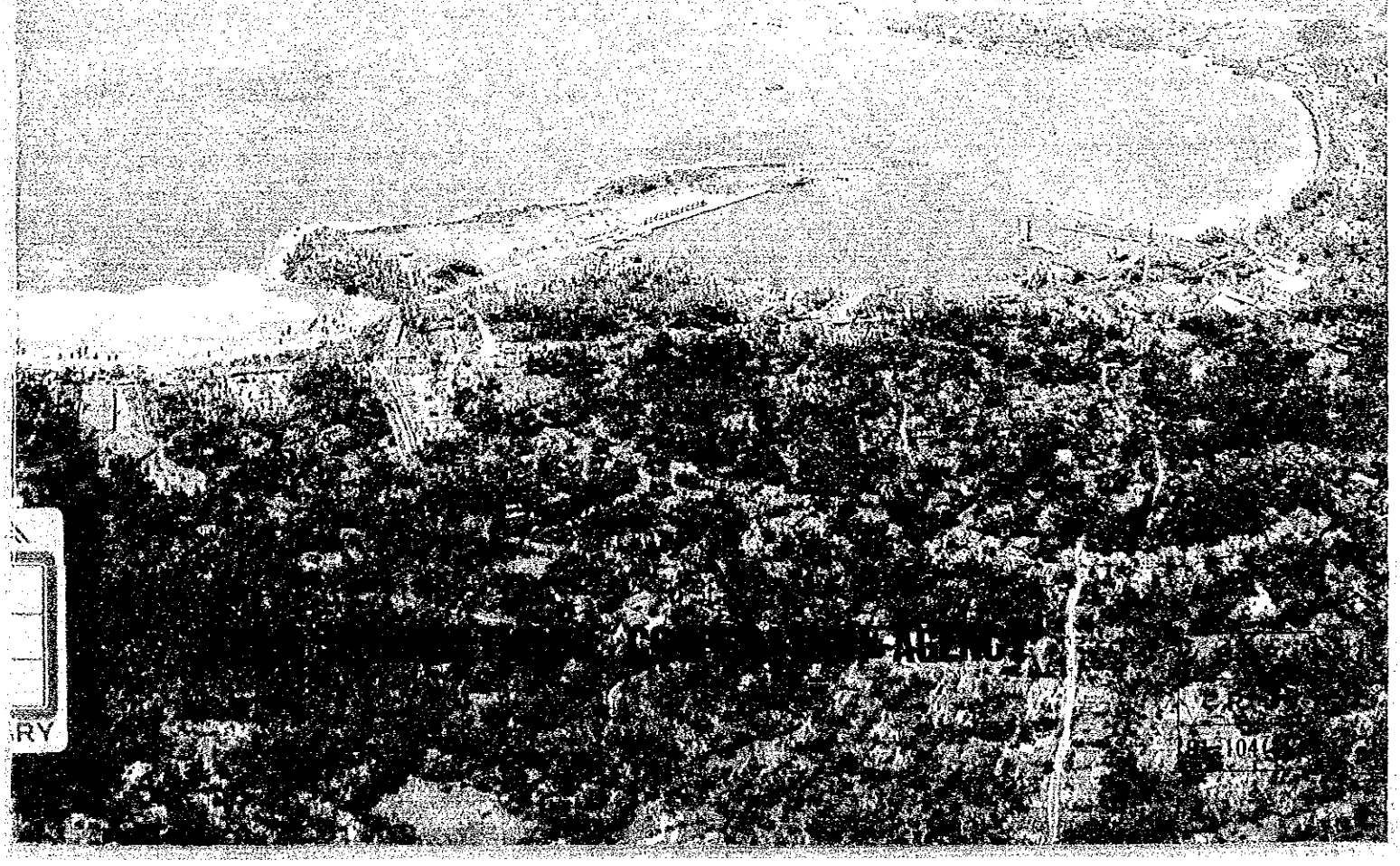
社会開発調査部報告書

No. 102

FINAL REPORT

THE STUDY ON THE DEVELOPMENT OF THE PORT OF GALLE IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

NOVEMBER 1991 SUMMARY



FINAL REPORT

THE STUDY ON THE DEVELOPMENT OF THE PORT OF GALLE IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

NOVEMBER 1991 SUMMARY

PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a feasibility study on the Development of the Port of Galle and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a study team headed by Mr. Haruo Okada, Executive Director of the Overseas Coastal Area Development Institute of Japan, four times between September 1990 and September 1991.

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

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

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

November 1991

Kensuke Yanagiya
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

November 1991

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Dear Mr. Yanagiya

It is my great pleasure to submit herewith the Final Report for the Study on the Development of the Port of Galle in the Socialist Republic of Sir Lanka.

The report is the result of studies carried out by the Overseas Coastal Area Development Institute of Japan(OCDI) and Japan Port Consultants, Ltd.(JPC) at the contract of the Japan international Cooperation Agency(JICA). The study team conducted four field surveys between September 1990 and September 1991.

Based on the findings of these surveys and on data and information collected and analyzed in Japan, the masterplan was formulated with a target year of 2005. Moreover, the short-term development plan was formulated with a target year of 1997, including a feasibility study.

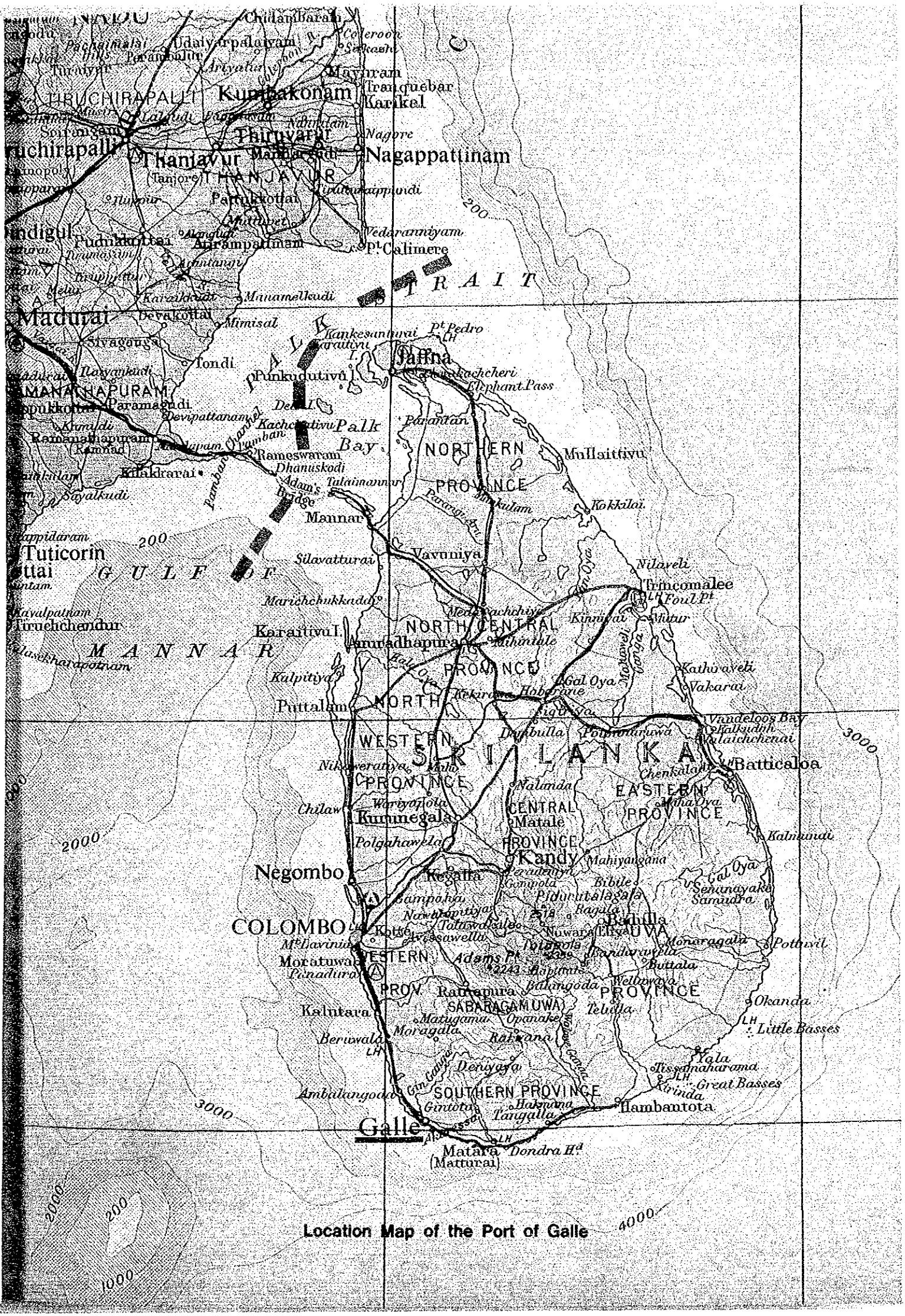
The study shows that the development of the Port of Galle is extremely important. We, therefore, earnestly hope that measures will be taken to implement this project.

On be half of the study team, let me express my heartfelt thanks for the generous cooperation, assistance and warm hospitality extended to the study team during their stay in Sri Lanka.

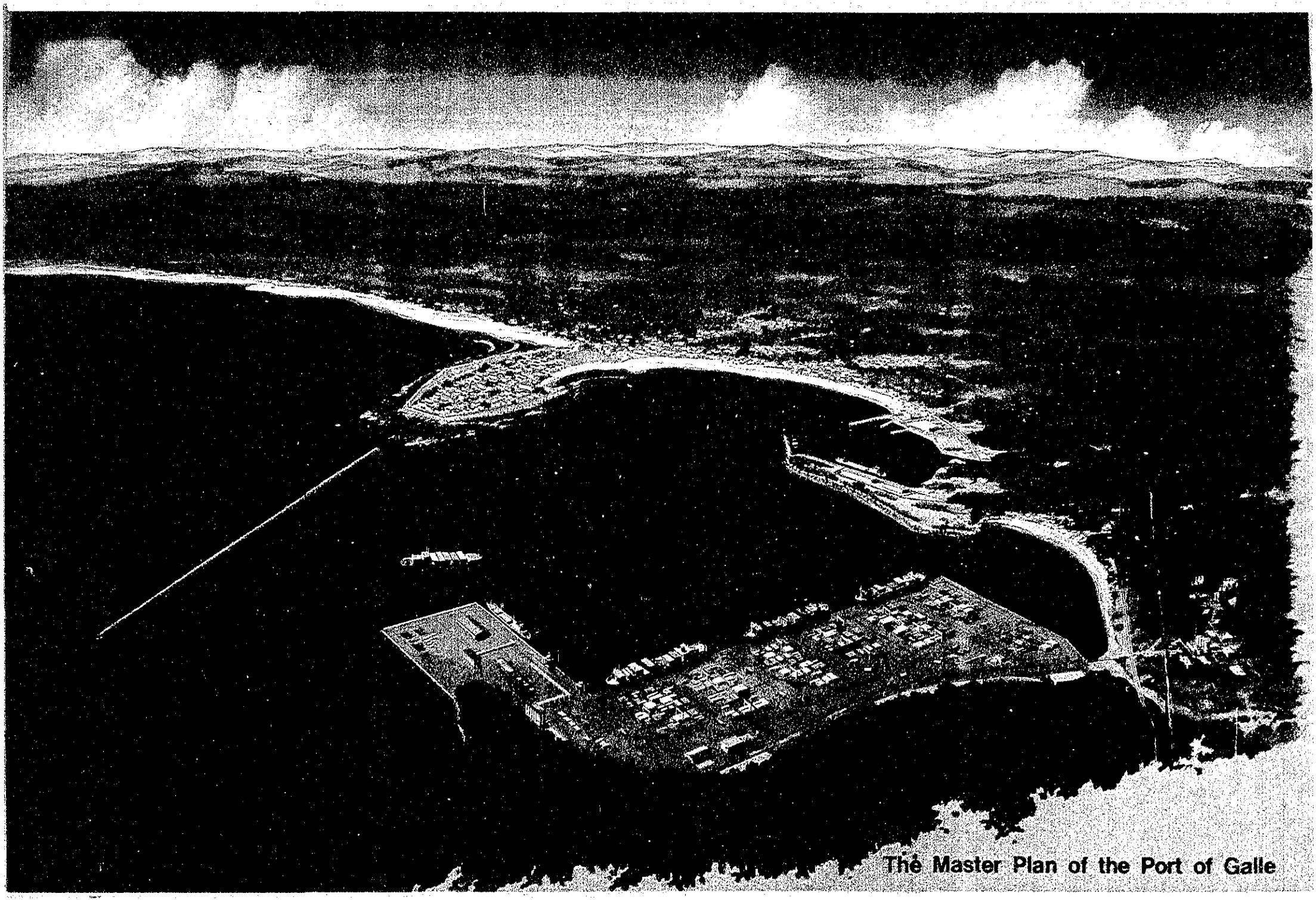
Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport, the Japanese Embassy and the JICA Office in Sri Lanka for their valuable advice and assistance during the field surveys and preparation of this report.

