It is recommended that new berths be designed as 14m to cope with the unexpected increase of calling vessel size. This is because the difference in construction cost between berths with 12m in depth and berths with 14m in depth per unit length is small while increasing the depth of existing berths would be very costly.

Part 1 PRESENT CONDITIONS

Chapter 1 Socioeconomic Condition of Sri Lanka / Southern Area

1.1 Natural Conditions

1.1.1 Geography and Topography

Sri Lanka, an island in the Indian Ocean, is located at the east-southeast tip of the Indian subcontinent. Sri Lanka has an area of about 65,000 k m^2.(See Figure 1.1.1). The northern part from the center of the island is almost all plains, while the southern part is mountainous and surrounded by coastal plains. The island consists of 9 provinces and 25- districts (See Figure 1.1.2).

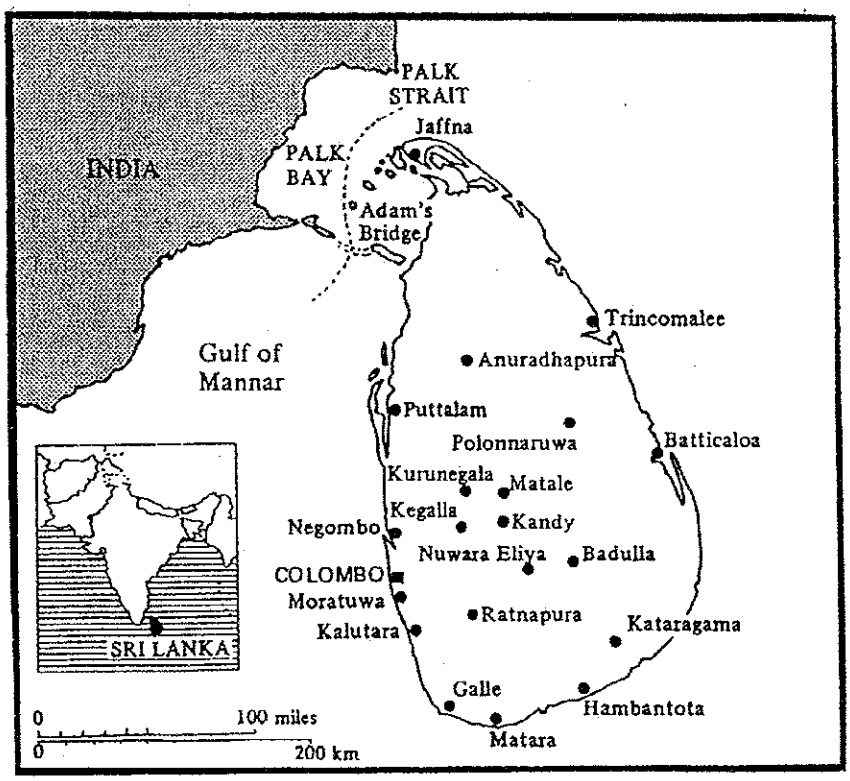
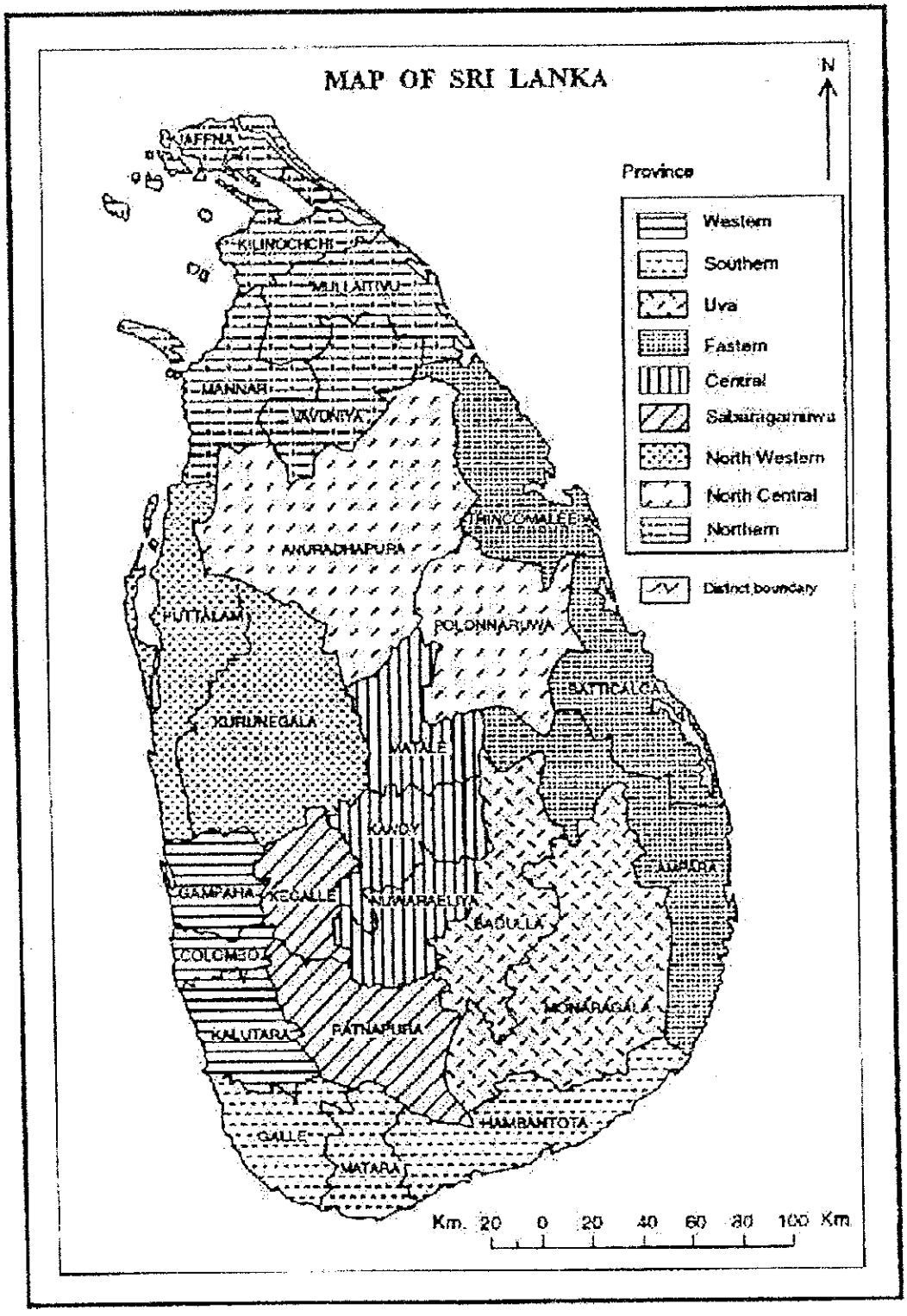


Figure 1.1.1 Democratic Socialist Republic of Sri Lanka

1.1.2 Climate

The climatic year in Sri Lanka can be divided into distinct periods, i.e., the Southwest Monsoon period from May to September, the Northeast Monsoon period from December to February and two intermonsoonal periods. The island receives 500mm to 4,000mm of rain in the Southwest Monsoon period and 500mm to 2,500mm of rain in the Northeast Monsoon period. Through the Year, the southwest quarter of the island receives much rain.

