

THE DEMOCRATIC SOCIALIST REPUBLIC
OF
SRI LANKA

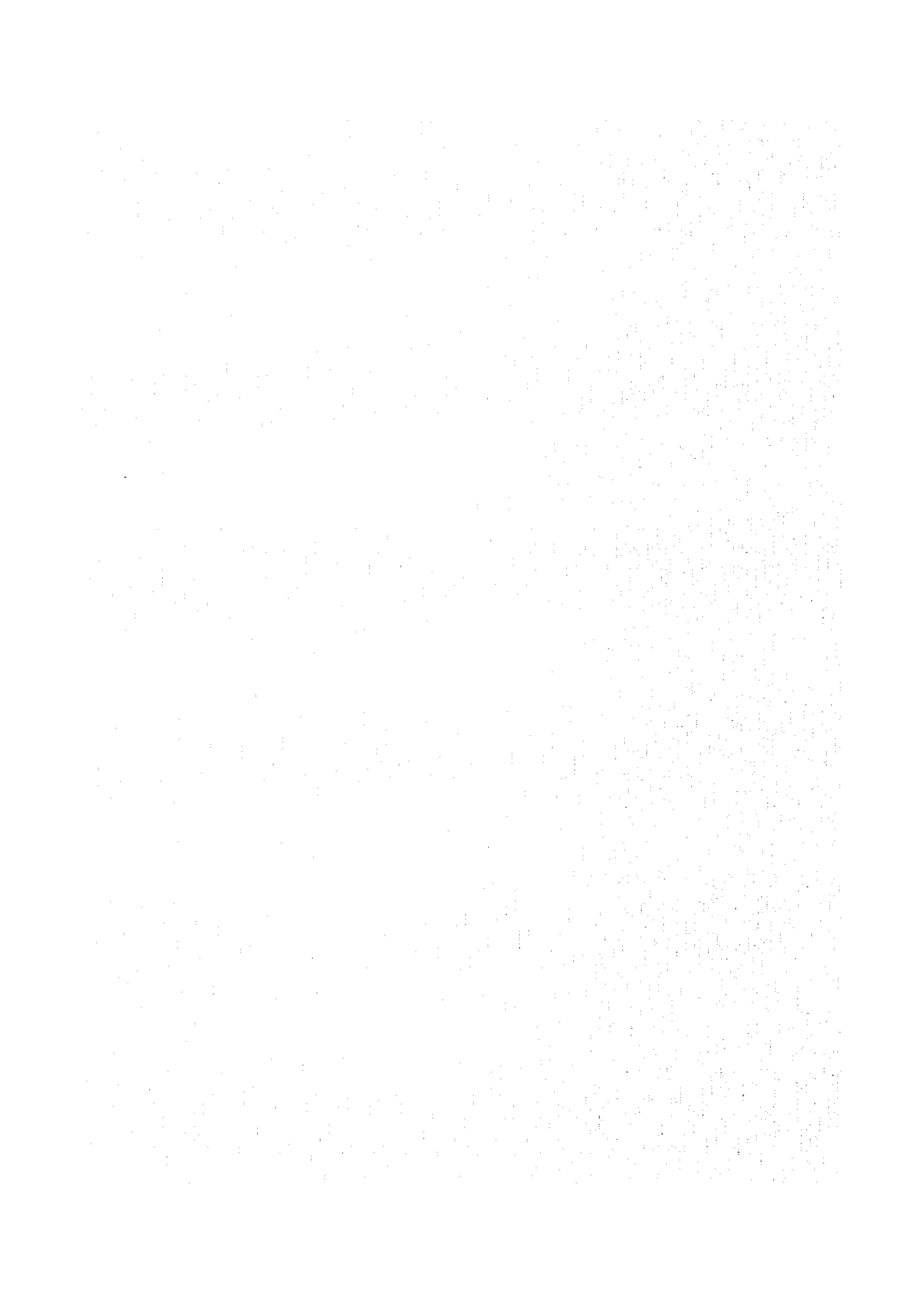
REPORT ON

THE DEVELOPMENT PROJECT
OF
THE PORT OF COLOMBO

MARCH, 1980

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

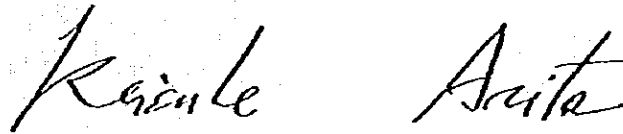
At the request of the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan has decided to conduct a study on the Development Project of the Port of Colombo, and the Japan International Cooperation Agency (JICA) carried out the study.

JICA dispatched to Sri Lanka several times, a Survey Team headed by Mr. Masao Ohno, Executive Director of the Overseas Coastal Area Development Institute of Japan. The Survey Team consulted with Government officials of Sri Lanka, collected reference material and made field surveys. After returning to Japan, the Survey Team has compiled this report on the basis of data and information collected.

I hope this report will prove to be useful for the Development of the Port of Colombo, thereby contributing to the promotion of friendly relations between on two countries.

I would like to express my heartfelt appreciation to all the officials concerned of the Government of Sri Lanka for their cooperation extended to the Survey Team.

March, 1980



Keisuke Arita
President

Japan International Cooperation Agency
Tokyo, Japan

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial operations. This section also highlights the role of internal controls in preventing fraud and errors.

2. The second part of the document focuses on the implementation of a robust risk management framework. It outlines the various risks that an organization may face, including financial, operational, and reputational risks. The document provides guidance on how to identify, assess, and mitigate these risks effectively.

3. The third part of the document addresses the need for continuous monitoring and reporting. It stresses that organizations should regularly review their financial performance and risk levels to ensure they remain aligned with their strategic objectives. This section also discusses the importance of clear communication and reporting mechanisms.

4. The fourth part of the document discusses the role of technology in enhancing financial management and risk control. It highlights how modern software solutions can streamline processes, improve data accuracy, and provide real-time insights into an organization's financial health.