Yours Faithfully,

Haruo Okada
Leader
Japanese Study Team for the Development
of the Port of Galle
(Executive Director, Overseas Coastal
Area Development Institute of Japan)



Location Map of the Port of Galle



The Master Plan of the Port of Galle

Abbreviation List

A	ADB	Asian Development Bank
	APL	American President Lines
	ASEAN	Association of South-East Asian Nations
	ave.	average
B	BOD	biochemical oxygen demand
	BOT	build, operate and transfer
	BXCL	Bengal Express Container Line
C	C°	centigrade
	CC	Sri Lanka Cement Corporation
	CCD	Coast Conservation Department
	CFC	Ceylon Fertilizer Corporation
	CFC	conversion factor for consumption
	CFS	container freight station
	CIF	cost, insurance and freight
	COBRA	Continental Britain Asia Container Service
	COD	chemical oxygen demand
	CPC	Ceylon Petroleum Corporation
	CSC	Ceylon Shipping Corporation
	CSL	Ceylon Shipping Lines
D	DL	datum level
	DWT	dead weight tonnage
E	EC	European Community
	EIRR	economic internal rate of return
	EPZ	export processing zone
F	FAO	Food and Agriculture Organization of the United Nations
	FIRR	financial internal rate of return
	FOB	free on board
	F/S	feasibility study

G	GB	gigabyte(s)
	GCEC	Greater Colombo Economic Commission
	GDP	gross domestic product
	GNP	gross national product
	GRT	gross registered tonnage
	Gwh	gigawatt(s)-hour
H	ha	hectare(s)
	HP	horsepower
	hr	hour
	HWL	high water level
	HWOST	high water of ordinary spring tide
I	IBRD	International Bank for Reconstruction and Development
	IMF	International Monetary Fund
J	JCT	Jaye Container Terminals
	JICA	Japan International Cooperation Agency
K	kg	kilogram
	kHz	kilohertz
	km	kilometer(s)
	kv	kilovolt(s)
L	L-M	Little and Mirrlees
	LOA	length over all
	LWOST	low water of ordinary spring tide
M	m	meter(s)
	mm	millimeter(s)
	Mn.	million
	MSL	mean sea level
	MOST	Ministry of Surface and Transport
	M.T.	metric ton(s)
	Mw	megawatt(s)

N	n.a.	not available
	NFS	National Fertilizer Secretariat
	NIES	Newly Industrializing Economics
	NNP	New North Pier
	NWSDB	National Water Supply and Drainage Board
O	OCC	opportunity cost of capital
	OECD	Organization for Economic Cooperation and Development
	OECF	Overseas Economic Cooperation Fund of Japan
Q	QCT	Queen Elizabeth Container Terminal
	QEQ	Queen Elizabeth Quays
R	r	correlation coefficient
	Rs	Rupees
S	SAARC	South Asian Association of Regional Cooperation
	SCF	standard conversion factor
	SDR	special drawing right(s)
	SLR	Sri Lanka Railways
	SLRTBs	Sri Lanka Regional Transport Boards
	SLPA	Sri Lanka Ports Authority
T	TEU	twenty-foot equivalent unit
U	UAE	United Arab Emirates
	UDA	Urban Development Authority
	UK	United Kingdom
	US	United States
	USA	United States of America
	USAID	United States Agency for International Development
	USSR	Union of Soviet Socialist Republics
W	WDL	work datum level

Exchange Rate

US$1.00 = Rs.41.00 = ¥138.85

CONTENTS (SUMMARY)

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Significance of the development of the Port of Galle

From the international shipping points of view, the Port of Galle offers a very advantageous location. It is extremely important to take advantage of this favorable location. Therefore, we should pay attention to its possible function as transshipment base for container cargo. There has been a tendency for large container vessels to decrease their number of port calls as the size of the vessels increases, a tendency which is seen as economically favorable. As a result, economically advantageous ports are selected as hub ports in the main world shipping route. The Port of Colombo is one of those ports. And because of its more advantageous location, the Port of Galle has the potential to become a more productive hub port than Colombo. In terms of its distance from the main shipping route, it is expected that the Port of Galle will serve as a distribution terminal for bulk cargo such as wheat in southwest Asia by using its locational advantage, which is possible scenario for the future of the international bulk cargo transportation.

Viewed from the nation-wide port development policy, it is necessary to construct a new port to supplement certain shortcomings of the Port of Colombo, in light of the fact that expansion of the Port of Colombo is impossible due to physical restrictions. Therefore, it is a matter of significance to develop the Port of Galle for Sri Lanka.

Development of the Southern Province is given the highest priority by the Government of Sri Lanka. This province has remained economically stagnant because it lacks the necessary industries capable of absorbing highly educated labor forces. Industrial development, therefore, should be facilitated as soon as possible for economic development of the province. In this sense, the development of the Port of Galle, in that it will help spearhead regional development as well as support industrial development, is considered quite important.

2. Master Plan to the year 2005

Cargo throughput of the Port of Galle at the year of 2005 is estimated at 713,000 TEU of container, 1,523,000 tons of other cargo. Wharves

mainly for handling container and bulk cargo are newly planned in the Galle Bay, leaving the existing berth to service the conventional vessels.

Alignment of new port facilities in the bay is determined only after the natural conditions such as waves and soil, present condition of land utilization and potential for future development have been carefully examined. The Galle Bay is attacked by both swells all through the year and wind-waves during southwest monsoon season that come through the mouth of the bay facing southwest. Therefore, it is indispensable to construct long breakwaters to secure calmness in the inside water area. There are scattered rocks in the surface layer covering almost the entire bottom of the bay and therefore it is necessary to dredge much amount of rocks to accommodate large vessels like the container vessel. In order to select the optimal construction site of port facilities, we formulated five alternatives to compare construction costs, the calmness of basin, future potential and so on. The selected plan, in which the front of Rumassala Hill is reclaimed to build a new wharf, is cost-effective in that the dredging cost is cheaper than the other alternatives because of the large depth and deep rock bed. The contents of the master plan are; 3 container berths (depth; -14m, length; 1050m), 2 general/bulk cargo berths (depth; -14m,-12m, length; 510m), 1 oil berth (depth; -7.5m, length; 120m, inside of the existing breakwater). A channel with a width of 300m and a depth of 14m, and a southwest breakwater with a length of 1300m are planned. Also other facilities, handling equipment, yard, warehouse, road, railways and so on are planned.

3. Short Term Development Plan up to the year 1997

(1) Content of the plan

The cargo throughput at the year of 1997 is estimated at 226,000 TEUs of container, 597,000 tons of other cargoes. Assuming that break bulk cargo is handled at the existing berth, as in the master plan, 1 container berth (depth; -14m, length; 350m),1 feeder berth (depth; -9m, length; 170m), 1 general/bulk cargo berth (depth;-12m, length;240m) and 1 oil berth (depth; -7.5m, length; 120m) are planned. The southwest breakwater (length; 1,200m) and the east breakwater (length; 165m) are also planned. Besides these,

handling equipment, warehouses and so on are also planned.

(2) Construction Cost and Implementation Program

Cost estimation was carried out based on preliminary design of facilities and the implementation program. The number of days available for construction on the sea is limited due to high waves, especially during the southwest monsoon season. Therefore, the implementation schedule is rigorous one to ensure that the service begins at the beginning of 1997. Total construction cost amounts to US$ 334.61 mill and foreign portion is US$ 245.29 mill accounting for 73.3%.

(3) Management and Operation Program

A new organization needs not to be established to administrate and operate port facilities that are to be newly constructed. The present organization presided over by the residential manager should be enlarged and strengthened. The financial aspects of this project present some difficulties (see below). Hence, allocation of personnel should be restricted to the minimum level to secure economic operation.

(4) Evaluation

Comprehensive evaluation is carried out through an economic analysis in which implementation of the project is evaluated from the national economic point of view and through financial analysis in which profitability of the project itself and financial soundness of the administration body are evaluated.

In an economic analysis, evaluation is carried out by the internal rate of return(IRR) calculated through cost benefit analysis. The objective of this project is to promote the development of the Southern Province through the development of the Port of Galle and the introduction of handling of transshipment container cargo is to spearhead the same objective. We took the revenue earned from the transshipment cargo and the savings from the inland transportation cost for local cargo as a benefit and compared it with the project cost. Considering that the breakwater, basin and channel contribute to all the facilities including ones to

be constructed in the bay after the completion of the short term plan, we divided the construction cost of them into a short term plan and a later plan. On this basis, the calculated IRR is 8.15% with 35 years of project life. This figure judged only marginally feasible compared with the international benchmark. However, since some indirect benefits, such as the increase of employment and income related to port activities in the hinterland are likely to result from this project and providing that other projects in the Southern Province development plan are promoted so that full utilization of port facilities can be achieved, this project is ranked as one to be implemented.

In the financial analysis, we calculated the financial internal rate of return (FIRR) by the discount cash flow method and made tables of financial statements. There is some margin for fare-hike comparable to those of neighboring countries concerning the handling charge of container transshipment. Then, 20% fare-hike is assumed. It is also assumed that 85% of the construction cost is loaned by the Government; a low interest long term loan is provided by the foreign country and the rest of it is procured from local financial organizations. The construction cost of the breakwater and channel for the initial cost is too vast to burden SLPA within the short term plan, and nor do these facilities bring any direct benefit. Therefore, it is assumed that the SLPA will not bear that construction cost.

Financial internal rate of return is calculated at 4.99% on the basis of these conditions. This rate is higher than the average procurement interest rate of 4.03%, thereby preserving the profitability of the project. On the other hand, according to estimated financial statements of the SLPA, financial soundness of the SLPA is maintained solely from the profit provided by port activity in Colombo. Therefore, we conclude that this project is feasible from a financial aspect from both the viewpoints of profitability and financial soundness providing that the SLPA does not pay for the construction cost of the breakwater and channel.

Recommendations

The development of the Port of Galle is not only the best way to utilize its advantageous location and increase national profits for Sri Lanka; it would also reap benefits for the Southern Province. Based on these projections, the development of the Port of Galle is of prime importance.

Based on the analysis it was found that the implementation of a single port project is only marginally viable from an economic point of view, as construction costs would be higher due to the need for a long breakwater to secure calmness in the basin and because the hinterland area of the port is underdeveloped. It is, however, judged to be a project worth launching, one that will spearhead development of the Southern Province, provided that other projects in the Province are facilitated as planned and industrial development keeps pace with the port development so that full utilization of port facilities can be achieved. For the implementation of this project, we strongly recommend that the following steps be taken:

(1) It is indispensable to foster port related industries in the hinterland to increase feasibility. Accordingly, prospect precisely the concrete schedule of port utilization through examining feasibility of port related industries in the development plan of the southern province.

(2) Introduction of container transshipment cargo is the key to success in the initial stage of this project. Accordingly, utilization of the port by desirable clients such as big shipping lines should be secured. It is necessary to get promises from the shipping lines that the port will indeed be called on.

(3) As the development of the Port of Galle is an important project for spearheading the development of the Southern Province, some special strategical decision should be made to ensure that the expected results are realized. Namely, the Sri Lankan Government should offer financial incentive to promote this project. It is impossible financially to implement this project for SLPA, when the

construction cost of breakwater and channel dredging is paid without the full support of the Government.

(4) Self-help by SLPA itself is also needed. SLPA should make an effort to accumulate internal reservation through an efficient operation in the Colombo port, which would result in financial soundness. Finally it is necessary to carefully inspect the change of the financial condition after beginning the construction of the new berth.

PART I GENERAL DESCRIPTION OF PRESENT CONDITIONS

1 INTRODUCTION

1-1 Background of the Study

Sri Lanka's international trade is on the rise due to the economic development of the country. The Port of Colombo, the main port in the country, plays a very important role as a transshipment port in world shipping because of the development of containerization in shipping and Colombo's advantageous location between the West and the East.

In particular, by dint of the formulation of a master plan through Japanese technical cooperation and construction of port facilities using Japanese yen loans, more rapid growth of transshipment cargo volume has been brought about, and Colombo Port is now contributing not only to the development of Sri Lanka's trade but also to the accumulation of foreign currency.

As the amount of container cargo handled at this port is still increasing, the SLPA is now constructing new port facilities. However, it is acknowledged that there are many difficulties in enlarging the port facilities because of the physical condition of the port. Therefore, the necessity of formulating a plan for a port supplementary to the Port of Colombo is increasing.

Since the Port of Galle (hereinafter referred to as "the Port") is located not far from the Port of Colombo and is very close to major shipping routes, the Port has a high priority as a port supplementary to the Port of Colombo.

However, the southern region of this country is comparatively underdeveloped, and development of this region is one of the most important subjects for the country. Therefore, there are high hopes that the Port's development will spearhead the development of this region.

On the basis of the situation described above, the Government of Sri Lanka has requested the Government of Japan to provide technical cooperation in conducting a study for development of the port of Galle.