The temperature is almost constant through the Year, at about 29℃. The average temperature in Nuwara Eliya (altitude 1890m) where located hill country is around 16℃. The average humidity is relatively high, at more than 75% at Colombo and Galle.



Source: Statistical Pocket Book Of The Democratic Socialist Republic Of Sri Lanka -1998

Figure 1.1.2 Province and District of Sri Lanka

1.2 Socioeconomic Conditions

The southern area is relatively less developed with heavy dependence on agriculture and underdevelopment of modern manufacturing. In spite of several sectoral development programs/projects, the area has not witnessed much development over the past 4 decades. This has been due to the stagnation or decline of some of its traditional economic activities (coconut, rubber, cinnamon and a number of crafts) and because the greater part of national resources have been concentrated in more developed areas of the country.

Notwithstanding, the southern area is important to the country's economy due to the various economic activities, which derive from its developed agriculture (tea industry) and partially developed industry and tourism as indicated the following sections.

1.2.1 Population

Sri Lanka had a population of 18.5 million, and an annual growth rate of 1.1% in 1997. The fertility rate was 2.2 and life expectancy was 72 years.

The population of the southern area was estimated at approximately 3 million.

1.2.2 GDP

It is clearly observed that compared to the tremendously huge share of the gross regional domestic product (GRDP) in Western Province, that of other provinces has continued to be low. Southern Province shared 9.7% of the national GDP in 1997. Even in terms of GDP per capita, the southern area has been showing less than the national average.

It is clearly observed that the economies of Southern Province and three adjacent provinces are heavily dependent on agriculture, while manufacturing is underdeveloped.

1.2.3 Trade

The foreign trade situation changed drastically after the economic liberalization in 1977. The country's exports grew by about 10% annually during the last two decades and kept pace with the growth of world exports, which grew by 9.1%. The imports grew annually by 12.4% during this period. Imports and exports in 1997 accounted for 69.7% of GDP compared with 35% in 1977. The trade sector became a driving force in the economy, encouraging the growth of income and employment opportunities.

The export structure became diversified with the emergence of new export items such as garments, rubber based products, ceramics, petroleum products, various spare parts including electronics, and industrial exports became the largest contributor to export earnings, accounting for 74.1% of total exports in1997. The composition of imports also changed from consumer goods to growth oriented intermediate and investment goods, which together accounted for 75.4% of imports in 1997.

1.3 Major Industrial Sectors

1.3.1 Agriculture

The agricultural sector (including forestry and fishery) remains a major force in the country's economy in terms of GDP and employment of labor force, accounting for 21.9% and 47.1% respectively in 1997. Agricultural exports like tea, rubber, coconut and so on shared 22.9% of the total export volume in the same year.

In Southern Province, agricultural GDP stood at 29.7% in the total GRDP in 1995, an increase of 30.7% compared to the 1990's.

(1) Paddy

Net extent of harvested area in the Province accounted for 76,300 hectares in 1997, sharing 12.3% of the total national cultivated area. Production in the area amounted to 251,900 MT which was equivalent to 11.4% to all island production.

(2) Plantation Crops

Plantation crops consisting of tea, rubber and coconut are grown by both the state sector and private small holding sector with the latter significantly contributing to national production.

1) Tea
The tea industry has shown a declining trend over the years. The contribution to GDP from the tea sector was only 1.6% by 1997. It accounted for 15.3% of the total exports and 67.9% of agricultural exports in 1997. The southern area is well placed in production of tea, specifically higher quality tea shares half of the total production in recent years.

2) Rubber
Rubber production slightly increased from 96 million kg in 1948 to 106 million kg in 1997. Rubber production was primarily aimed at the export market. In 1997, the country exported 61.4 million kg, 58% of production as a raw material. The balance is now being used by the domestic industries. As export value, it earned Rs. 4,640 million

3) Coconut
Coconut production increased from 1,765 million nuts in 1948 to 2,630 million nuts in 1997. Nearly 70% of the production is domestically consumed. Exports of coconut products accounted for Rs. 6,939 million.

1.3.2 Industry

Under the economic policy reform in 1977 there was a complete turn around in the industrial policy, focusing it mainly on the export market and relying on the private sector. Foreign investment was encouraged by introducing various incentives Since 1990, special attention has been given to decentralization of industrial locations. Special incentives have been given

for investors in remote areas. The establishment of the Board of Investment (BOI) of Sri Lanka in 1992 was another step in this new direction. It is directly responsible for investment incentives

Industrial sector shared 25.5% of the country's total GDP, while manufacturing stood at 16.4% in 1997.

(1) Manufacturing

The concentration of industries in the Western Province, especially in Colombo and Gampaha District due to better infrastructure facilities, proximity to port facilities and high dependence on imported raw materials.

Meanwhile, due to the Government policy, number of industries in the southern area has steadily increased. The share of the sector in Southern Province, which accounted for 9.6% of the Province's GDP in 1995, is far below the national average.

(2) Koggala Export Processing Zone

The establishment of the Koggala Export Processing Zone (EPZ) in the Galle District in 1992 was an important policy measure taken for regionalisation of industrial development. Although the factories were granted tax holidays and import duty free concession, there was a long stagnant period. Fifteen factories mainly producing garments and plastic ware now occupy the EPZ. Cargo volume handled in Koggala EPZ for exports accounted for approximately 1,140 TEUs and 1,320 TEUs in 1998 and 1999 respectively, while value added stood at Rs. 1980 million and Rs. 2043 million in the same years.

1.3.3 Tourism

The tourist arrivals to the country has shown higher growth since 1977 with improved international transport facilities and the positive impact of the open economic policy package. The economic benefits of tourism are not limited to foreign exchange earnings and employment generation. The creation of indirect employment is much higher than the direct employment opportunities. Tourism has contributed to the regional dispersion of modern business activities, thereby involving the rural segments in the development process.

1.3.4 Other Sectors

Energy sources in Sri Lanka consist of hydropower, petroleum, gas and bio mass, share of which in 1995 stood at 17%, 25%, 1% and 57% respectively. Power generation increased by 8-12% during 1978-96, and helped to maintain a reasonable rate of economic growth.

The demand for electricity increased at an average rate of 8%-10% during 1995-1997, reaching the maximum demand of 1,037 MW in 1997. The total capacity of system is 1542 MW in 1997.

Percentage of electrification in the South Province stood at 55% at the end of 1998. In terms of electricity sales in GWh (million kWh) the Province shared 8.3% of the total 4,521 GWh.

In Sri Lanka, there exist 2.8 fixed telephones per hundred population in 1998, penetration rate going up from 1.0 per hundred population in 1995. The number of cellular mobile phones has increased six folds to 174,202 in 1998 compared to 1994.

Telephone distribution in Southern Province shared only 4.3% in 1996, extremely low when compared with the population distribution of 13.0% in the same year.

1.4 Transportation Sectors

1.4.1 Railway

The railway system in Sri Lanka is at present operated by the Sri Lanka Railways (SLR) as a government department under the Ministry of Transport and Highways. The system has a total track length of 1,447km(1998) of broad gauge and 59km(1998) of narrow gauge. The SLR has 175 locomotives, 1,297 passenger coaches and 2,703 wagons at 1998.[1]

Table 1.4.1 Performance of Sri Lanka Railways

Item	Unit	1998	1999(a)
Operated kilometers	,000	8,534	8,964
Passenger kilometers	million	3,206	3,393
Freight ton kilometers	million	108	106

Source: Sri Lanka Economy In 1999 and Medium-term prospects, Central Bank of Sri Lanka
(a) Estimates

1.4.2 Roads

Sri Lanka's road systems are classified as A to E type. Total road lengths are less than 26,000km in 1999. The road development authority (RDA) is responsible for the development and maintenance of national highways which are A and B type. Other types of roads are under control of Provincial Councils.