5. The fifth part of the document concludes by emphasizing the importance of a strong corporate governance structure. It notes that a well-defined governance framework is crucial for ensuring that all activities are conducted in a fair, ethical, and transparent manner. The document also mentions the need for regular audits and reviews to ensure compliance with relevant regulations and standards.

LETTER OF TRANSMITTAL

March 25, 1980

Mr. Keisuke Arita
President
Japan International Cooperation Agency

Dear Mr. Arita:

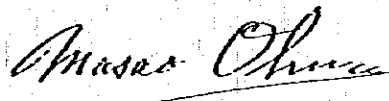
It is my great pleasure to submit herewith a report on the Development Project of the Port of Colombo, the Democratic Socialist Republic of Sri Lanka.

The Japanese study team, headed by myself, conducted a survey on the Project mainly in Colombo for 26 days from June 11, 1979, at the request of the Japan International Cooperation Agency. The findings of the feasibility study and our proposition on the port development are included in this report. The study shows that the importance and priority of the Project is very high so that I hope the Project be executed in the earliest opportunity.

On behalf of the Japanese study team and myself, I would like to express my deepest appreciation to the Government of the Democratic Socialist Republic of Sri Lanka, the Sri Lanka Ports Authority and various organizations concerned the Project for their unlimited cooperation, assistance and warm hospitality extended to the team during our stay in Sri Lanka.

My indebtedness also is great to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs and the Japanese Embassy in Sri Lanka for giving us valuable suggestions and assistance in the field study and in preparation of this report.