1-2 Objectives of the Study

Based on the above, the objectives of the study are summarized as follows:

(1) To prepare a Master Plan for the development of the Port of Galle up to the year 2005 to spearhead the regional development of the Southern Province.

(2) To conduct a Feasibility Study of the Short Term Development Plan for the Port of Galle within the framework of the Master Plan. A Short Term Development Plan shall be prepared for the period up to 1997, giving consideration to adequate arrangement of the main breakwaters and channel alignment to secure safe navigation as an urgent necessity.

(3) To make technical transfer to the counterparts in the process of the study.

1-3 Scope of the Study

The study will be carried out according to the flow chart shown in Figure 1-1-1.

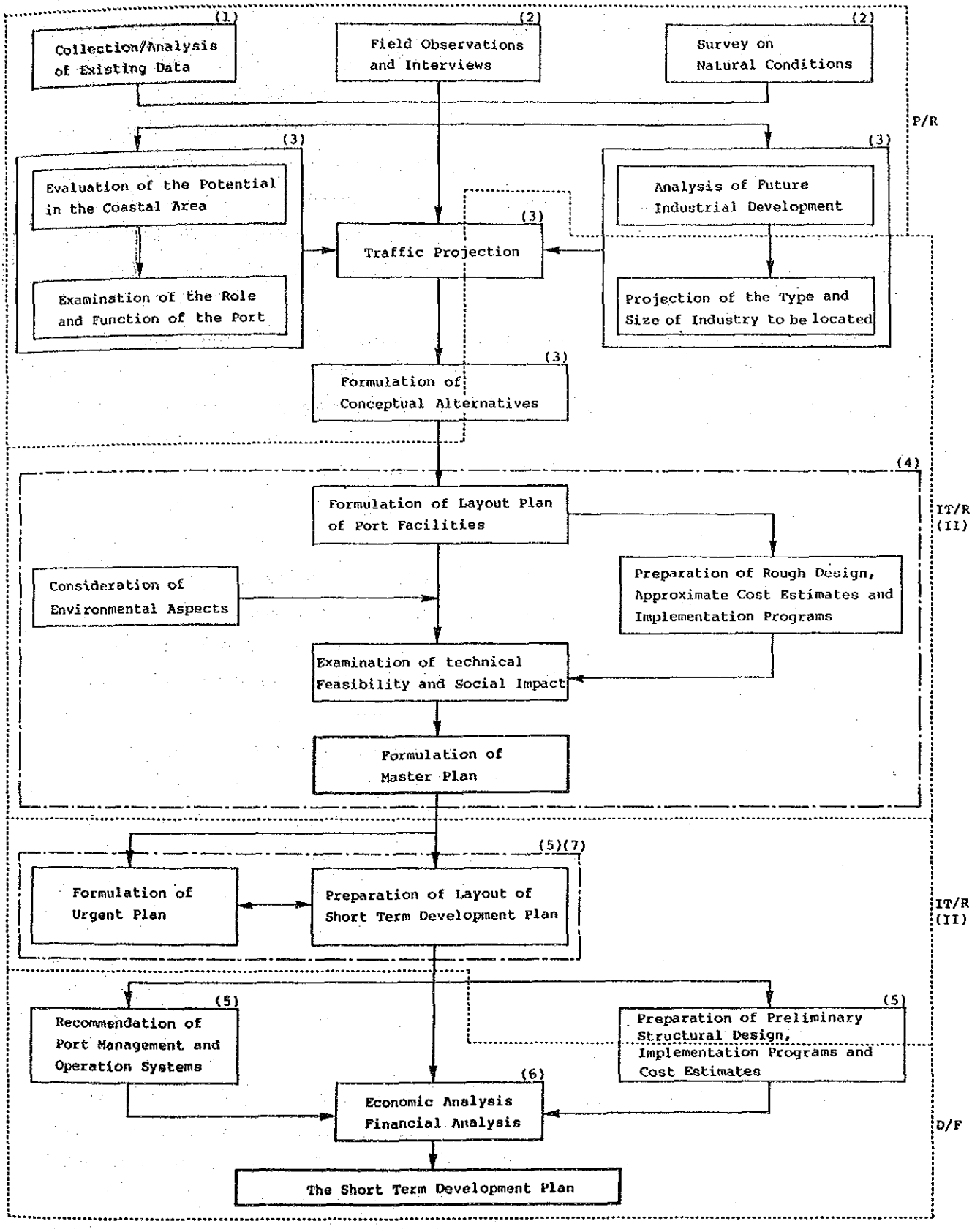


Fig. 1-1-1 Overall Study Flow

2 GENERAL DESCRIPTION OF SRI LANKA

2-1 Geography and Topography

Sri Lanka, an island in the Indian Ocean, is located at the east-southeast tip of the Indian subcontinent and situated from 6 to 10 degrees north latitude and from about 80 to 82 degrees east longitude. Sir Lanka has a maximum length of 432 km and a maximum width of 224 km and an area of about 65,000 km^2.

The island consists of 9 provinces: Western, Central, Southern, North-Western, Sabaragamuwa, Northern, Eastern, Uva and North-Central, and 25 districts. The capital of Sri Lanka is Sri-Jayawardenepura (Kotte).

2-2 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 southwest quarter of the island receives 500mm to 4,000mm of rain and the rest of the island receives less than 500mm of rain in the Southwest Monsoon, period. On the other hand, the whole island receives 500mm to 2,500mm of rain in the Northeast Monsoon period.

The temperature is almost constant through the year, at about 26 °C.

The average humidity is relatively high, at more than 75%.

2-3 Socioeconomic Activities

2-3-1 population

According to the estimation of Central Bank of Sri Lanka, the total population of Sri Lanka at the end of 1989 was 16.81 million, compared with 16.59 million at the end of 1988. The average growth rate of the population from 1980 to 1989 was about 1.5% per annum.

The population of Sri Lanka is mainly made up of Sinhalese, as well as a few other ethnic groups such as Sri Lanka Tamil, Indian Tamil, Sri Lanka

Moors, Burghers and Malays. According to the 1981 census, Sinhalese comprise 74% of the total population. The religious affiliations as enumerated in the 1981 census showed that of the total population 69.3% were Buddhists, 15.5% Hindus, 7.6% Christians (of which 90% were Roman Catholics) and 7.5% were Muslims.

2-3-2 National income

In 1989, the Sri Lanka economy achieved a relatively modest rate of economic growth. The gross domestic product (GDP) of Sri Lanka at current prices in 1989 was Rs.228,373 million, an increase of 12.2% over 1988. And the GDP at 1982 constant pices in 1989 is Rs.121,729 million. The growth rate is 2.3%, compared with a growth rate of 2.7% in 1988. The average annual growth rate of GDP from 1982 to 1989 is about 3.7%. This rate is slightly lower than the value predicted by the government of Sri Lanka because of interruptions by a series of civil disturbances.

The average growth rate of value-added in the agricultural sector from 1982 to 1989 was only 1.5%, due to difficulty in increasing production of three major crops: tea, rubber and paddy. However, growth of 6.0% during the same period was in the manufacturing sector due to the contribution of factory industries, especially in the private sector. Sectors with high average growth rate are the public administration sector, the banking sector and the mining sector. Sectors with low average growth rate are the service sector and the construction sector.

The gross national product (GNP) of Sri Lanka at current prices and at 1982 constant prices in 1989 were Rs.222,467 and Rs.118,791, respectively. The GNP per capita at current prices was US$367 in 1989.

2-3-3 Trade

The characteristics of Sri Lanka's trade are exports of primary products such as tea, rubber and coconut products, and imports of consumer goods such as rice, flour, sugar, milk, motor cars & cycles and miscellaneous goods as well as imports of intermediate goods such as petroleum, fertilizer, chemicals, paper, wheat and textiles and investment goods such as machinery. However, the export of industrial products, especially textiles & garments has increased remarkably in recent years.

The balance of trade of Sri Lanka has been in the red, but this shows a downward trend. The balance in 1989 reflected a trade deficit of Rs.24,050 million (SDR 521 million), which was 8% lower than the previous year's deficit of Rs.24,102 million (SDR 564 million) on a SDR basis.

Export composition has gradually changed. The most noticeable changes were the rise in the share of industrial exports from 48% to 51% and a corresponding decrease in the share of agricultural exports from 43% to 39%, from 1988 to 1989. Textiles and garments continued to be the major export category, accounting for 31% of total exports in 1989. Meanwhile, the share of plantation crops in total exports dropped further to 35%.

The exchange rate of the Sri Lanka Rupee against U.S.Dollar in 1980, 1983, 1986 and 1989 are 9.00, 25.00, 28.52 and 40.00 Rs, respectively.

2-3-4 Prices

The average annual rates of increase in consumer prices in Sri Lanka in the past five years and the past ten years were 8.5% and 12.6%, respectively.

The average annual rate of increase in wholesale prices in Sri Lanka over the past five years was 3.7%.

2-3-5 Employment

The unemployment problem in Sri Lanka was both the result of an increase in the size of entrants into the labor force, with better education and higher aspirations, as well as the slow growth of the economy.

A Labour Force & Socioeconomic Survey was carried out by the Department of Census and Statistics in 1985/86. The survey estimated that the unemployment rate was about 14%. However, current information on the employment and labour market situation in Sri Lanka is limited.

2-4 Transpiration

2-4-1 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. The system has a total track length of 1,394km of broad gauge and 59km of narrow gauge.

The SLR as of 1985 operated its broad gauge track with 237 locomotives and 1,366 passenger coaches along with 3,840 goods wagons.

In 1989, the SLR carried 1,677 million passenger-km, as compared with 1,859 million in 1988, a decrease of 9.8%. The SLR also carried 178 million ton-km of freight, as compared with 198 million in 1988, showing a decrease of 10.1%.

2-4-2 Roads

Colombo, being the country's administrative and commercial center, is connected to district capitals and the main urban centers through a road network of Class A roads, which are paved and bitumen-surfaces. There are 4,050km of such roads, which are supported by a network of Class B roads connecting other important towns. These are metaled and bitumen-surfaced and have a total length of 4,875km. Minor roads are classified as Class C, D and E. These have total lengths of 10,409km, 5,418km, and 714km, respectively.

Sri Lanka has a total of 86,200km of roads of all categories, of which 29,747km are bitumen-surfaced. The Department of Highways maintains 25,466km (25,684km in 1988) of roads, which are mentioned above paragraph. The total length of roads available for motor transport is about 30,000km. The all-island road density is 1.31km per km^2; the density of paved roads is 0.45km per km^2.

Motor traffic has shown fairly rapid growth since 1975, the most noticeable increase being in motorcycles and private coaches (a kind of minibus), showing more than ten and twenty-fold increases between 1975 and 1988, respectively. Private cars also increased about from 92,000 to 187,000 during the same period.

2-4-3 Sea Transport

Until recent times, sea transport in the island was handled by foreign shipping companies. In 1954, the Ceylon Shipping Lines Ltd. (CSL) was formed. CSL now operates as a subsidiary of the Ceylon Shipping Corporation (CSC) and provides a coastal shipping service together with a feeder service linking Indian ports and those of other countries with Colombo.

Ship haulage in Sri Lanka is provided by ports. These ports are managed and operated by the Sri Lanka Ports Authority (SLPA), which was established as a government-owned corporation in 1979. In recent years, the port of colombo has been modernized in order to expand its capacity to cater to the requirements of larger vessels with container facilities. The port of Colombo now can satisfactorily function as a pivotal port handling transshipment containers in this region.

The volumes of cargoes handled at Colombo, Galle and Trincomalee ports in 1989 were 10.429, 0.214 and 1.184 million tons, respectively.

2-4-4 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. The project included the construction of a second runway, expansion of the apron and the construction of fully equipped passenger and cargo terminals. The airport now has the capacity to handle over one million embarking/disembarking passengers per annum.

Air Lanka, the national carrier, was founded in 1979 to replace Air Ceylon and now operates a fleet of five Tristars and one B737, of which two aircraft are owned by the airline. It provides international services to 24 cities in 19 countries.

Air Lanka carried approximately 720,000 passengers and 2,832 million passenger-km 1988.

3 GENERAL DESCRIPTION OF THE SOUTHERN PROVINCE

The Southern Province, which seems to be the hinterland of the Port of Galle, is one of the country's nine provinces, and is located along the entire southern coast of Sri Lanka. The Southern Province is divided into the three districts of Galle, Matara and Hambantota, whose areas are about 1,650 km^2, 1,280 km^2 and 2,610 km^2, respectively.

Galle and Matara districts are in the wet zone and Hambantota District is in the dry zone.

3-1 Socioeconomic Activity

3-1-1 Population

In 1989, the population of the Southern Province was 2.10 million, 12.5% of Sri Lanka's population. The average annual growth rate in the Southern Province from 1981 to 1989 was 1.35%. This was a little lower than the national rate of 1.44% in the same period.

More than 90% of the people of the Southern Province are Sinhalese. Also, more than 90% of the people of the Southern Province are Bunddhists.