Motor traffic has shown fairly rapid growth since 1975. And all kinds of motor traffic are continuing to increase in recent years. The road traffic has become an important mode of transportation compared to railways. The share of road transport of the total volume of freight in 1995 is 86%.

[1] Economic And Social Statistics Of Sri Lanka 1999, provincial data.

Table 1.4.2 Freight transport by mode (million ton km)

	1985		1995	
	Volume	%	Volume	%
Rail	232	7	137	3
Lorries and truck	2,700	80	3,913	86
Other	463	13	480	11
Total	3,395	100	4,550	100

Source: Fifty years of Sri Lanka's independence a socioeconomic review

The provision of passenger transportation in Sri Lanka is still mainly dominated by the public sector, although private sector participation has been increasing in recent years, especially in bus transportation.

Total road lengths are about 2,900km in 1996 in Southern Province. A2 is a main road in Southern Province, which connected Colombo and Wellawaya. This road is a heavy traffic route.

Motor traffic growth tendency in Southern Province is almost same as whole country. Total number of motor vehicles with valid revenue licenses in Southern Province has grown by 11% to 79,829 during 1998.[2]

Accordingly, the construction of three expressways was proposed which were Colombo-Katunayake, Colombo- Kandy and Colombo- Matara. The final report of the feasibility study for the Colombo- Matara expressways was finalized and the engineering planning started on June 2000.

1.4.3 Sea Transport

Three ports, namely Colombo, Galle and Trincomalee, provide ship haulage in Sri Lanka. These ports are operated by the Sri Lanka Ports Authority (SLPA), which was established as a government-owned corporation in 1979.

The total number of ship arrivals at three ports increased by 3% to 4,339 during 1999. The total cargo handling volume was 26,995 million tons in 1999 a slight increase from 1998.[3] The detail of the three ports is described in Chapter 2.2, 2.3, Chapter 4.

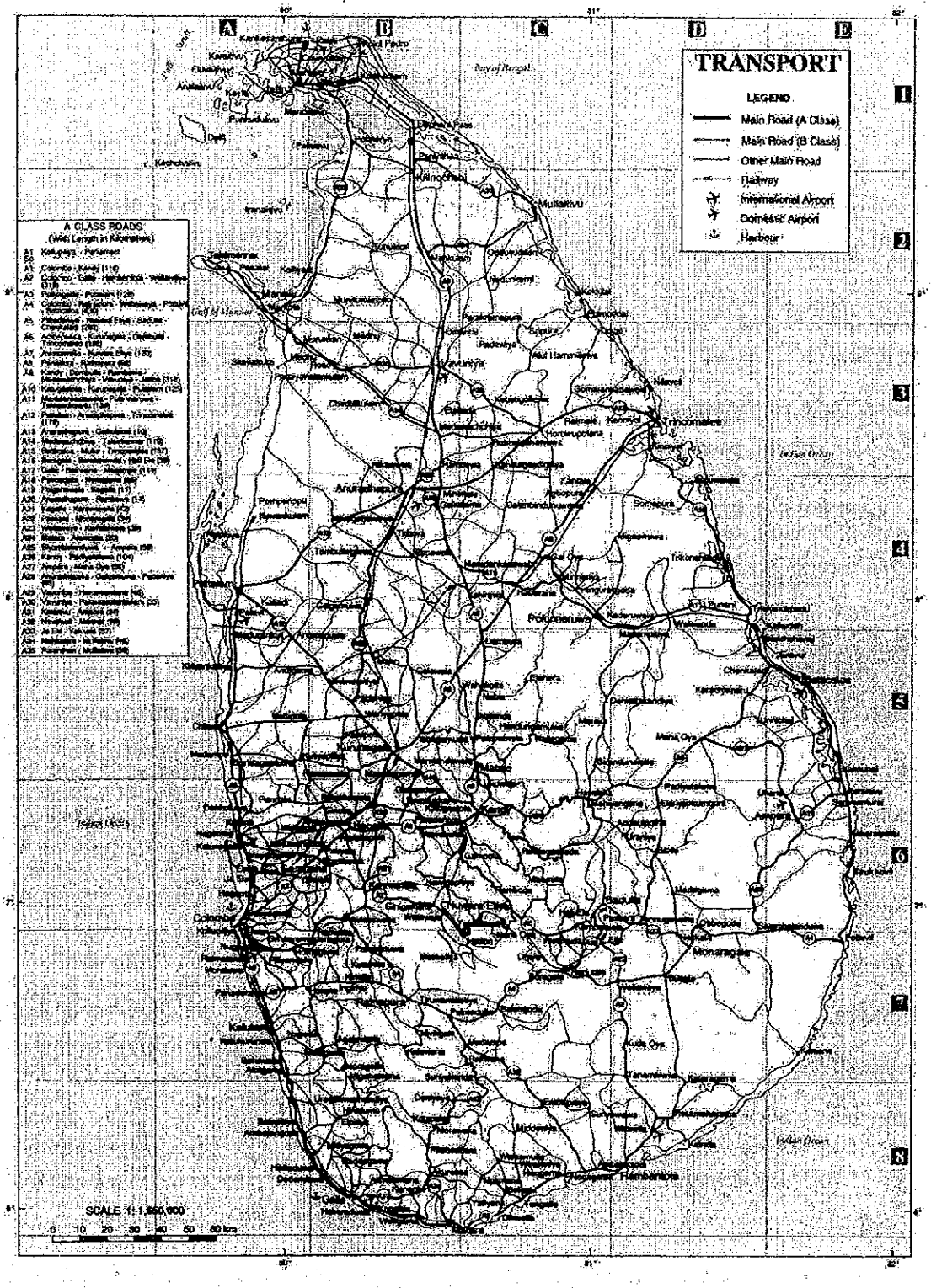
Coastal shipping in Sri Lanka is not so vital both passenger and cargo transport except for coastal shipping services for Northern province include Jaffna. Such cargo has been essentially food items and construction material.

[2] Economic And Social Statistics Of Sri Lanka 1999, provincial data.
[3] Port statistics 1999

1.4.4 Air Transport

Sri Lanka has one modern international airport at Katunayake, about 30km north of Colombo, which was constructed in 1961 with foreign assistance. Modernization and expansion of the airport complex was completed in 1988. In 1994 the Colombo International Airport handled approximately 1.6 million passengers and 50,000 tons of airfreight.

Air Lanka, the national carrier, was founded in 1979.Air Lanka carried approximately 1.2 million passengers in 1998



Source: Arjuna's Atlas of Sri Lanka

Figure 1.4.1 Transport in Sri Lanka

Chapter 2 Present Conditions of Main Ports in Sri Lanka

2.1 Port Development Policy

Considering the importance of port and shipping sectors, Sri Lanka Government formulated the first national port development policy named "National Ports and Shipping Policy of Sri Lanka" in 1997.