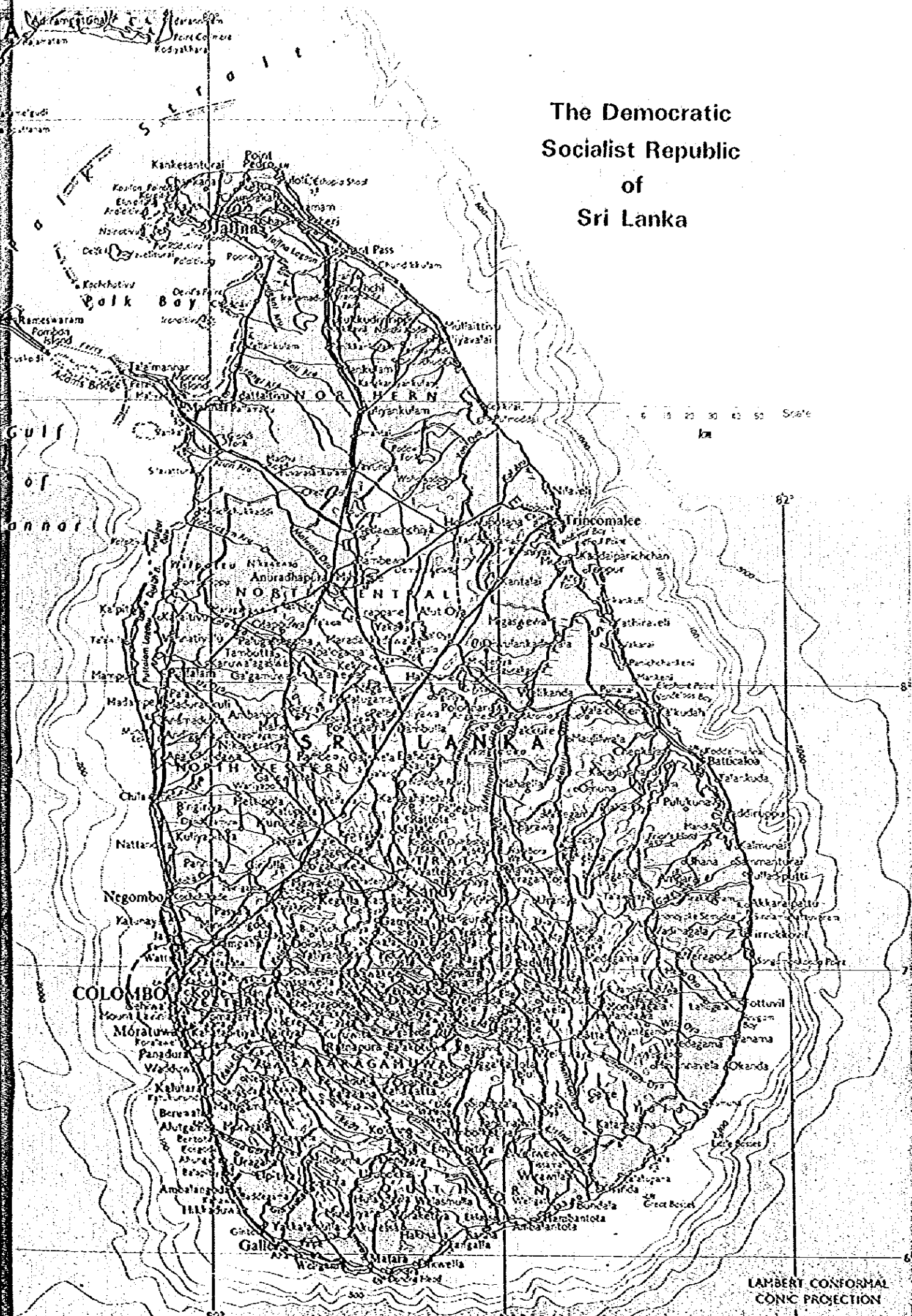
Sincerely yours,

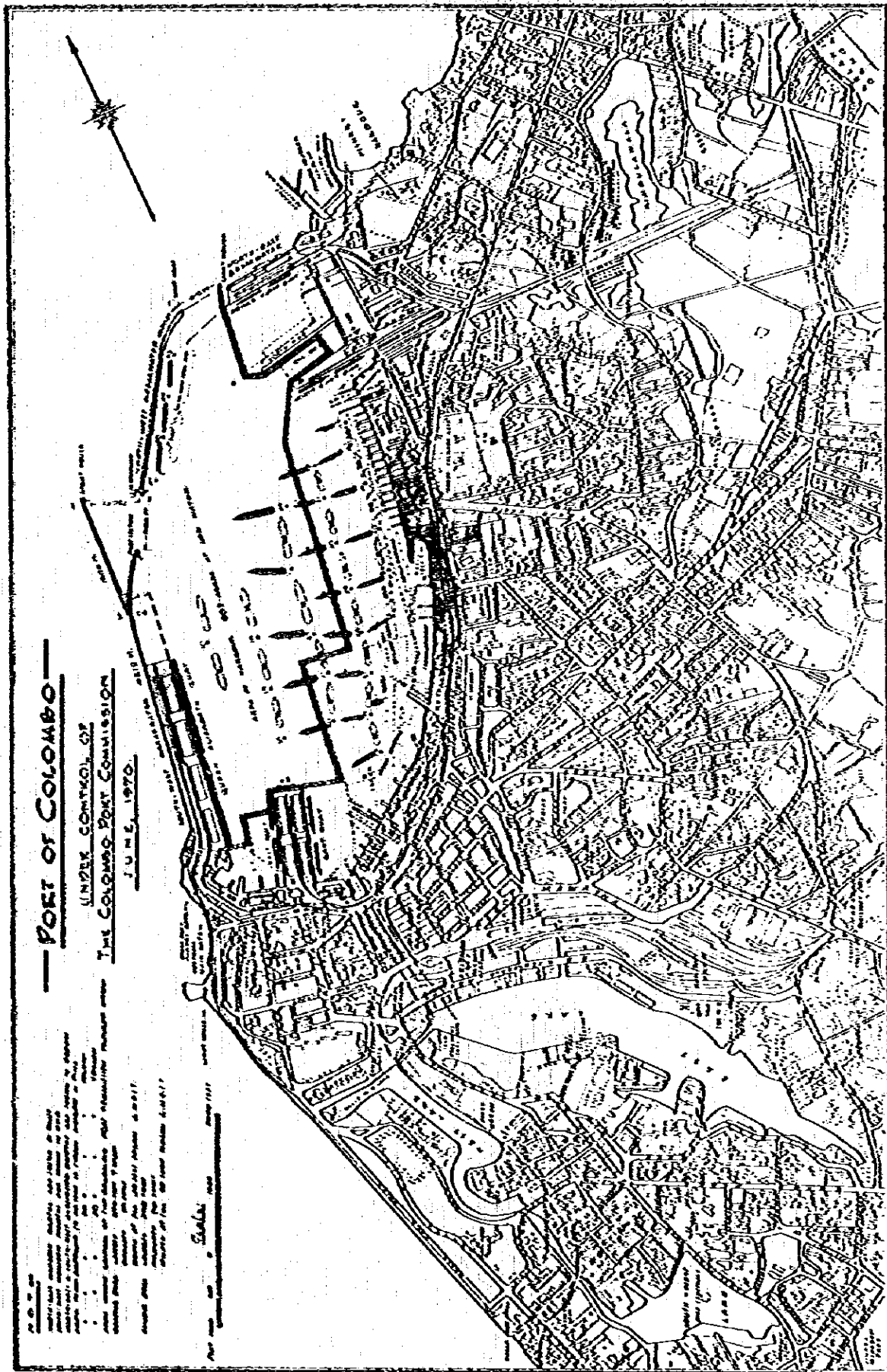


Masao Ohno
Head
Japanese Study Team for the Development of the
Port of Colombo
(Executive Director, the Overseas Coastal Area
Development Institute of Japan)



The Democratic Socialist Republic of Sri Lanka





PORT OF COLOMBO
UNDER CONTROL OF
THE COLOMBO PORT COMMISSION
JUNE, 1970

1. The map shows the harbor and city of Colombo, Sri Lanka, under the control of the Colombo Port Commission as of June 1970. The map is based on the 1:50,000 scale map of Colombo, Sri Lanka, published by the Survey Department, Sri Lanka, in 1968. The map is oriented with the harbor at the top and the city extending downwards. Key features include the harbor area with several piers, the city grid, and various labeled buildings and structures. The map is titled 'PORT OF COLOMBO' and 'UNDER CONTROL OF THE COLOMBO PORT COMMISSION'.

Scale

DRAWING BY SURVEY DEPT. SRI LANKA, 1970.
 SOURCE: PORT COMMISSION - CIVIL ENGINEER'S DEPARTMENT, JUNE, 1970.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial operations. This section also highlights the role of internal controls in preventing fraud and errors.

2. The second part of the document focuses on the implementation of robust risk management strategies. It outlines various risk assessment techniques and provides guidance on how to identify, evaluate, and mitigate potential risks. The text stresses the need for a proactive approach to risk management to protect the organization's assets and reputation.

3. The third part of the document addresses the importance of effective communication and reporting. It discusses the need for clear and concise communication channels and the role of regular reporting in keeping stakeholders informed. This section also touches upon the importance of data security and the need for strong cybersecurity measures to protect sensitive information.

4. The fourth part of the document discusses the importance of continuous improvement and monitoring. It emphasizes that organizations should regularly review their processes and procedures to identify areas for improvement. This section also highlights the role of key performance indicators (KPIs) in measuring organizational success and the need for a culture of continuous learning and innovation.

5. The final part of the document provides a summary of the key points discussed and offers concluding remarks. It reiterates the importance of the discussed topics and encourages organizations to take proactive steps to implement the recommended practices. The document concludes by stating that a commitment to these principles is essential for long-term success and sustainability.