3-1-2 National Income

There are no reliable estimates of provincial GDPs in Sri Lanka, except a survey called "Strategy for the Accelerated Development of the Southern Province of Sri Lanka", carried out by the Marga Institute.

The estimates indicated that the Southern Province's GDP at 1982 factor cost prices was Rs.9,331 million, nearly 9.9% of the national GDP. The population of the province was 12.6% of the total population of the country, which means the per capita GDP of the province was considerably lower than the national average.

3-1-3 Employment

The Southern Province is one of the regions of the country that have been worst-affected by the chronic problems of high unemployment and slow

growth that characterize the Sri Lanka's economy in general. This is because the province has not participated adequately in the post-1977 phase of rapid economic growth, due to lead projects and the large-scale investments being located elsewhere.

The province's number of unemployed people in 1981 was about 148,000, nearly 16% of all the unemployed people in Sri Lanka, according to the Census of Population and Housing 1981. The unemployment rate in the Southern Province in 1990, which was provided by Galle Municipal Council was 26.0%. It was rather high compared with the national level of 18.0% in 1989.

3-2 Industrial Activity

The largest productive sector in the Southern Province is agricultural sector, which contributes approximately 30.3% of the total value added, compared with 26.4% of that of the nation in 1982 (22.7% in 1989). The share of manufacturing sector is low, at 9.4% of the total, compared with 14.4% on a national basis in 1982 (16.8% in 1989).

3-2-1 Agriculture

There are some agricultural activities in the Southern Province. The sectoral GDP of agriculture in the province was 11.3% of the national GDP. The province accounts for only 8.5% of Sri Lanka's area, but the cultivated areas' ratio by main crops are 12.5% (paddy), 15.0% (tea), 13.7% (rubber), 12.0% (coconut) and 78.4% (cinnamon), respectively.

3-2-2 Industry

The level of manufacturing activity in the Southern Province is low and the structure is relatively undiversified. The sectoral GDP of manufacturing in the province was only 6.4% of the national GDP. It was around one-half of the population ratio.

The industries in the Southern Province are mainly agro-based. Such industries consist of the processing of agricultural products.

3-2-3 Fishery

Sri Lanka, an island country, has a coastline 1561 km in length and 230,000 km^2 as its exclusive Economic Zone.

Marine fishing in the country takes place all around the coast but is mainly confined to the continental shelf area. The area of the shelf is about 28,000 km^2, with the Southern Province having 5,100 km^2 of this, or 18.2%, and Galle District 2,150 km^2, or 7.7%.

The fishing fleet of Sri Lanka consists of around 28,000 vessels of which 2,945, or around 10%, are in the province, of which 770, or around 3%, are confined to Galle District.

Fish production in Sri Lanka in 1989 was 205,286 tons. The province's share of the nation's fish production in 1980 and 1989 was 12.5% and 17.1%, respectively.

3-2-4 Tourism

The number of tourist arrivals reached 407,230 in 1982 which was the peak year, and decreased to a half that amount in 1987. This phenomenon was caused by the eruption of civil disturbances in 1983. But tourism is gradually increasing.

Revenue from tourism accounts for 3 ~ 4% of foreign receipts. Though this percentage is small, the revenue from tourism helps the economy.

The main resources regarding tourism can be described in the following five items:

- Beach resorts
- Highland resorts
- Wildlife national parks
- Ancient relics
- Gem shopping

The Southern Coast abounds with areas of scenic and recreational value as well as places of archaeological, historical and cultural significance.

In particular, there are many hotels on the coast from Colombo to Galle. Marine and beach resorts are the most significant tourism resources on the South Coast for foreign tourists. According to data from 1989, the

total number of foreign tourist nights in the South Coast was about 30% of those for the whole country. Therefore, the South Coast plays a very important role in tourism.

3-3 Infrastructure

3-3-1 Transportation

The characteristics of the Southern Coastal Line are as follows:

Gauge:	Broad Gauge (5' - 6', 1,676 mm)
Route:	Colombo Fort to Matara
Length:	156,818 m

The main roads in the Southern Province are as follows:

A 2:	Colombo - Galle - Matara - Hambantota - Wellawaya	310km
A17:	Galle - Akuressa - Madampe	140 km
A18:	Pelmadulla - Nonagama	80 km
A24:	Matara - Akuressa	20 km

3-3-2 Water and Energy

(1) Water

Water resources are divided into two categories: surface water and groundwater. The National Water Supply and Drainage Board (NWSDB) manages a supply of surface water and the Water Resources Board controls groundwater.

According to a recent survey done by the NWSDB, there are sufficient resources of water in the Southern Province.

The existing water supply schemes in the following areas will be rehabilitated with foreign assistance in the near future. They are Matara, Weligama, Hikkaduwa, Galle, Tangalle, Hambantota, Ranna and Hungama.

(2) Energy

There are 18 power stations in Sri Lanka. And there are 25 grid stations where transmission lines are brought in for the purpose of stepping down the voltage to an intermediate level (33 KV), and for distribution to wide local areas. However, the Southern Provinces has no power station. It has one grid station whose capacity is sufficient for supplying electricity to the province.

3-4 General description of Galle City

3-4-1 Topographic condition

Galle City is divided into three zones: the western zone, the middle zone and the eastern zone.

The western zone is made up of Galle Fort surrounded by walls made of granite. The front of the Fort is a rocky and there are some places, more than 200 m off the shore, where rocks crop up on the sea surface.

The middle zone is almost flat, except for one hill which is located just behind the center of Galle City. Galle Port is located in the middle zone. The Port area is composed of both the original land area, which has plenty of rocks, and the reclaimed land area. All shores are sandy beach except for the port area.

The eastern zone is a comparatively high Hill whose name is Rumassala. The south-eastern side of this hill faces the outside of Galle Bay and has a very beautiful beach. The western side of the hill is rocky and very steep. There are no flat areas on the hill. Almost all the shoreline of the eastern zone is rocky.

Topographic conditions in water area are mentioned in Chapter 4.

3-4-2 Land Use

In the western zone (the Fort area), there are many buildings which are historical and archaeological. There is an old port which has small jetties at the outlet of the Fort. It is still used as a pilot station and the pilot boat is moored there.

The center of the middle zone runs the main coastal road and it has an administrative area, a business area, a commercial area and a residential area along the road. Tea and rubber plantations are located in the inland areas, i.e., paddy fields are located in the lower part of the inland area and plantations of tea and rubber are located at a somewhat higher inland area. The western part of the middle zone is the center of Galle City, which has a town hall, a post office, a railway station, bus terminal, markets, etc. There is a cement factory in the eastern part of this zone, but at the same time there are some less-utilized areas along the coast. The beaches next to the old port are used for small fishing boats to anchor in the western part of the middle zone.

The eastern zone is a hill which is used only for housing. As this hill is rocky, the SLPA has used some sections of it for rock excavations which were necessary for the construction works.

3-4-3 Roads and Rivers

In the middle zone, there is a two-lane paved road. In the Fort itself, there is a network of roads forming a square pattern. In the eastern zone, there is only a narrow unpaved road on the hill leading to the watering point.

There are two river mouths in Galle Bay. The river, the Mora-goda Ela, empties into the Galle Port basin, and the other, Lunuvila Ela, empties into Galle Bay on the eastern side.

With regard to the railway, it runs around 500 meters behind the main road in the middle zone.

4 NATURAL CONDITIONS OF COASTAL AREA ADJACENT TO GALLE PORT

4-1 Meteorology

Field observation records obtained by the Galle Observatory of the Department of Meteorology (located at lat. N 06°02' and long. E 80°13') during the last 10 years have been analyzed to compile the necessary meteorological data noted below.

4-1-1 Winds

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%.

4-2-1 Rainfall

The annual total amount of rainfall ranges from about 1,550 to 2,560 mm with an 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.

The maximum average monthly value of 304.1 mm has been registered in November as against the lowest average value of 50.7 mm in February. The largest daily amount of rainfall recorded during the 1980-89 period is 192.1 mm.

4-2 Oceanography

4-2-1 Waves

An adequate knowledge of the characteristics of waves attacking the port (wave height, period and direction and frequency distribution of wave

occurrence) is prerequisite for the study and especially for the evaluation of the breakwater layout plans and the sheltering effects of the breakwater structures. Further, the determination of the design waves for the breakwaters demands long-term wave observation record or substitute results obtained by calculations.

(1) Swells (Fig. 4-2-1)

The swell and wind wave characteristics of Galle Bay on the basis of the observation data by the Coast Conservation Department during the period from March 1989 to February 1990 are as follows.

The swell directions are substantially constant at SSE to SSW throughout the year. However, certain swells from W to SW directions are observed during the southwest monsoon season. The most frequent direction is south with a 63.2% frequency of occurrence, followed by SSW with 28.5%.

A maximum wave height of 2.89 m has occurred during the southwest monsoon period and swells of 1.0 m and 2.0 m or over in height occur with frequency of 88% and 8.5%, respectively, during the southwest monsoon. Wave height attains its minimum value during the northeast monsoons and swells with a height of over 0.5 m attack the port throughout the year.

(2) Wind Waves (Fig. 4-2-2)

The influences of wind waves are most significant during the southwest monsoon season with wind waves of 1.5 m or more in height generated with a frequency of nearly 50%. Wind wave heights of 2.5 m or more have occurred with a 0.5% frequency and the maximum value of 4.22 m observed in August 1989.

The most frequent wind wave directions are WSW and W with a combined frequency of 83.7%.

During the northeast monsoon, northeast wind waves are blocked by the main island, providing the calmest waters in the neighborhood of Galle Port. Wind waves in excess of 1.0 m in height occur with a frequency of only 19.3% and they range in direction from SE to ESE. They come around the southernmost tip of the island.

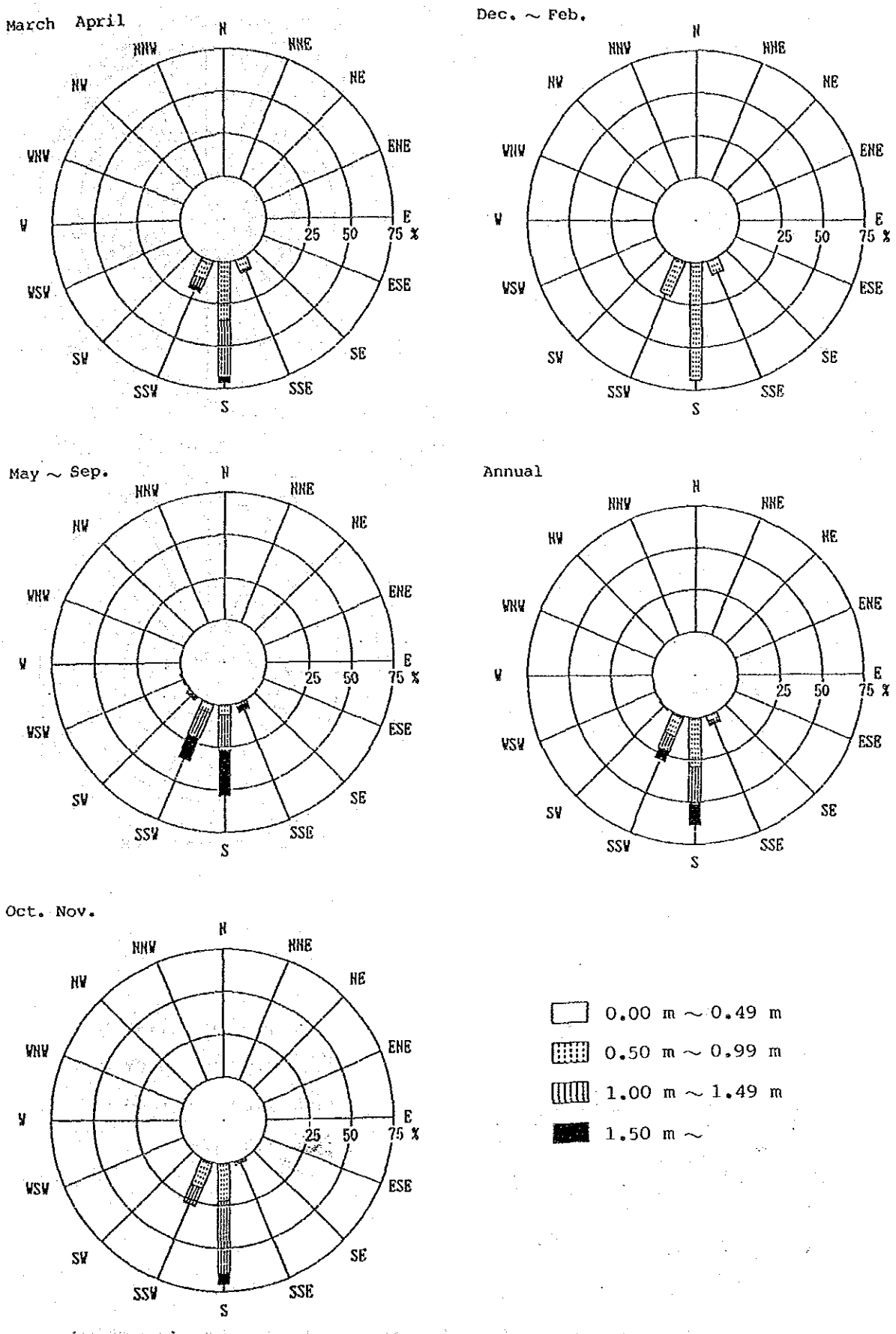


Fig. 4-2-1 Distribution of Significant Wave Height and Direction (Swell)