It says that the long term vision is for Sri Lanka to consolidate and further development its position as a competitive shipping centre in the South Asia region which would result in the generation of economic activity, employment and income. Based on the objectives, development objectives of each port are proposed as follows:

- Development of the Port of Colombo as a hub port in the region
- Development of the Port of Galle into a hub port with infrastructure facilities that would makeit a multipurpose port.
- Development of the Port of Trincomalee to cater for bulk and break-bulk cargo and marine-related industrial activity

The purpose of the development of Galle Port is transferred from a hub port to a regional port.

2.2 Colombo Port

Colombo Port is the largest port and the physical distribution center in Sri Lanka. It is famous as container hub port in South Asia. Total container volume handled at the Port in 1999 was 1,704,000 TEUs of which 68% was transshipment containers. The total throughput of container decreased by 0.4% over 1998 and this marks the first decrease in the last 10 years. On the other hand, domestic container throughput has been increasing steadily because of the steady economic growth of Sri Lanka and the Sri Lankan Government's policy of encouraging foreign trade and foreign investment.

Colombo Port also handled non-container cargo amounted to 6,676,000 tons in 1999 including bagged sugar, bagged fertilizer, cement, iron/steel and crude oil, which are indispensable for daily life and economic activities. Table 2.2.1 shows the cargo throughput at Colombo Port in the last 10 years.

To meet the increasing container cargo traffic demand, Colombo Port has been continuously developed and redeveloped. Recent examples include dredging of the North Channel, construction of new CFS, redevelopment of feeder container berth and redevelopment of North Pier.

The first BOT project has already started. The concession agreement was signed in August of 1999 between the Sri Lankan Government and South Asia Gateway Terminal (SAGT), which is a joint venture of SLPA, John Keells Holdings, P&O Netherlands, P&O Nedlloyd of Holland, Evergreen Group Taiwan, Asian Development Bank and the Commonwealth Development Plc. The Queen Elizabeth Quay will be expanded 100m toward the inner harbour side with a total length of 1000m which will make it able to accommodate 3 container vessels at once. The construction work has

Table 2.2.1 Cargo Throughput of Colombo Port

('000 Tons)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Tonnage Discharged										
1.Containerized										
(1)Containerized Local	933	973	1,176	1,400	1,628	1,847	2,018	2,450	2,806	2,866
(2)Containerized T/S	2,482	2,587	2,556	3,411	3,930	4,142	5,622	7,262	6,816	6,568
(3)Re-stow	48	42	51	59	67	81	97	155	165	129
(Sub-total)	3,463	3,602	3,783	4,869	5,625	6,070	7,737	9,867	9,787	9,563
2.Break Bulk										
(1)Cement Bags	121	161	88	216	223	516	326	409	376	446
(2)Fertilizer Bags	497	428	338	460	411	508	430	364	432	494
(3)Flour Bags	335	239	237	243	218	188	155	135	97	84
(4)Lentils Bags						35	8	7	5	
(5)Onions Bags	30	44	35			32	59	70	28	9
(6)Rice Bags	198	127	228	234	210	3	206	84	81	46
(7)Sugar Bags	287	388	372	382	343	431	385	547	333	472
(9)Iron/Steel						167	216	204	251	225
(10)M/Vehicle						54	43	54	77	71
(12)Other Break Bulk	436	467	490	514	555	249	215	195	283	227
(Sub-total)	1,904	1,854	1,789	2,049	1,960	2,183	2,043	2,069	1,963	2,074
3.Dry Bulk										
(1)Cement	304	201	322	333	403	438	535	490	515	622
(2)Clinker				10	55	48	10	44	105	113
(3)Fertilizer				17	28	15	42	31	48	32
(4)Gypsum				15	14	22	25	30	37	17
(5)Wheat	29	28				29	9			
(6)Maize						62	77	72	107	106
(7)Other Dry Bulk	111	388	177	217	103	18	6		60	11
(Sub-total)	444	617	499	592	603	632	704	667	872	901
4.Liquid Bulk										
(1)Crude Oil	1,717	1,637	1,304	1,800	1,857	1,872	2,041	1,822	2,092	1,898
(2)Fuel Oil	146	214	682	314	363	540	748	1,072	762	1,296
(3)LP Gas	17	18	31	38	51	67	70	86	99	126
(4)Palm Oil	23	28	2	66	31	22	52	57	59	60
(5)Other Liquid Bulk	5	6	0	6	8	4	5	6	13	11
(Sub-total)	1,908	1,903	2,019	2,223	2,309	2,505	2,916	3,043	3,025	3,391
TOTAL DISCHARGED	7,719	7,975	8,090	9,733	10,497	11,390	13,400	15,646	15,647	15,929
Tonnage Loaded										
1.Containerized										
(1)Containerized Local	821	844	887	1,031	1,193			1,681	1,706	1,816
(2)Containerized T/S	2,477	2,573	2,527	3,356	3,861	4,100	5,557	7,243	6,828	6,641
(3)Re-stow	47	41	50	60	62	81	98	154	162	129
(4)T/S Break Bulk	36	28	4	12	32	18	9	8	4	3
(5)T/S Dry Bulk	15									
(6)T/F Cement Bulk	40	213		90					55	
(Sub-total)	3,436	3,700	3,468	4,549	5,149	4,199	5,664	9,086	8,755	8,589
2.Break Bulk										
(1)Tea	145	170	106	89	105	45	45	39	59	24
(2)Rubber	44	21	13	11	13	3	1	1		
(3)Coconut Prod.	75	26	7	6	7	2				
(4)Coastal Service						85	2	116	92	66
(5)Other Break Bulk	109	163	116	97	115	95	124	28	63	102
(Sub-total)	373	379	241	203	240	230	172	184	214	192
3.Dry Bulk										
(1)Wheat Bran										
(Sub-total)	0	0	0	0	0	0	0	0	0	0
4.Liquid Bulk										
(1)Refined Fuel	98	98		67	90	96	79	80	20	21
(2)Naptha	75	99	77	118	97	110	112	93	128	82
(3)Coastal Service		25	41	43	33	1	1	29	20	12
(4)Other	2					26	20			
(Sub-total)	175	222	117	228	221	233	212	202	168	115
TOTAL LOADED	3,983	4,300	3,826	4,980	5,609	4,662	6,048	9,472	9,137	8,896
TOTAL TONNAGE	11,703	12,275	11,916	14,713	16,106	16,052	19,448	25,118	24,784	24,825