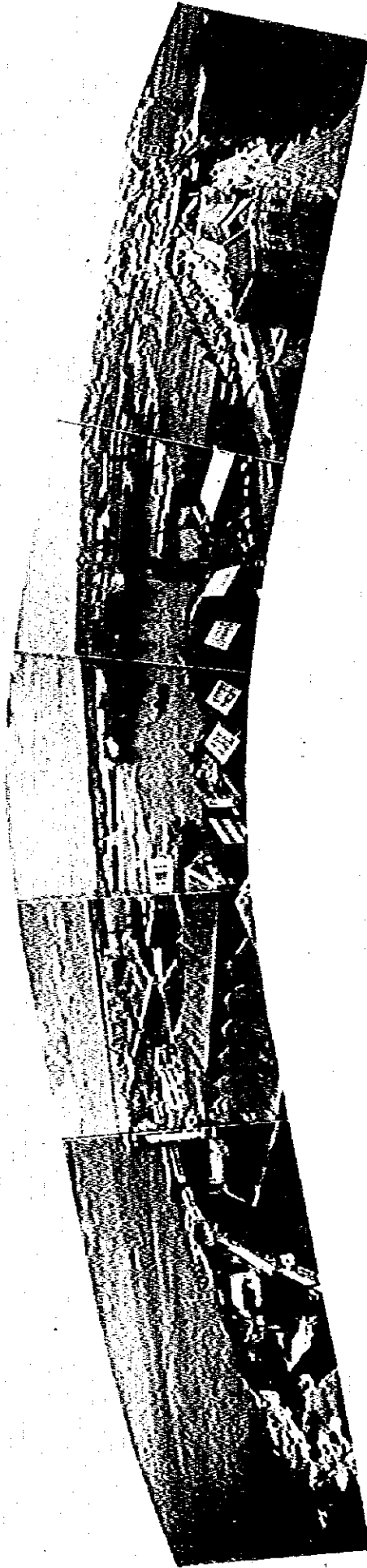


Photo-1 A General View of the Port of Colombo



Photo-2 Container Rolling-off at the Queen Elizabeth Quay No.4



Photo-3 Container Yard at the Queen Elizabeth Quay No. 4



Photo-4 Bandaranaika Quay



Photo-5 Backyard for Coal Jetties

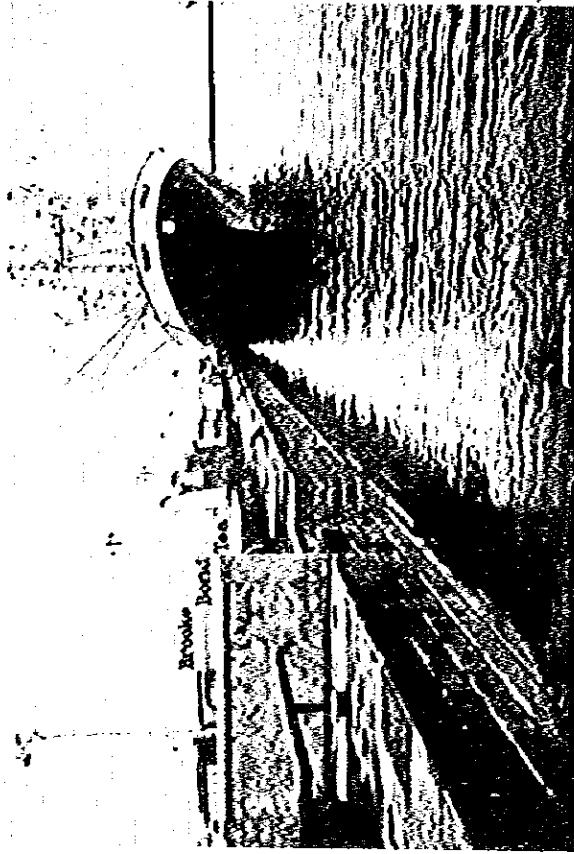


Photo-7 South Pier



Photo-9 Bunkering Facilities

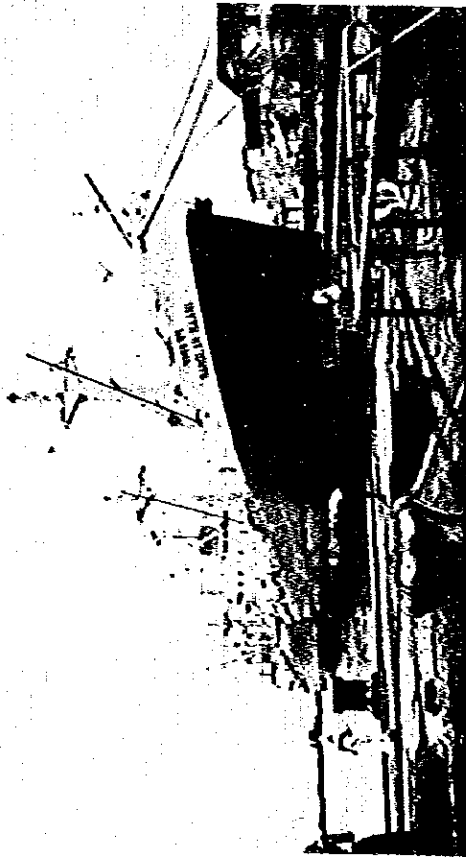


Photo-6 North Guid Pier

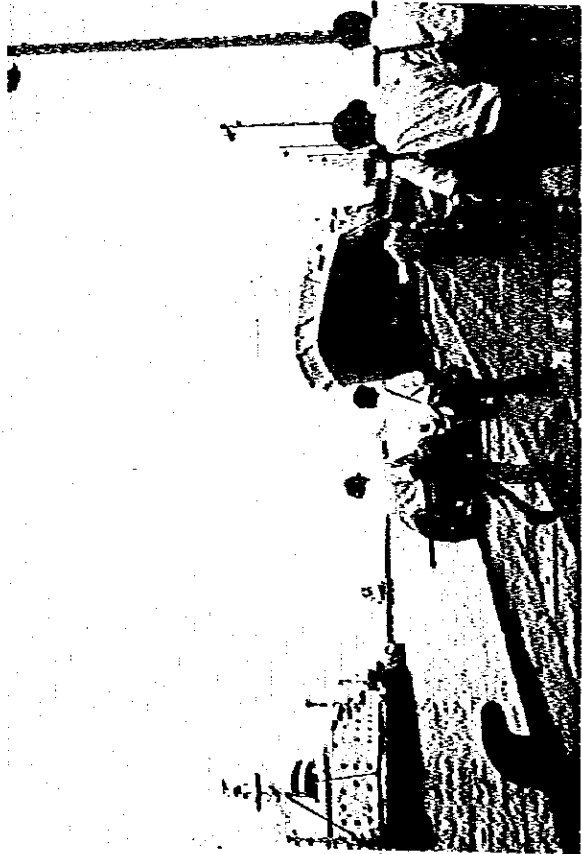


Photo-8 North Pier

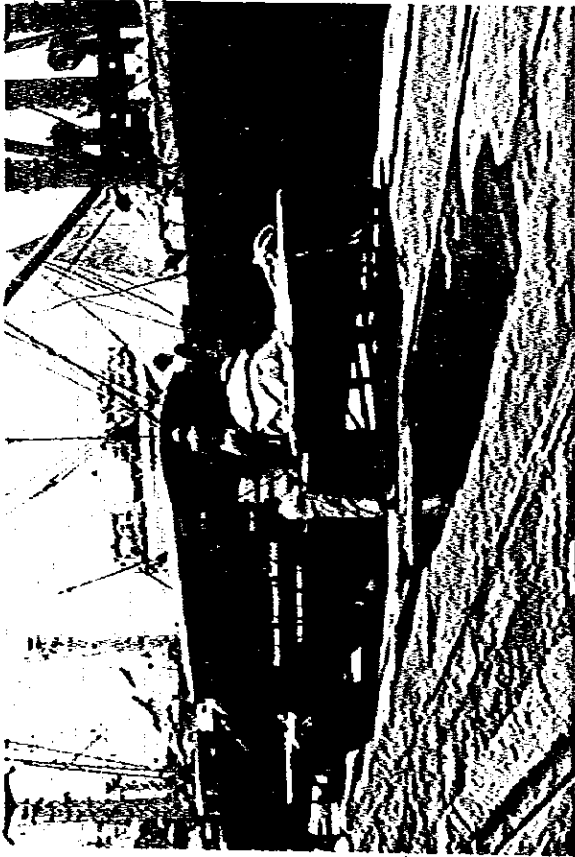


Photo-10 Cargo Handling at the Prince Vijaya Quay

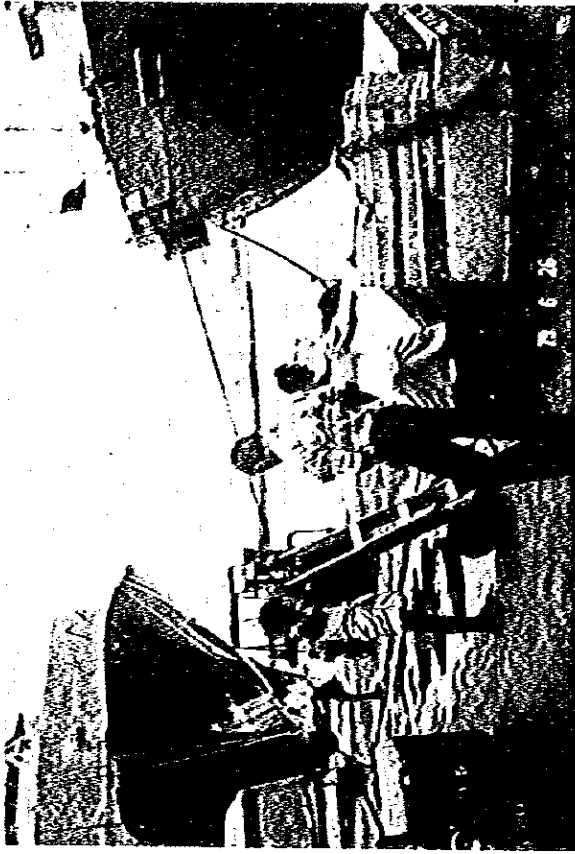


Photo-11 Cargo Handling at the Queen Elizabeth Quay

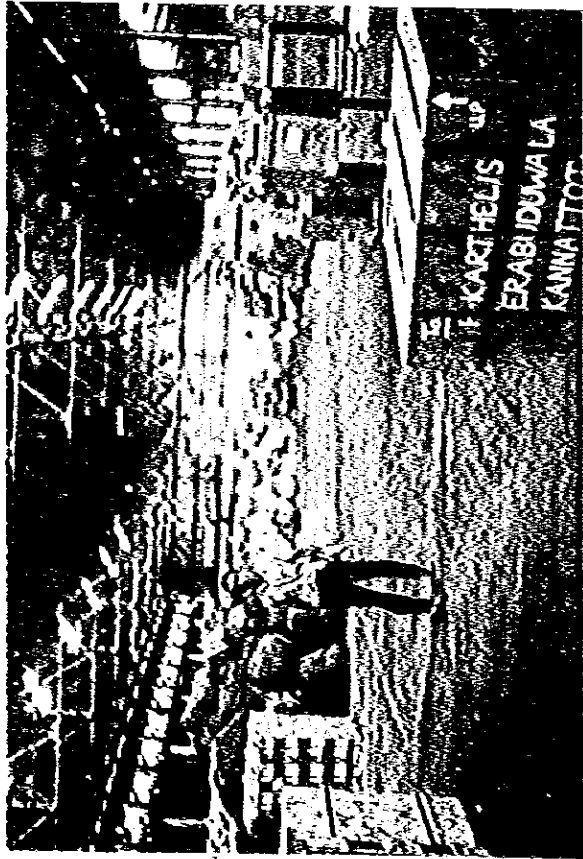