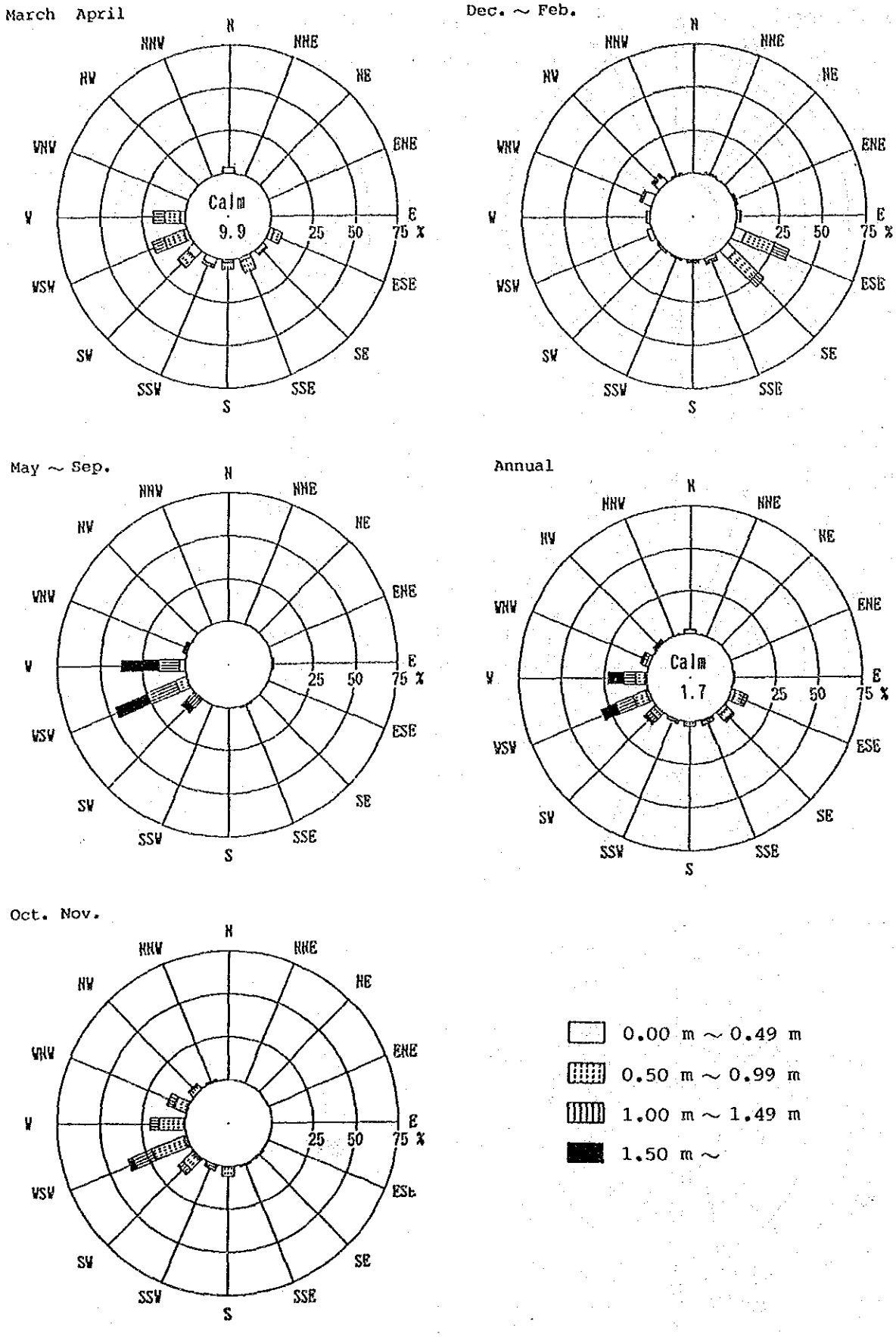


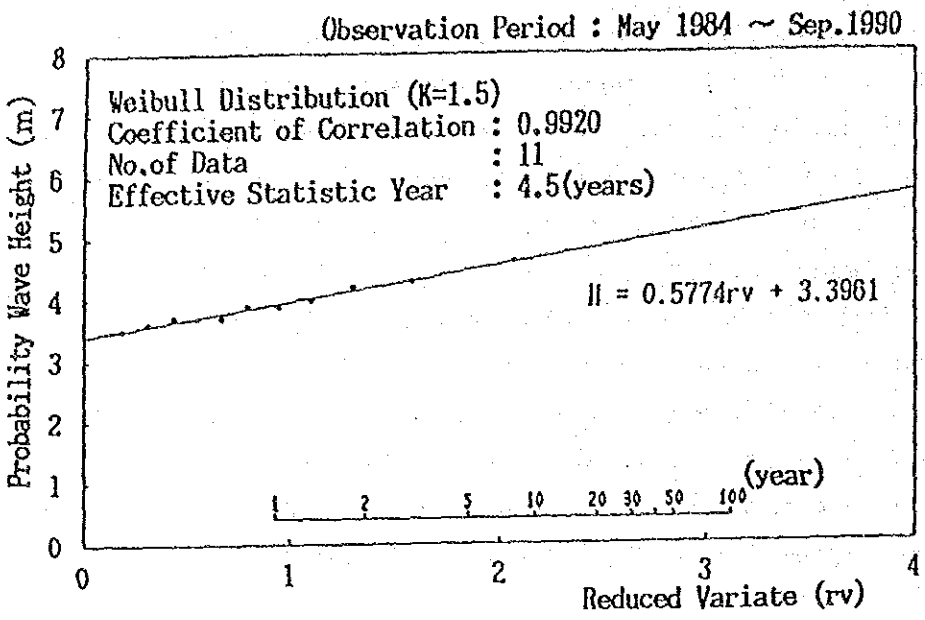
Fig. 4-2-2 Distribution of Significant Wave Height and Direction (Wind Wave)

(3) Analysis of Extreme Waves with Given Return Periods (Fig. 4-2-3)

According to the results of analysis by Gumbel-Weibull's extreme statistic method with respect to the available field wave data, the probability wave with 40 to 50 years return period was estimated to be 5.0 m in height. Taking the relatively short observation period into account for the probability wave estimation, it is necessary to consider an additional height to 5.0 m.

In addition, considering the effect of cyclones which seldom pass across the southern part of the island, a height of 5.5 m and a period of 9.5 sec have been taken for the design wave for the purpose of this study.

The design wave characteristics thus determined will have to be reviewed at the detailed design stage in the light of additional field wave data which may be made available after this study.



Return Period (year)	Non-exceeding Probability	Reduced Variate (rv)	Wave Height (m)	Wave Period (sec)
50	0.99182	2.8478	5.0	8.5
40	0.98977	2.7590	5.0	8.4
30	0.98636	2.6423	4.9	8.4
20	0.97955	2.4732	4.8	8.4
10	0.95909	2.1699	4.6	8.3
5	0.91818	1.8436	4.5	8.3
2	0.79545	1.3605	4.2	8.2
1	0.59091	0.9279	3.9	8.1

Fig. 4-2-3 Occurrence Probability of Significant Wave Height

4-2-2 Tidal Levels

The tidal levels from the tidal constituents by the Indian Tide Table are as follows:

H.W.O.S.T.(≒ H.W.L.)	0.607 m	(0.6m)
M.S.L.	0.336 m	
L.W.O.S.T.(≒ L.W.L.)	0.065 m	(0.1m)
D.L.	0.000 m	

Note: Values in brackets are based on the chart.

The work datum level (W.D.L.) currently in use at Galle Port for construction purpose is 0.43 m below the Mean Sea Level (M.S.L.), or about 10 cm lower than the calculated datum level noted above.

4-2-3 General Features of Coastline and Sand Drift

Galle Bay, located at the southwestern tip of Sri lanka, is oval-shaped and measures about 2.5 km southeast to northwest and about 1.5 km northeast to southwest and 1.8 km wide at the bay entrance. A plain continental shelf, formed at a depth of about 70 m, extends nearly 20 km offshore.

The bay entrance opens to southwest and is dotted with reefs. On the west of the bay is located the Fort Area which rests on reefs and virtually forms a headland and the east side is surrounded by cliffs which also from a headland (Rumassala Hill).

Data available at the Coast Conservation Department show that the southwestern coasts of Sir Lanka are eroded at an annual rate of 30 cm. The prevailing wave energy direction is south-southwest to west-southwest and the coastlines in the vicinity of Galle Bay run in a NW direction on the west and in an ESE direction on the east. Judging from these facts, the sand drift is presumed to branch off into the easterly and westerly directions in the neighborhood of the bay. The sand drift into the bay is intercepted by the east and west headlands.

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, which is evidenced by the fact that the water depths of the

inner and outer harbours have remained virtually constant since the completion of dredging work in 1984.

4-3 Site Investigation

4-3-1 General

The purpose of the site investigation is to obtain information on topographical features of the land and seabed, the submarine geology and subsoils.

The investigation was carried out between the middle of October and the middle of November 1990.

4-3-2 Components of Investigation

The investigation comprised the following activities:

a) Topographical Survey

b) Hydrographical Survey

c) Seismic Prospecting

d) Soil Exploration

The location map is shown in Fig. 4-3-1.

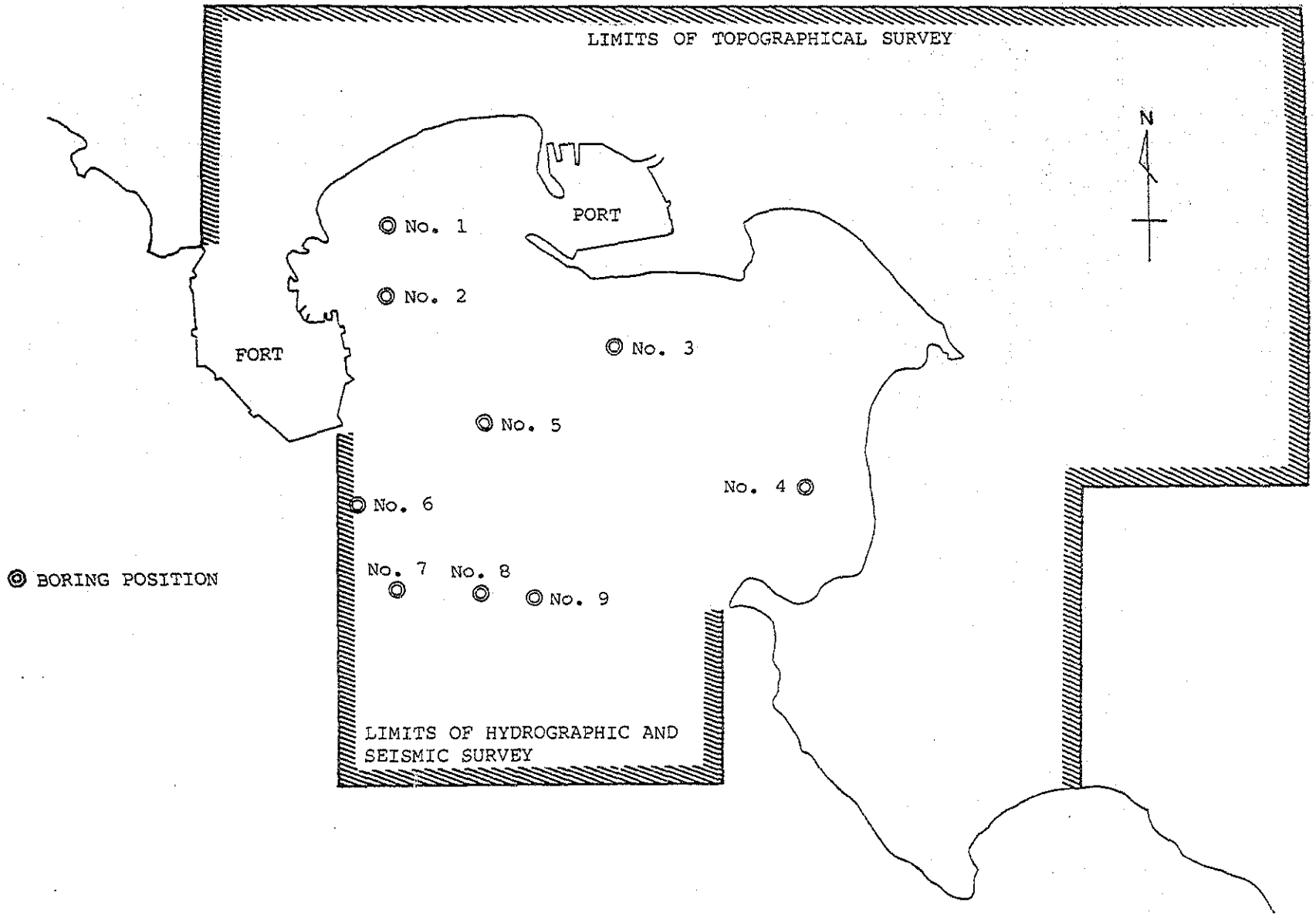


Fig. 4-3-1 Location Map

4-3-4 Results of Investigation

The result of topographic survey and hydrographical survey are shown in Fig. 4-3-2.