Source: SLPA

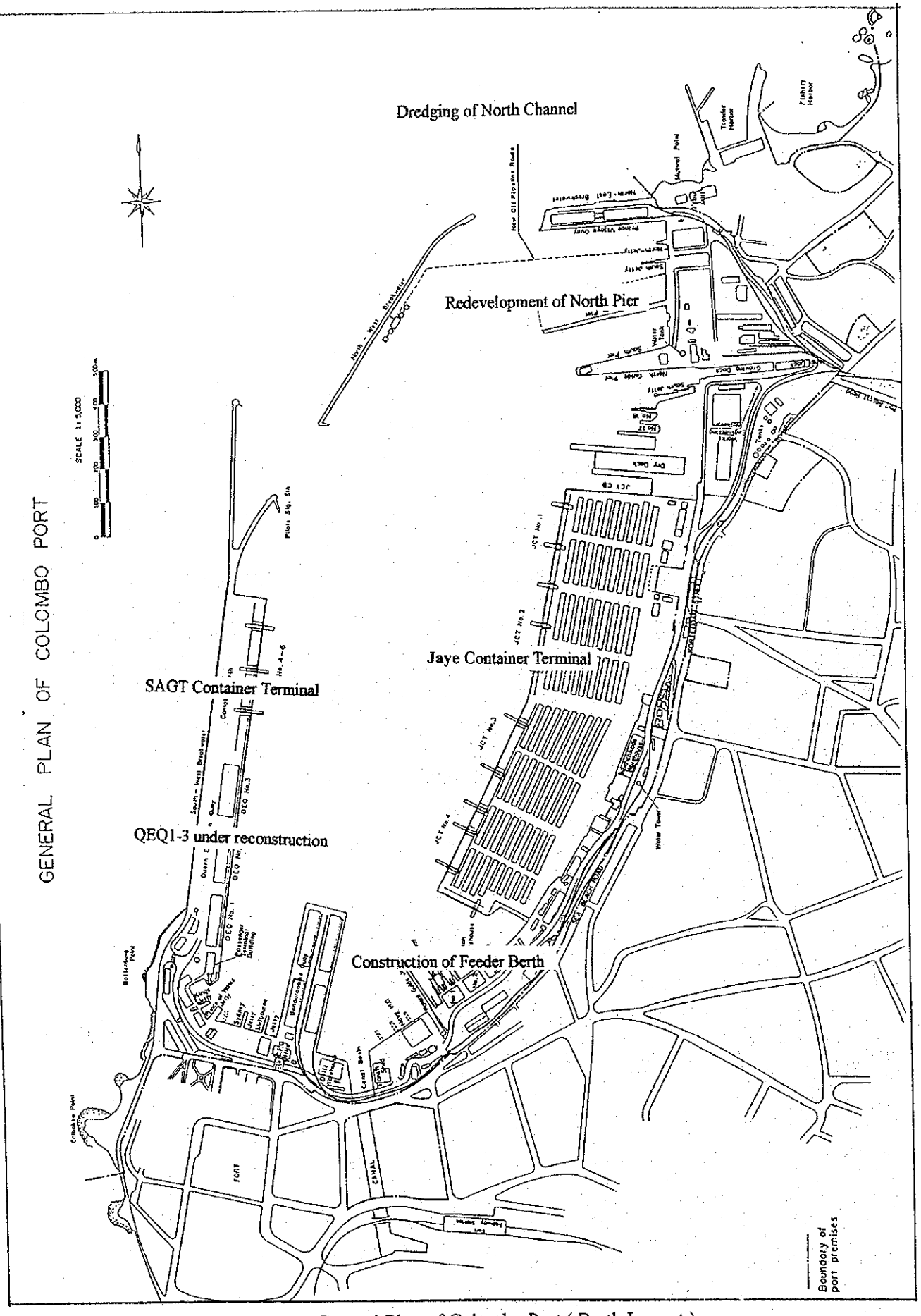


Figure 2.2.1 General Plan of Colombo Port (Berth Layout)

already started in the southern part of QEQ and SAGT started terminal operation of Queen Elizabeth Container terminal in September of 1999.

At present a feasibility study on the Southern Harbour Development of Colombo Port is being carrying out with financial assistance from ADB. The project calls for the construction of Container Terminals outside the South-East Breakwater. The study will be completed in January of 2001.

Figure 2.2.1 shows the berth layout of Colombo Port.

2.3 Trincomalee Port

Trincomalee Port located on the East Coast of Sri Lanka facing the Bay of Bengal and is a good natural harbour in the innermost part of the Trincomalee Bay.

Trincomalee Port is the second largest port in Sri Lanka in terms of cargo throughput. The volume of cargo handled in 1999 was 1,731,000 tons of which imported wheat represented half. Other main cargoes are imported clinker and flour and wheat barn for domestic export.

Table 2.3.1 shows the berthing facilities of the Port. At present there is no public berth. All berths are privately owned and operated. SLPA is now constructing the first public berth which will have a water depth of 13m, a berth length of 252 m and be capable of berthing 40,000 D.W.T. vessels. The berth is expected to be completed in June of 2001.

Table 2.3.1 Berths of Trincomalee Port

	Length	Draught
Prima Outer	200m	13.0m
Prima Inner	122m	5.0m
Oil Jetty	198m	9.3m
Tokyo Cement	155m	8.7m
Multipurpose	252m	13.0m

Chapter 3 Natural Conditions of Coastal Area adjacent to Galle Bay

3.1 Meteorology

The prevailing wind direction is SW in the two monsoon seasons and this direction accounts for 56.6 % of all wind directions observed all year round and as high as 69.2 % during the southwest monsoon months. Strong winds with speeds in excess of 20 knots have occurred in the southwest monsoon season only with a frequency of no more than 0.2 %. Annual frequencies of winds with speeds of over 10 knots are 10.5% and over 20 knots are 0.1% in Galle Port.

The highest mean maximum daily temperature of 30.9℃ is registered in March and April and the lowest value of 28.4℃ in August.

Humidity is 80% during the daytime, however increases to 88.6% at night. In monthly terms, daytime humidity is 72.8% in February and increases to 85% in August with a variation of 12 %, while nighttimes humidity varies from 86% in February to 91.3% in December with a variation of no more than 5%.

The annual mean value of 2,154.3 mm. Viewed seasonally, rainfall is concentrated in April-June and September-November, that is, the periods immediately preceding and following the southwest monsoon season. These six months account for as much as 68% of the total annual amount of rainfall. The average annual number of rainy days is 174 days (approx. 48%) and the number vary from 14-20 days/month during the southwest monsoon season and periods immediately before and after it to 5-11 days/month during the northeast monsoon season.

3.2 Oceanography

(1) Waves

During periods from February 1989 to September 1992, from August to November 1993 and May 1994 to September 1995, offshore wave observations were conducted by the offshore wave rider buoy, which was installed 12 km southern seaward from Galle Port. Moreover, during periods from May 1984 to December 1986, September 1988 to December 1991 and January 1993 to September 1995, the inshore wave rider buoy conducted inshore wave observations, which was installed 2.5 km offshore from Galle Port.

According to the result of above-mentioned wave observations, for year-round overall sea waves, the frequency of occurrences was 85% for waves heights of 1.0 m or more, about 33% for wave heights of 2.0 m or more and about 2% for wave heights of 3.0 m or more. In terms of wave directions, SSW had the highest frequency of occurrences. Wave periods of approx. 8.0 second showed a higher frequency. Considered on a monthly basis, SSE waves were prevailing during December to February with less than 2.0 m in height, however, waves higher than 3.0 m were recorded from W to SSW

directions over the May to October period. For inshore waves considered on annual basis, the frequency of occurrences was approximately 62% for wave heights of 1.0m or more, about 6% for wave heights of 2.0 m or more, and about 0.2% for wave heights of 3.0m or more. The most frequent wave period was in the neighbourhood of 7.0 second. Taken on a monthly, wave heights were smaller over the December-February period, but tended to increase during the May-October period.

After simulation with above-mentioned conditions, 50-year significant wave parameters for different deepwater wave conditions, 50-year maximum wave parameters and wave vectors are described in figures. The design wave characteristics at outer breakwater with a 50-year return period have been defined as follows;

Direction	Height ($H_{1/3}$)	Height (H_{max})	Period
WSW	6.2 m	10.7 m	12.3 sec.