Photo-12 Inside of a Transit Shed

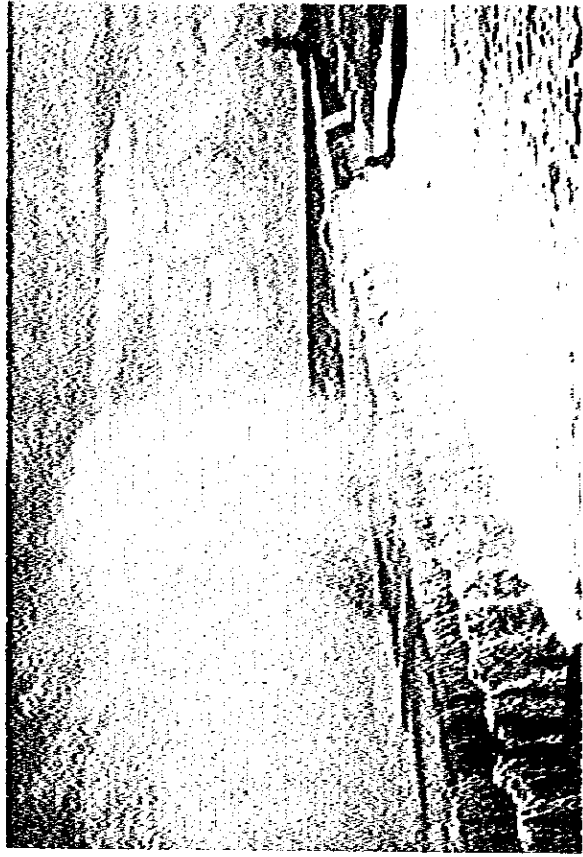


Photo-13 South-West Breakwater

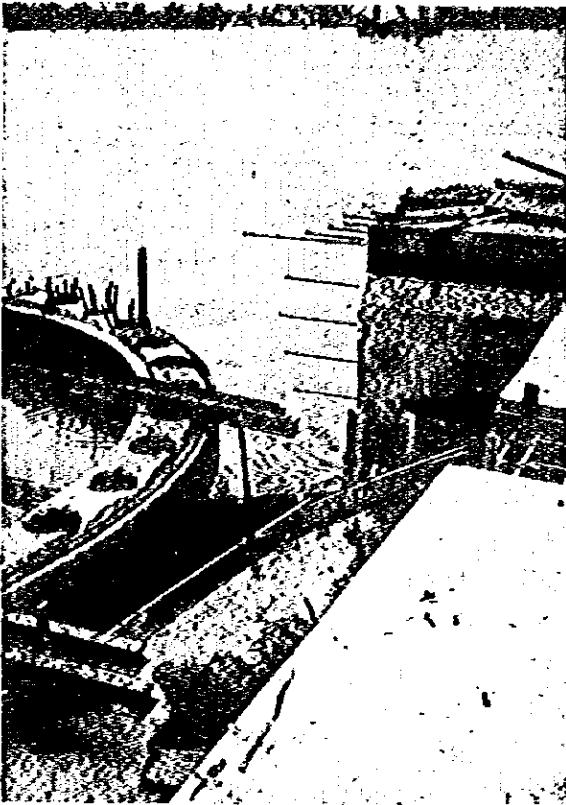


Photo-14 Quaywall of the
Queen Elizabeth Quay No. 5

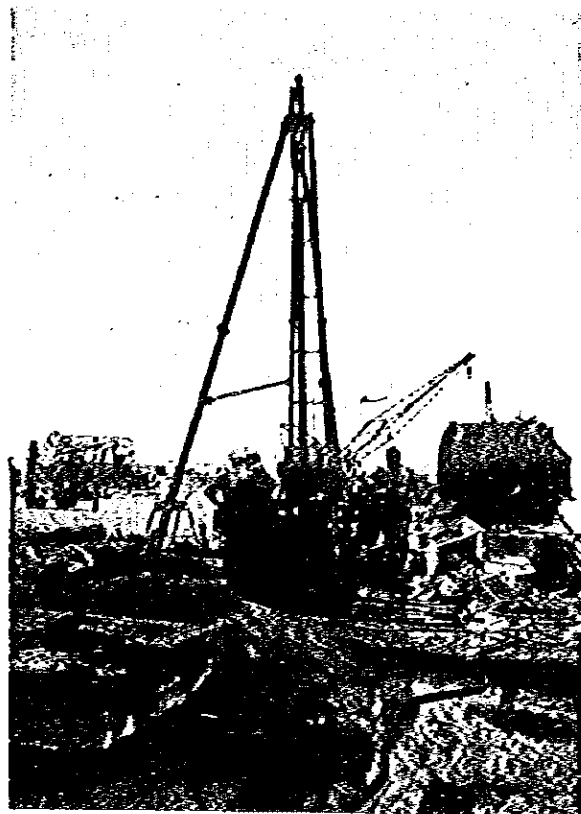


Photo-15 Soil Investigation at the
Queen Elizabeth Quay



Photo-16 Refinery

ABBREVIATIONS

QEQ No. 5	:	Queen Elizabeth Quay No. 5
QEQ No. 4	:	Queen Elizabeth Quay No. 4
BQ	:	Bandaranaike Quay
KQ	:	Korteboam Quay
NGP	:	North Guide Pier
NP	:	North Pier
SP	:	South Pier
CB	:	Coaster Berth
NE Breakwater	:	North-East Breakwater
SW Breakwater	:	South-West Breakwater
NW Breakwater	:	North-West Breakwater
W/H	:	Warehouse
SLPA	:	Sri Lanka Ports Authority
CPC	:	Colombo Port Commission
P(C)C	:	Port (Cargo) Corporation
PTPSC	:	Port Tally and Protective Services Corporation
CSC	:	Ceylon Shipping Corporation
FEECs	:	Foreign Exchange Entitlement Certificates
ADB	:	Asian Development Bank
CDL	:	Colombo Dockyard Ltd.
UNCTAD	:	United Nations Conference on Trade and Development
FAO	:	Food and Agriculture Organization
ILO	:	International Labour Organization
NEDECO	:	Netherlands Engineering Consultants
CIF	:	Cost Insurance and Freight
FOB	:	Free on Board
FCL	:	Full Container Load Cargo
LCL	:	Less than Container Load Cargo
TEU	:	Twenty Equivalent of Units
IRR	:	Internal Rate of Return
FRR	:	Financial Rate of Return
CFS	:	Container Freight Station
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
¥	:	Yen
US\$:	U. S. Dollar
Rs.	:	Rupees