(1) 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. 4-3-3.

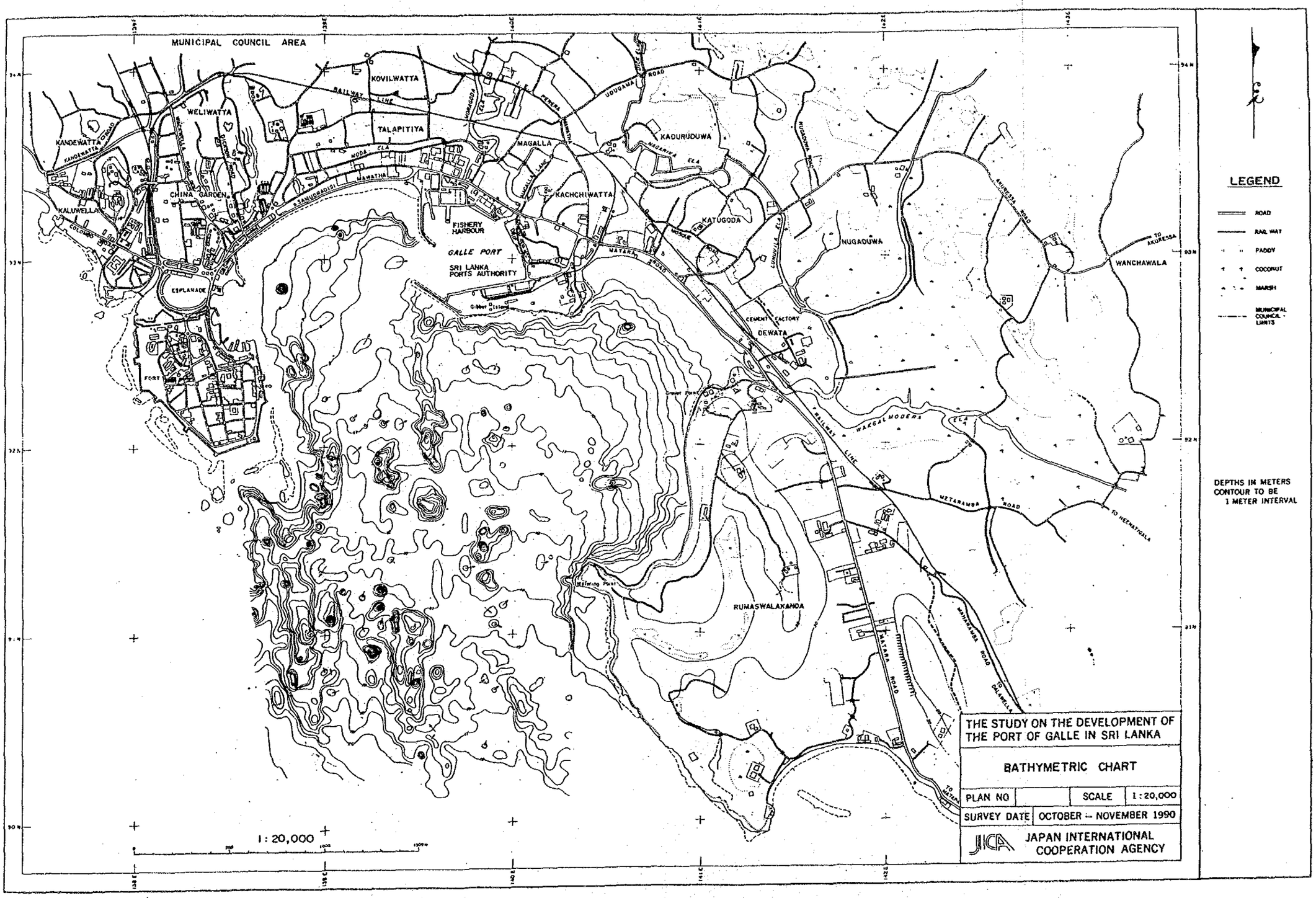


Fig. 4-3-2 Bathymetric Chart

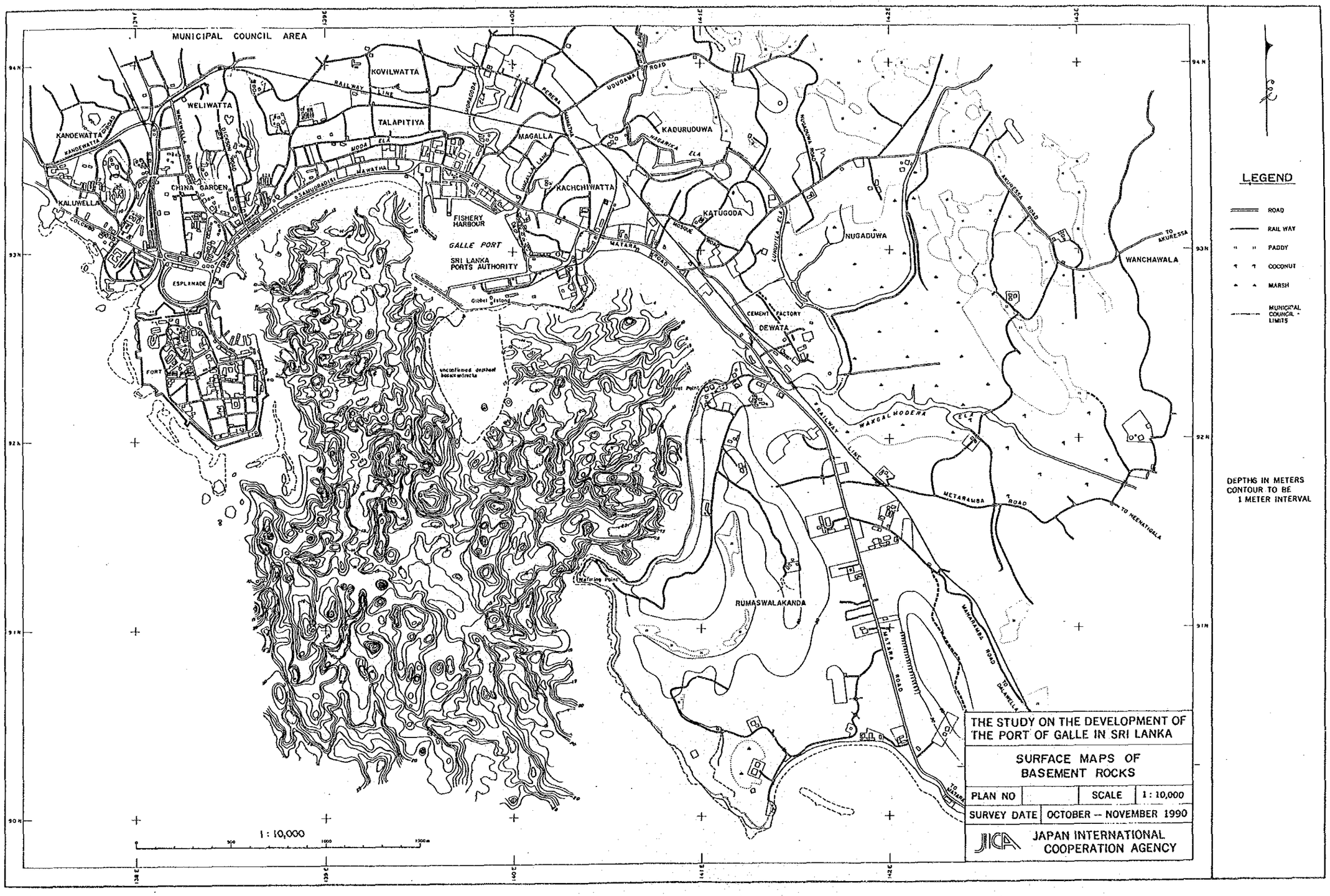


Fig. 4-3-3 Contour of Basement Surface Chart

(2) Soil Exploration

The soil survey for the Gall Project is conducted at nine (9) Points and the Geological Cross Sections based on the survey are summarized in Fig. 4-3-4.

The surface layer of the seabed at the all survey area, generally, consistes of very loose saturated soft sediment with its thickness varying from 0.80 m to 2.0 m.

The soil layers underlying the surface layer show a great difference in the soil characteristics at the respective survey points.

At the survey points BH.1 to BH.5, the very soft saturated organic clay or plastic clay layer exists with thickness of 2 to 11 m and N-value of nearly zero (0) and the lower part of this layer constitutes of the sporadic peat layer of 1 to 4 meter thickness.

At the survey points BH.6 to BH.9 is made from densely compacted fine sand with gravel in 2 to 4 m thickness at the N-value of greater than 15, under which weathered rock or hard bed rock layer appears.

Consequently, a considerably deeper layer of loose sand and clay exists at the inner-most area of the Bay.

At the outside the Bay, the layer of the fine sand with gravel lies sporadically.

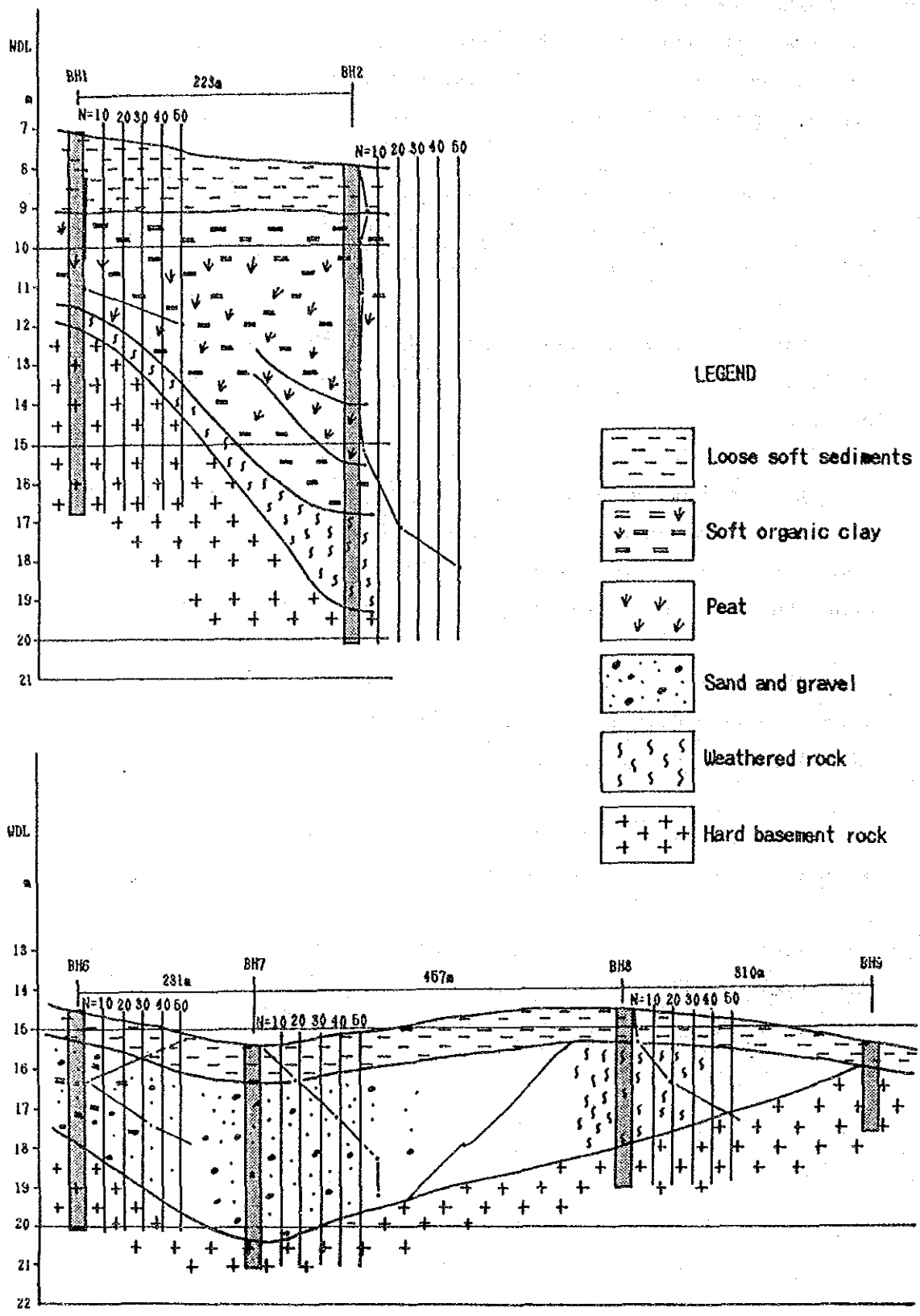


Fig. 4-3-4 Geological Cross Section

(3) Laboratory Test

Using undisturbed and disturbed samples used in the standard penetration tests.