(2) Tidal Levels

Based on main tidal constitutions in Galle Port given in the Indian Tide Table, the tidal levels required for design purposes have been determined as follows:

H.W.O.S.T.(≒H.W.L)	0.607 m (0.6 m)
M.S.L	0.336
L.W.O.S.T.(≒L.W.L)	0.065 m (0.1 m)
D.L.	0.00

Note: Values in brackets are based on the chart.

(3) Tidal Current

The current speeds in the vicinity of Galle Port are very insignificant.

(4) General Features of Coastline and Sand Drift

Data available at the Coast Conservation Department show that the southwestern coasts of Sri Lanka are eroded at an annual rate of about 30 cm. The sand drift into the bay is intercepted by the east and west headlands. In consequence, the sand drift inside the bay is presumably limited in volume and the shoreline remains virtually unchanged. Two small rivers with a total drainage area of nearly 50 km^2, namely, the Moragoda and Lunuvila, discharge into Galle Bay. They have a gently inclined bed and their mouths are completely closed in times of droughts. For these reasons, the sediment discharge into the bay is considered to be very limited.

3.3 Site Investigation

The investigations, carried out between early March and the end of April 2000, comprised the Soil Exploration, Bathymetric Survey, Sonic Prospecting and Topographic Survey

(1) Soil Exploration

The purpose of this offshore soil exploration was to evaluate the overburden material and basement rock below the seabed within the outer Galle Port. Nine boreholes have been drilled at nine locations. Most of subsoil structure in Galle Bay consisted of three layers. Seabed surface layer is observed soft, overburden sediment of which thickness is surveyed from 1 m to 15 m. N values are distributed from 0 to 15 in this stratum. Interim layer consisted of weathered rock of which thickness is 0.5m to 10m. N values are distributed 20 to 40. Under these layers, the bedrock layer exists. N values are more than 50. At most of the boreholes, elevations of surface of bedrock layer are deeper than 12m, however we observed -11.78 m in BH4 near Gravet Point and -11.8 m in BH9 offshore of Watering Point.

(2) Bathymetric Survey

Bathymetric survey of Galle Bay has been conducted in order to evaluate the depth to the seabed and the overburden material. The area subjected to bathymetric survey is nearly the whole of Galle Bay. Processed data have been reduced to Chart Datum (CD), which is 0.38 m below Mean Sea Level and plotted to a scale of 1:20,000. In this bathymetric chart, depth contours are indicated at 1.0m intervals as shown in Figure 3.3.1.

The bathymetric survey indicates that the water depth of the Galle Bay increases gradually in the southerly direction from the innermost part of the Bay. The -10.0 m contour line runs approximately 200 m north of the tip of the Fort area to about 200 m west of Watering Point; the depth increases gradually with increasing distance in offshore direction to attain -13.0 m in the center of the bay mouth forming the Fort - Watering Point line and finally -20.0 m in the waters about 1,200 m south of the bay mouth center. However, the water area between the -10.0 m contour line and the 20.0 m line is scattered with rocks and the seabed is characterized by sharp rises and falls.

(3) Sonic Prospecting

Sonic prospecting of the seabed has been carried out in order to evaluate the depth to bedrock surface in Gall Bay. The area subjected to sonic prospecting is the same with above-mentioned bathymetric survey. Survey results are processed and plotted in the same manner as the above-mentioned bathymetric survey, thus sonic prospecting chart was prepared with a scale of 1:10,000, 1.0 m interval of depth contours as shown in Figure 3.3.2 and based on Chart Datum.

The sonic prospecting survey shows that the basement rock is encountered in the water depth range of -10.0 m to -14.0 m on the west of the existing access channel, while it is found at depths less than -10.0 m in the northwest of the innermost part of the Bay.

On the north of Watering Point the basement rock formation rises and falls sharply and is distributed in the depth range of 0 m to -20.0 m. The basement rock has a distribution at relatively greater depth (more than -20.0 m) behind the central to eastern part of Gibbet Island.

(4) Topographic Survey

The topographic survey of land in the vicinity of Galle Port has been conducted in order to evaluate the land use patterns and available infrastructures around the area. The subject area of the survey is approximate 8km^2 in the vicinity of Galle Port. The survey was based on the benchmarks fixed in the National Grid of Sri Lanka. Topographic maps with the scale of 1:35,000 and 1:2,500 as shown in Figure 3.3.3 were produced.