Exchange Rate

US\$ 1.00 = Rupees 15.625 = Yen 218.89

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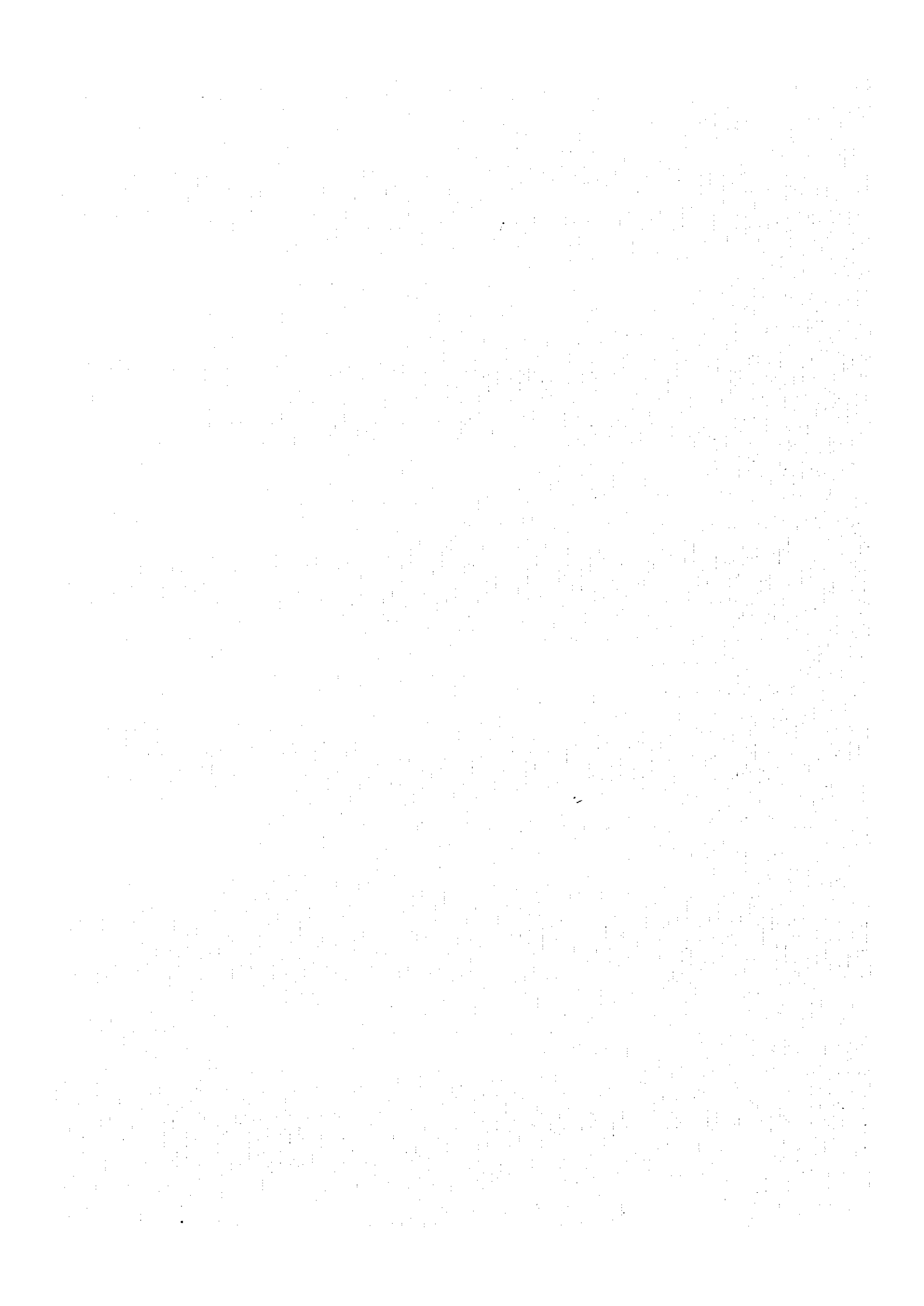
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CONCLUSIONS AND RECOMMENDATIONS



CONCLUSIONS AND RECOMMENDATIONS

I. Master Plan

1. Conclusions

1) In response to the requirements for the Port of Colombo listed in Table-C.1, the Master Plan with a target year of 1988 has been formulated as shown in Table-C.2.

The schedule of implementation of the Plan is shown in Table-C.3. The investments for civil engineering works, conventional cargo handling equipment and container equipment are shown in Table-C.4 (a), (b) and (c) respectively.

The total investment of the Project is 130 million US\$.

2) The feasibility of the proposed oil berth location, immediately behind the North-West Breakwater, depends largely on the depth of the sea bedrock in the approach channel. For this reason, the removal of the existing Oil Dock after the construction of new oil berths is not included in the Urgent Plan but rather in the Master Plan, though it is urgently required.

2. Recommendations

1) Master Plan – The Master Plan described above is recommended as a long term development plan of the Port of Colombo.

The Plan, however, should be reviewed after the completion of the Urgent Plan, because the current Sri Lankan National Economy is in a state of flux and long term plans must be periodically revised to meet the changing national potential.