The laboratory test results are shown in Table 4-3-1.

Table 4-3-1 Result 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) (kN/m^2)	-	-	54.8	36.7	24.3	26.0	28.2
Triaxial Test							
Cohesion(kPa)	-	24	-	-	-	-	-
Angle of Friction (deg.)	-	4	-	-	-	-	-
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/m^2

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.

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

Although there were railway facilities in the area until recently, they have been demolished. There are two warehouses. These can be used for storing large size cargoes but the main cargo now being stored is packed flour.

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.

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.

(2) Waterway

There are 6 buoys alongside the channel that point out shallow places.

(3) Mooring Basin

It has a depth of 8.85 m.

(4) Berths

The length of the quaywall is 426.7 m and the depth at the berths is 8.85 m.

(5) Warehouse

There are two warehouses, whose areas are 2,158 m^2 and 4,316 m^2 each, located just behind the apron.

(6) Water Supply Facilities

There is a water pump with a capacity of 200 tons, and an overhead tank whose capacity is 100 tons.

(7) Others

There are 3 lighters under repair whose capacity is 40 tons each. The management building has two storeys and its total area is 790 m^2.

5-4 Handling Equipment

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

Nowadays, the Port of Galle is an import port.
Main cargoes are clinker and flour.

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

YEAR	DISCHARGED							LOADED	Total Tonnage handled
	Rice	Flower	Sugar	Cement	Ferti lizer	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.

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%

5-7 Pilotage

(1) General

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

(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.

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 authority functions under the direction of a nine-member board of directors.

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

5-8-2 Working Hours and Labour

(1) Working Hours and Dates

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)

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.

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

(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.

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).

1-1-2 Potential Factors to be Considered

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

(1) Sea transportation
(2) Industrial development
(3) Others (Tourism)

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

ii) Cargo-handling conditions are to be well-organized.

iii) Provision of facilities necessary for storage and delivery of cargoes

iv) Feeders and connections with inland transportation are to be well-organized

v) The dual functions of a base for ships' departure and stopover is to 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.

2) Possibility of Cargo Transference

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.

The next table is the result of calculations showing the difference in distance (ton-mile using Galle substructed from ton-mile using Colombo).

Table 1-2-1 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, it is appropriate to assume that cargo handled at ports in Eastern India and Bangladesh would theoretically be shifted to the Port of Galle.

As a result, 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

a) Local Cargo

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.

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

If the allocation of cargoes to both ports is done 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 necessary to improve several conditions such as tracks to use the rail system.

* Roads

Judging from present conditions such as very narrow bridges, 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

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?

According to a rough estimation mainly using data from Colombo Port 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.

(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.

(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.

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.

2) Examination of Water Area Capacity of the Fishery Port

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.

There are also Buddhist temples, Hindu temples, a reservoir and so on.

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

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.

And more effort should be made to increase the number of events and the variety of publicity activities.

3) Brief Examination of Basin Area for Yacht Anchoring

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.

1-3 Basic Concept of the Coastal Development

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.

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.

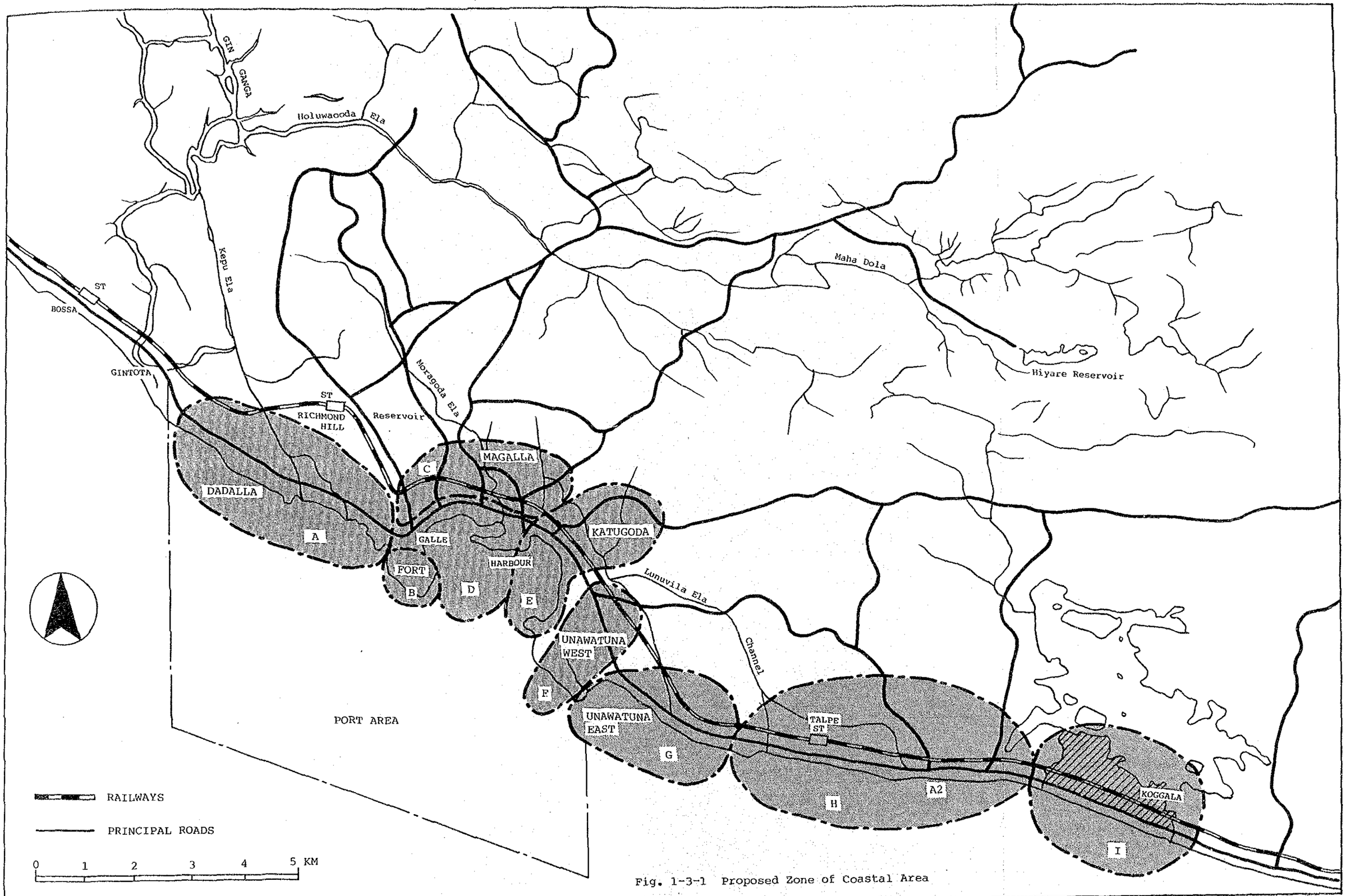


Fig. 1-3-1 Proposed Zone of Coastal Area

2 INDUSTRIAL DEVELOPMENT

2-1 General

The most 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.

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.

Sri Lanka is situated to the south of India in the tropics. The weather is suited to agricultural production. The growth rates of Sri Lanka's national products reveal how the character of its economy is changing. According to Table 2-1-1, 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.

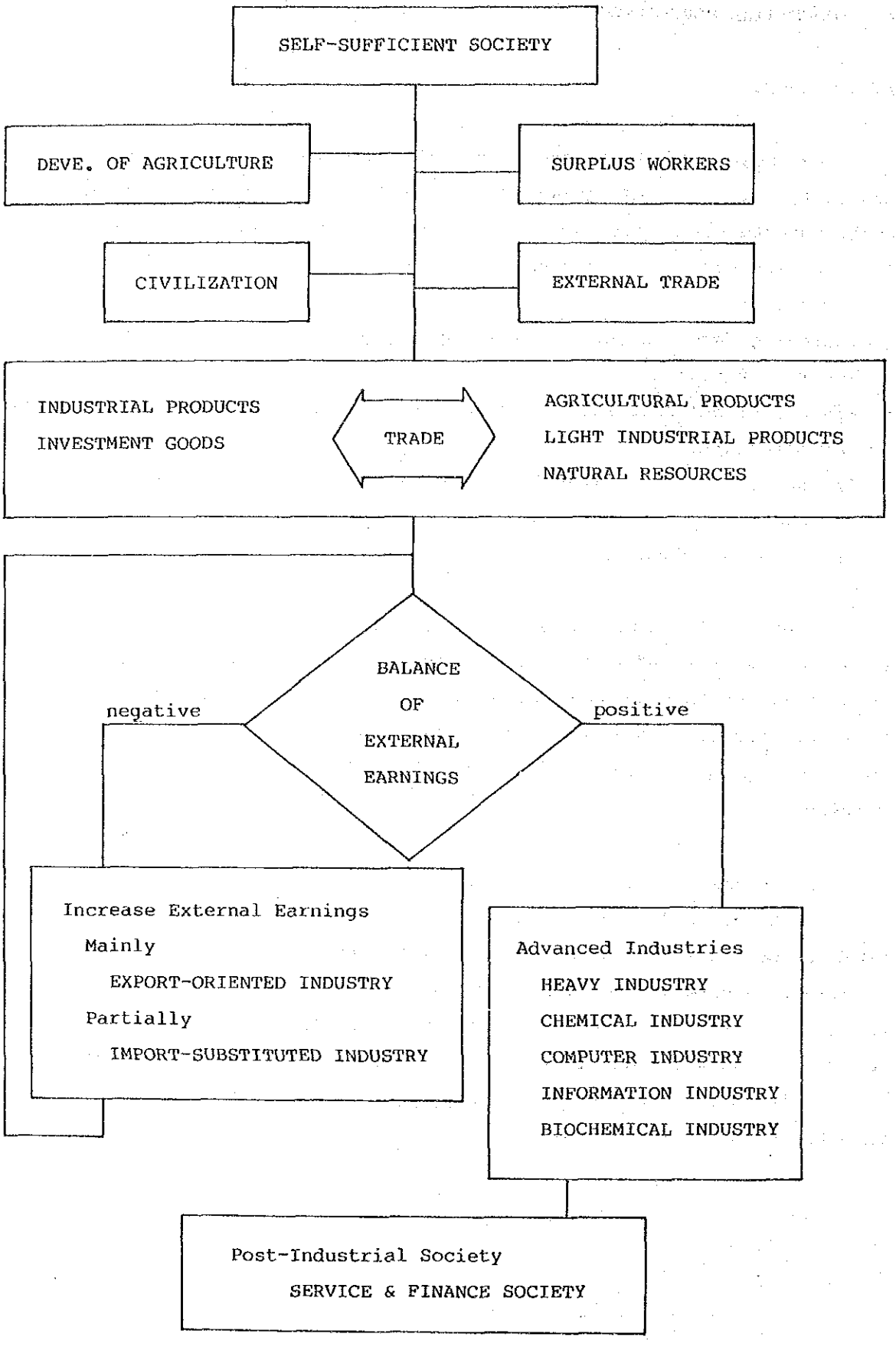


Figure 2-1-1 Developing Steps of Industrialization

Table 2-1-1 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 admi. & 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

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)?

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 2-1-2.

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 2-1-2, an industry which is underlined is liable for this area.

2nd selection: Trend of market

There are advantageous 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.

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

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

Consumer goods in the Southern Province

Construction goods	---	cement, steel, timber, brick
Living goods	---	cloth, electrical appliance, furniture, food sanitation, medicine, stationery
Agricultural goods	---	fertilizer, agricultural machine
Energy	---	petroleum, 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		

2-2 Present 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 2-2-1, and it can be seen that the GCEC's members play a leading role in the nation's economy.

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

Table 2-2-1 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 2-2-2 Contribution to National Economy by Industry

Item / Factory year (place)	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

Proposition of the type of industry to be located

According to the selecting policy mentioned in section 2-2 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

EPZ

It is proposed that the third EPZ in Sri Lanka is located at Koggala. Koggla 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 were listed in this study. According to this list, 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.

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.
* The 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.