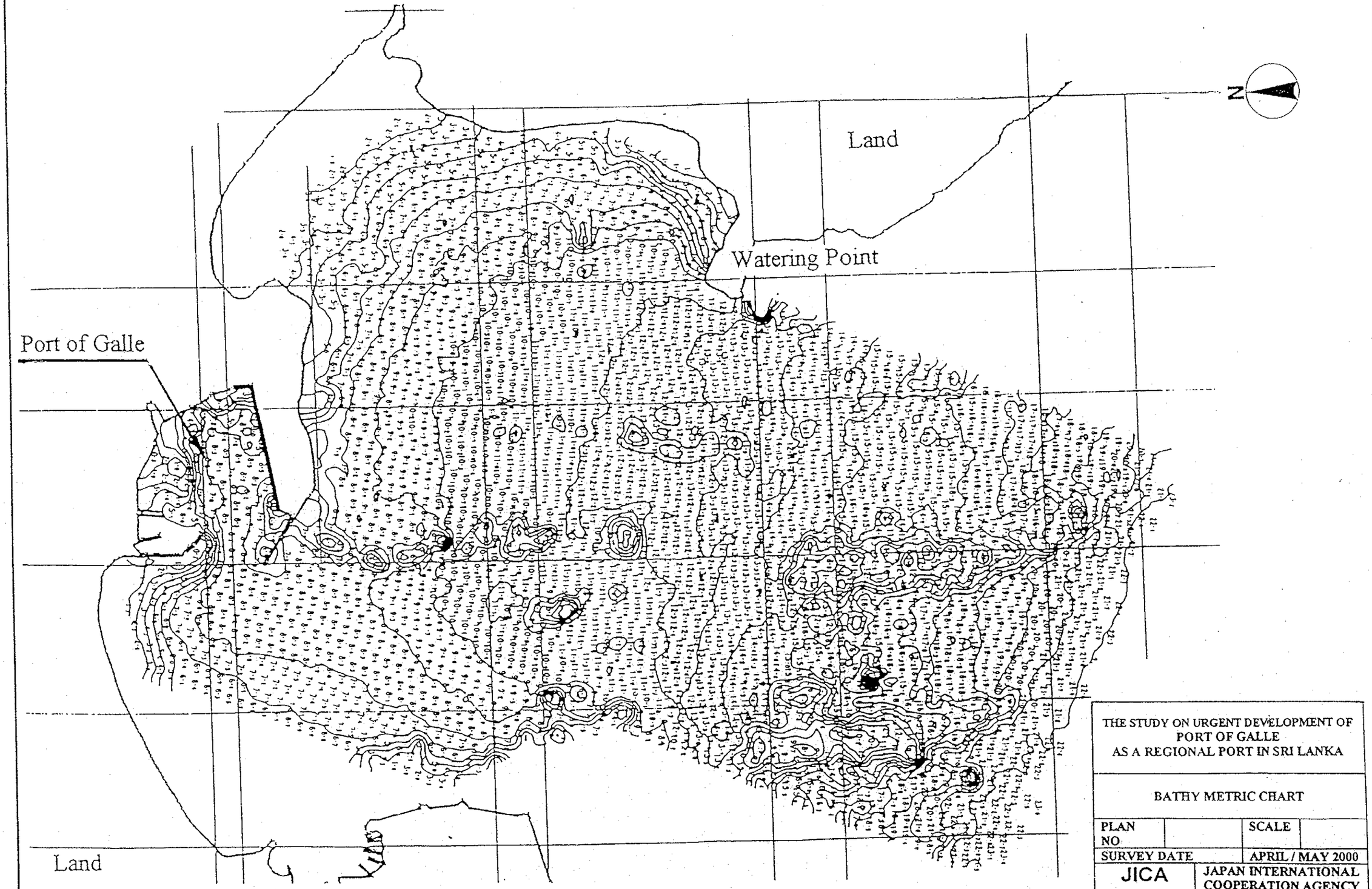


Figure 3.3.1 Bathymetric Chart

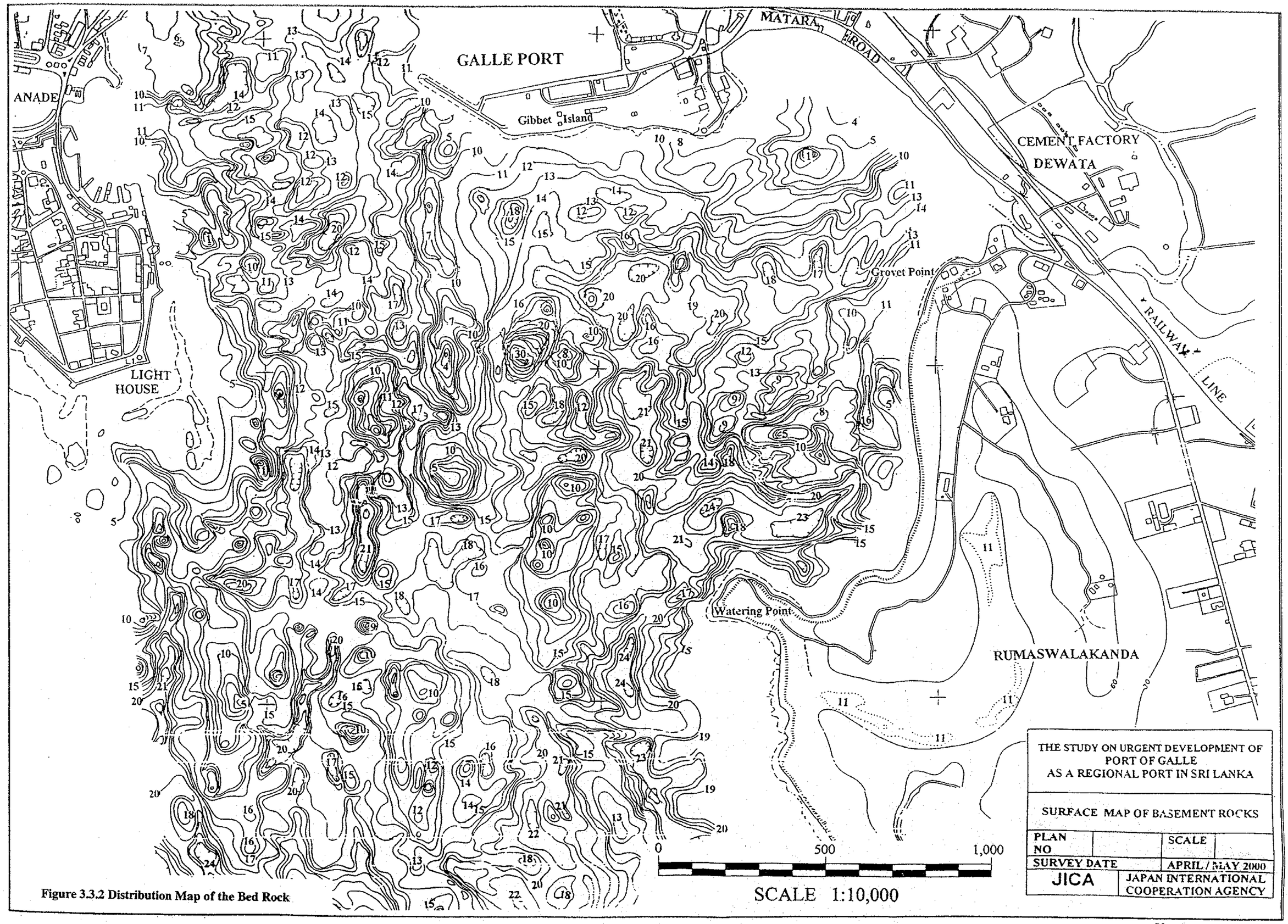


Figure 3.3.2 Distribution Map of the Bed Rock

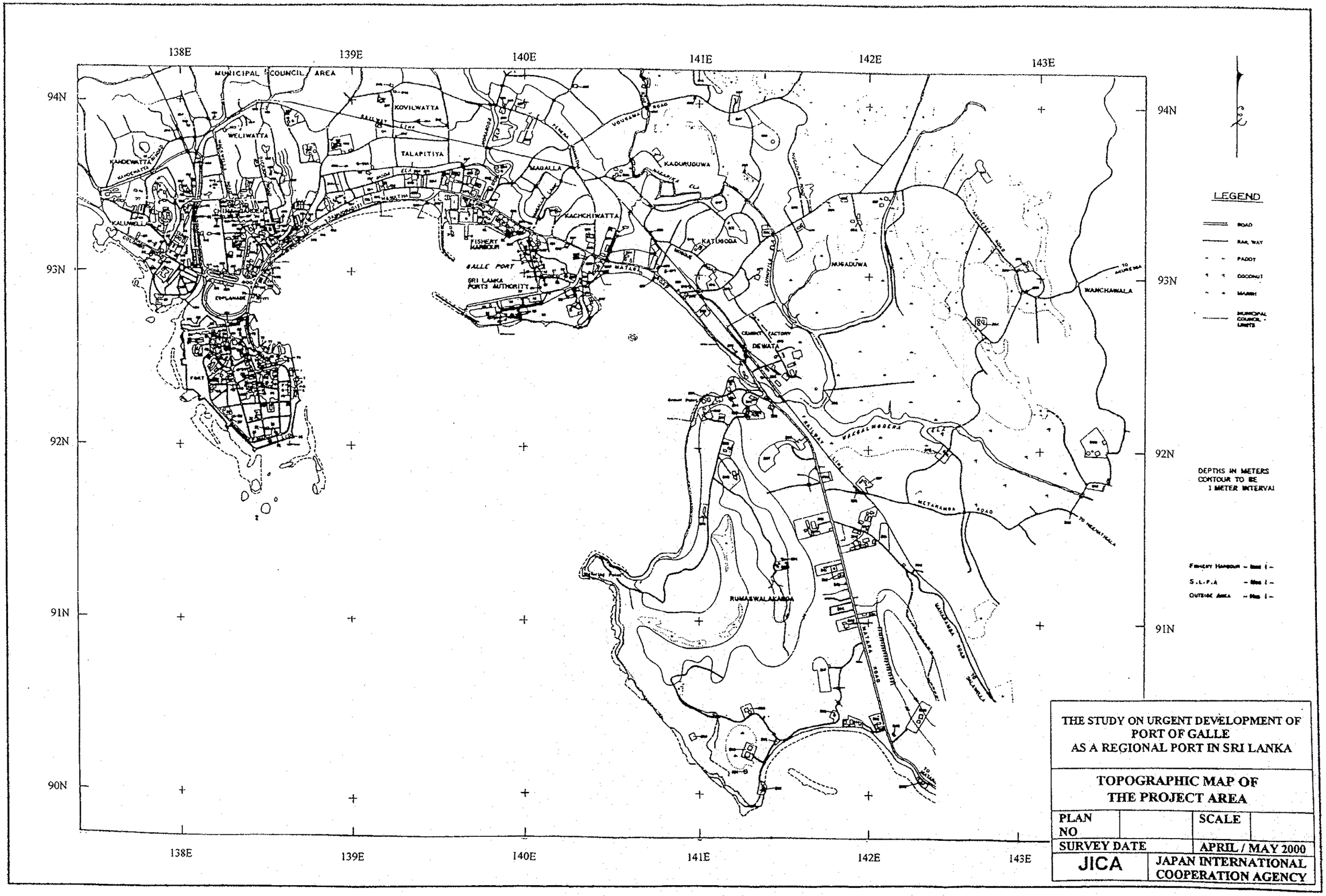


Figure 3.3.3 (1) Topographic Map of the Project Area

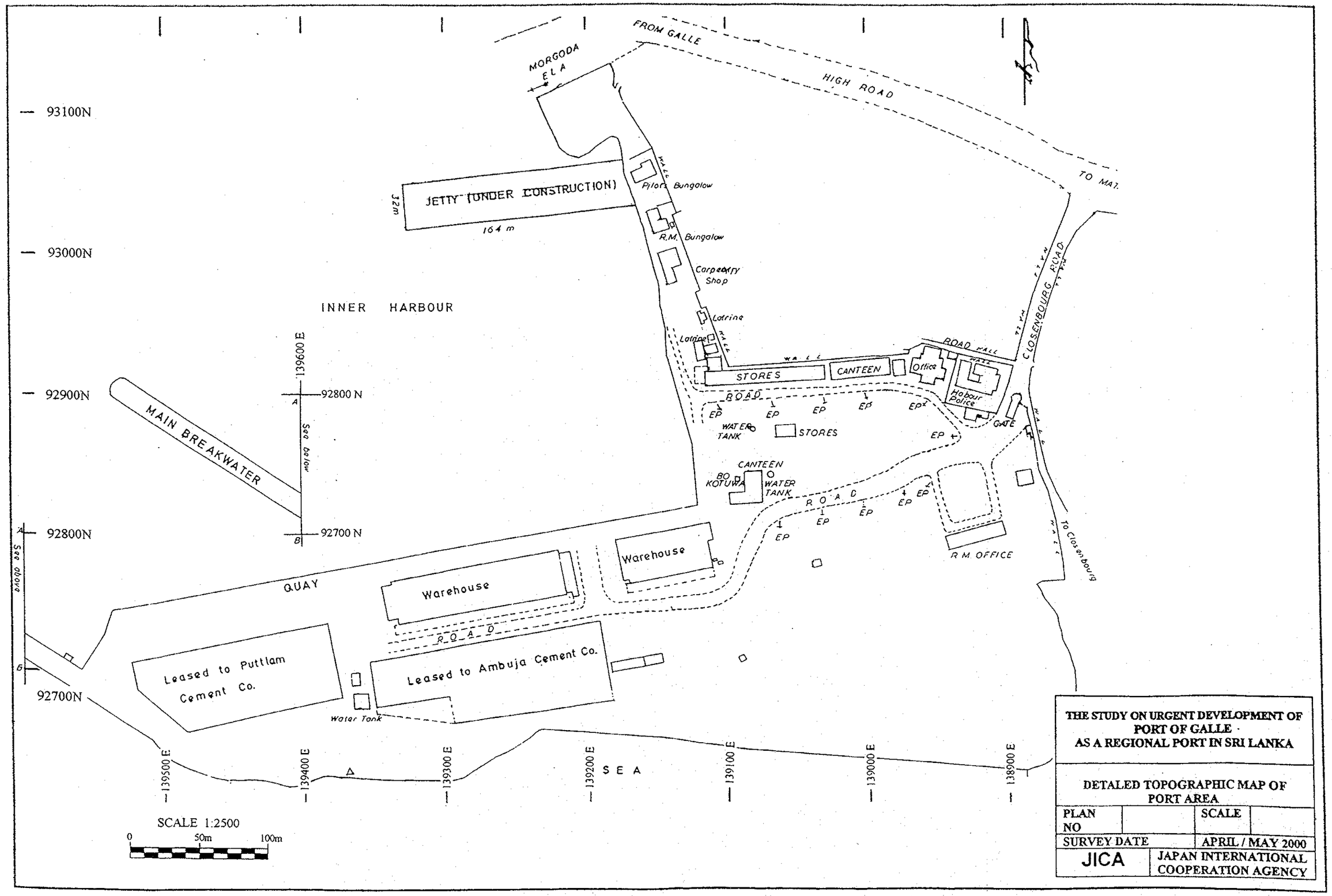


Figure 3.3.3 (2) Topographic Map of the Port Area

Chapter 4 Present Conditions of Galle Port

4.1 Location and Brief History of Galle Port

Galle Port is located in Galle Bay about 120 km south of Colombo Port on the south- west coast of Sri Lanka and its location is nearer to main shipping routes between the East and the West than Colombo Port. Galle Port is the only commercial port on the southwest coast.

It has the longest history among ports in Sri Lanka. Galle port 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, which still exist close to the entrance of the Galle Fort, were the only port facility and cargo handling was carried out using barges.

The natural conditions of the Galle Bay are characterized by swells, in particular 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.

Many plans to improve the conditions of Galle bay have been formulated and some date back to the middle of the 19th century. It was 1971 when the present port was constructed, making use of Gibbet Island. Gibbet Island is connected to the main land by reclaimed land 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.

According to the request of the Sri Lankan Government, JICA carried out the development study of Galle Port and submitted the Final Report in 1991. The Study proposed to develop Galle Port as a supplementary port of Colombo Port to alleviate the burden of container transshipment cargo on Colombo Port. The Plan called for two container berths, one general/bulk cargo berth and one oil jetty in short-term development plan and three container berths, two general/bulk cargo berths and one oil berth in long-term development plan. Although the Sri Lankan Government tried to develop Galle Port on BOT scheme, the plan was not realized.

4.2 Existing Port Facilities and Their Usage

The entrance of the Port is around 500 ft. (152m) wide and consists of two rubble mount breakwaters. The quay wall starts from the base of the south breakwater. The length of quay wall is about 420m and the first 60m of the quay on the western side is used for small vessels such as a tugboat and ship chandler service boats. Next to this part, the 300m section from the 1st bollard to 16th bollard is used for cargo vessels' berths. The present depth of the berths is less than 8m (despite the designed depth of 8.9m) because of siltation. Now, urgent dredging works are being carried out and in a couple of months depth of the berth and mooring basin will be 8.9m.

There are two warehouses with respective of 2,000m^2 and 4,000m^2. The smaller one is leased to the army and surrounded by barbed wire. The larger one is used for storing bagged flour.

Backyard of the quay wall and warehouses is leased to Cement Companies. One cement bagging plant (Galle Cement) has already been in operation from July in 1999, the other (Ceylon Ambuja