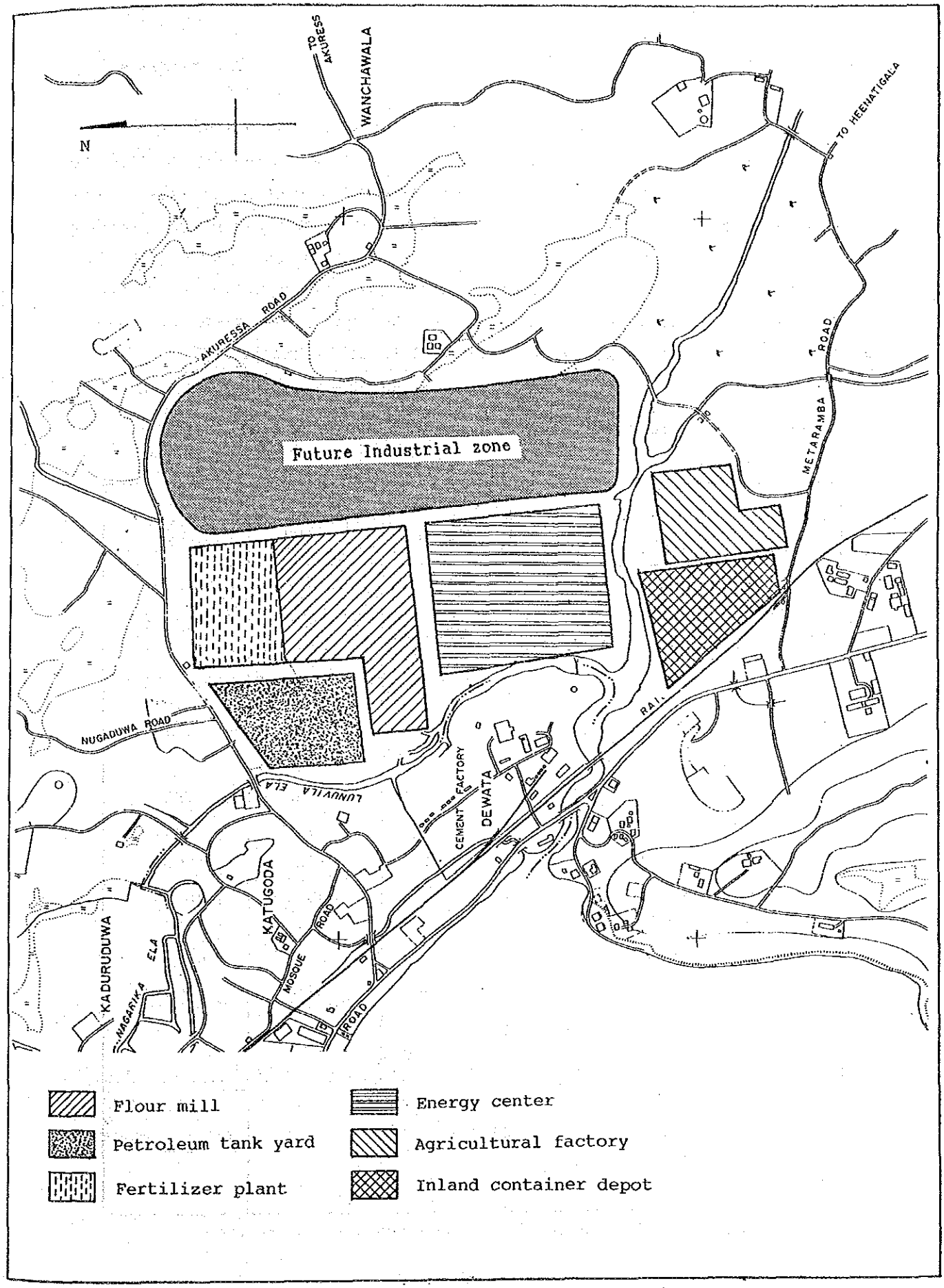


Figure 2-3-1 Plant Arrangement of Industrial Zone

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
		(TEU / month)	
EPZ	20,000	75	200
		(,000 tons / year)	
Industrial zone			
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.

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

3-1-1 Population

The Study Team adopted annual growth rate of population in Sri Lanka; 1.4% from 1990 to 1995, 1.35% from 1996 to 2000 and 1.3% from 2001 to 2005, in consideration of various conditions. As for the Southern Province, the Study Team adopted an annual growth rate of 1.3% from 1991 to 2005. The future population of Sri Lanka and the Southern Province in 1997 and 2005 can be calculated based on the above growth rate adopted.

Table 3-1-1 Future Population in 1997 and 2005

(In thousands)

Year	1997	2005
Sri Lanka	18,765	20,838
S/Province	2,326	2,579

3-1-2 Gross Domestic Product (GDP)

The Study Team estimated the future GDP and sectorial GDP of Sri Lanka and GDP of the Southern Province, at 1982 constant prices in 1997 and 2005 as shown in Table 3-1-2, 3-1-3 and 3-1-4.

Table 3-1-2 Future GDP of Sri Lanka at 1982 Constant Prices

(Rs. Million)

Year	1997	2005
GDP	175,576	269,453

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

(Rs. Million)

Sector \ Year	1997	2005
Plantation Agriculture	7,352	8,171
Non-Plantation Agriculture	26,833	34,580
Manufacturing/Construction	58,102	110,791
Services	83,289	115,911

Table 3-1-4 Future Provincial GDP at 1982 Constant Prices

(Rs. Million)

Year	1997	2005
GDP	19,026	32,689

3-2 Demand Forecast

3-2-1 Methodology

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

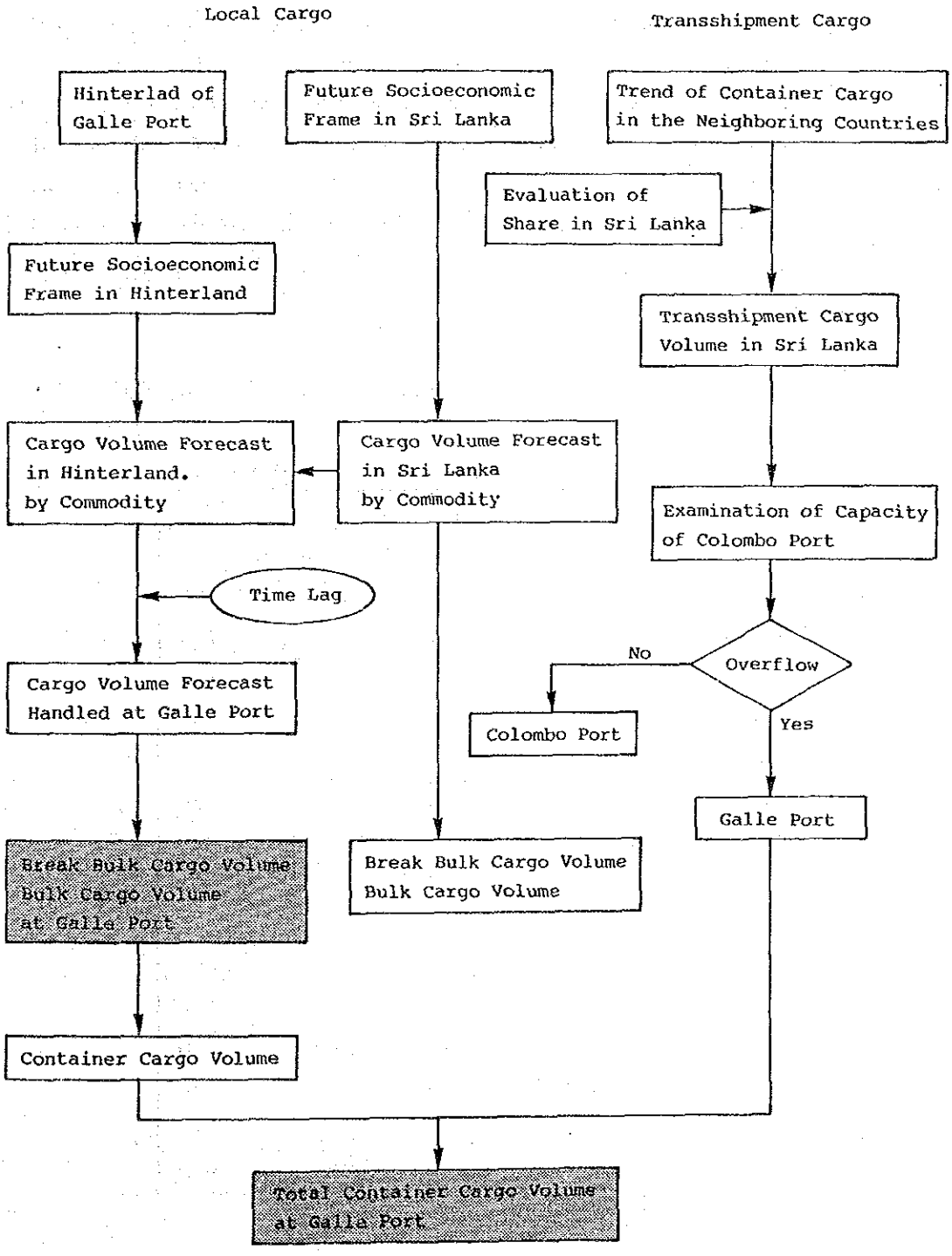


Figure 3-2-1 Flow Chart of Demand Forecast

3-2-2 Import/Export Cargo and Transshipment Container

The Study Team decided that Galle, Matara and Hambantota districts were to be defined as the hinterland of the Port of Galle at present after some considerations.

The cargo volume, handled at the Port of Galle in 1997 and 2005, by commodity is shown in Table 3-2-1. The cargo volume by handling mode is shown in Table 3-2-2.

At present, transshipment container cargo is handled at only the Port of Colombo. The majority of transshipment container cargo consists of the traffic between developed contries and Sri Lanka's neighboring countries (feeder areas) such as Bangladesh, India, Pakistan and Middle East nations. Total throughput of transshipment containers in Sri Lanka in 1997 and 2005 is shown in Table 3-2-3.

Table 3-2-1 Cargo Volume at the Port of Galle by Commodity

(Unit: '000 tons)

	1997	2005
(Import)		
Bulk Wheat	100	700
Bulk Fertilizer	84	129
Bulk Cement	0	155
Bulk Clinker	194	291
Flour (Coastal)	113	125
Sugar	41	56
General Cargo	162	348
Total	694	1,804
(Export)		
Containerized Flour	65	455
Tea	75	114
Rubber	14	20
Coconuts & Coconut Products	25	40
General Cargo	71	189
Total	250	818

Table 3-2-2 Cargo Volume at the Port of Galle by Handling Mode

	1997	2005
(Import)		
Bulk ('000 tons)	378	1,275
Break Bulk ('000 tons)	202	228
Container ('000 tons)	114	301
Loaded ('000 TEUs)	8.5	22.5
Empty ('000 TEUs)	4.4	11.7
Total ('000 TEUs)	12.9	34.2
(Export)		
Bulk ('000 tons)	0	0
Break Bulk ('000 tons)	17	20
Container ('000 tons)	233	798
Loaded ('000 TEUs)	18.7	63.8
Empty ('000 TEUs)	4.7	16.0
Total ('000 TEUs)	23.3	79.8
(Total)		
Bulk ('000 tons)	378	1,275
Break Bulk ('000 tons)	219	248
Container ('000 tons)	347	1,099
Loaded ('000 TEUs)	27.1	86.3
Empty ('000 TEUs)	9.1	27.7
Total ('000 TEUs)	36.2	114.0

Table 3-2-3 Transshipment Containers in Sri Lanka

(Unit: '000 TEUs)

		1997	2005
From/to the feeder ports	Bangladesh	54	78
	East India	140	223
	West India	257	346
	Pakistan	89	112
	Gulf & Red Sea	82	72
	Sub Total	622	831
From/to the Mother's ports		622	831
Total		1,244	1,662

3-2-3 Summary

All excess transshipment containers from the Port of Colombo will be handled at the Port of Galle.

Table 3-2-4 and 3-2-5 show the total container throughput (including local containers) in Sri Lanka and at the Port of Colombo, respectively. Table 3-2-6 shows the total cargo throughput at the Port of Galle.

Table 3-2-4 Total Container Throughput in Sri Lanka

		1997	2005
Discharged	Container ('000 TEUs)	211	349
Loaded	Container ('000 TEUs)	151	242
Sub Total	Container ('000 TEUs)	362	591
Transshipment	Container ('000 TEUs)	1,244	1,662
Total	Container ('000 TEUs)	1,606	2,253

Table 3-2-5 Total Container Throughput at the Port of Colombo

		1997	2005
Discharged	Container ('000 TEUs)	198	315
Loaded	Container ('000 TEUs)	128	162
Sub Total	Container ('000 TEUs)	326	477
Transshipment	Container ('000 TEUs)	1,054	1,063
Total	Container ('000 TEUs)	1,380	1,540

Table 3-2-6 Total Cargo Throughput at the Port of Galle

			1997	2005
Discharged	Bulk	('000 Tons)	378	1,275
	Break Bulk	('000 Tons)	202	228
	Container	('000 TEUs)	13	34
Loaded	Break Bulk	('000 Tons)	17	20
	Container	('000 TEUs)	23	80
Sub Total	Bulk	('000 Tons)	378	1,275
	Break Bulk	('000 Tons)	219	248
	Container	('000 TEUs)	36	114
Transshipment	Container	('000 TEUs)	190	599
Total	Conventional	('000 Tons)	597	1,523
	Container	('000 TEUs)	226	713