2) Oil Berths – The prompt implementation of a feasibility study for new oil berths, including a sounding of the depth of the bedrock surface in the approach channel, is recommended.

II. Urgent Plan

1. Conclusions

1) The Urgent Plan with a target year of 1983 is shown in Table-C.5. The schedule of the implementation of the Plan is shown in Table-C.3, and the details of the construction schedule of the civil engineering work is given in Table-C.6. The annual investment plan by currency is shown in Table-C.7.

The total investment is 70,458 thousand US\$ of which 54,040 thousand US\$ (76.7%) is foreign currency and the remaining 16,418 thousand US\$ (23.3%) is local currency.

2) The Urgent Plan is concluded to be feasible both physically and economically.

The bore hole data so far available, including those from the in situ surveys carried out during the study period, are insufficient in number for the detailed structural design. Hence, the soil properties assumed in the study must be confirmed before commencement of the Plan.

Economically, the internal rates of return are obtained as 17.1% with shadow pricing and 19.5% with market pricing.

3) At present (October 1979), the financial formalities of the Sri Lanka Ports Authority, which was established on the 1st of August 1979, have not been totally prepared. A 25% average raise in the existing port tariff, excluding the container tariff, is concluded to be necessary to ensure the sound finance of the Ports Authority. This assumes that the Port of Colombo separately employs a self-supporting accounting system, that both the interest rates of foreign loans from the international aid organizations and local loans from the Consolidated Fund are 8%, and that the dividend for the capital investment by the Government is 4%.

2. Recommendations

1) Urgent Plan – The Urgent Plan described above is recommended as a short term development plan of the Port of Colombo.

2) Finance – Corresponding to the interest rates of local/foreign loans for the Project, a port tariff level and a rate of dividend on the capital investment by the Government are recommended to be determined reasonably and adequately to ensure the sound finance of the Ports Authority after every financial matter is fixed.

III. Other

1. Conclusions

1) The rise in cargo handling productivity expected in the Master Plan and the Urgent Plan can not be achieved without an adequate and effective use of the land and sea area within the Port and a reliable maintenance/repair system for the equipment.

2) To meet unexpected but urgent needs, the purchase of a boring machine is strongly suggested.

2. Recommendations

1) Land use – Since the port area is not large, an adequate and effective use of land within the Port by removing facilities unrelated to the port function, by integrating redundant or idle facilities, and by reserving spaces for future use is recommended.

2) Use of protected sea area -- Since the protected sea area of the Port is not large, abolishing the cargo handling at midstream berths, which greatly contributes to the existing port congestion, is recommended at least in the final stage of the Master Plan.

3) The Plans include a large degree of mechanization in cargo handling. It is recommended that a reliable operation and management system, including retaining/training of equipment repair staff, parts supply/storage, maintenance and repair facilities for equipment be promptly established to ensure the smooth operation of the equipment.

4) Purchase of a boring machine is recommended. The cost of a boring machine, for use mainly in the standard penetration test, is about 25 thousand US\$, and is included in the engineering cost for the Plan.

Table C.1 Requirements for the Port of Colombo

Requirement	Details
1. Increase in cargo handling capacity	a. To meet expected demand in cargo traffic forecast
2. Improvement of service level/coverage	a. To relieve port congestion b. To prepare container facilities
3. Effective use of land	a. Removal of facilities/functions unrelated to the Port b. Effective use of idle spaces c. Unification/integration of boat/barge repairing shops
4. Improvement of road network	a. Improvement/widening of the existing road b. To insure proper interfacing of port and city road plans
5. Improvement of safety	a. Improvement of approach channel and turning/mooring basin b. Removal of the existing Oil Dock
6. Increase in large ship repairing capacity	a. Construction of a 65,000 DWT dry dock. b. Modification of existing cargo handling berths to ship repair berths

Table - C.2 Summary - Master Plan

Item	Unit	Q'ty	Cost		Target Year	Note
			Value (1,000 US\$)	Share (%)		
Conventional Berths						
KQ #2 (New Berth, Temporary)	Berth	1	-		1983	Modified to CTNR Berth after 1988 Widening of 50m, Two -9m Berths
NP (Widening, 1 Berth → 2 Berths)	Berth	2	3,538	2.7	After Removal of Oil Dock	
NGP/SP (Cargo Berth → Ship Repair Berth)	Berth	3	-		1983 (1B) After Completion of NP (2B)	
QEQ #5 (Container → Conventional)	Berth	1	-		1988	
Cargo Handling Equipment	Set	1	7,537	5.8	1980	
Sub Total			11,075	8.5		
Container Berths						
QEQ #5 (Crane Foundation, etc.)	Set	1	1,628	1.2	1981	#2 (Conventional → Container)
KQ #1/#2/#3	Berth	3	47,736	36.6	1983 (#1) 1988 (#2/#3)	
Dredging	Mn.m ³	1.5	2,880	2.2	1983, 1988	
Container Equipment	Set	1	31,092	23.9	1981, 1983, 1988	
Sub Total			83,336	63.9		
Oil Berth*						
Dolphins	Set	1	937	0.7	Set by F/S*	*A feasibility study including an in situ survey of the bed-rock depth along the approach channel should be carried out.
Pipelines, etc.	Set	1	11,515	8.8	-	
Bunkering Facilities	Set	1	686	0.5	-	
Improvement of Port Entrance	Set	1	12,011	9.2	-	
Extension of SW Breakwater	(m)	(150)	(6,171)			
Removal of the Southwest End of NW Breakwater	(m)	(75)	(514)			
Seawall/Wave Dissipation Work along NW Breakwater	(m)	(700)	(5,326)			
Dredging	M.m ³	3.24	6,900	5.4	-	
Tug Boat	No.	1	1,919	1.5	-	
Sub Total			33,968	26.1		
Road	km	5.7	1,981	1.5	1982 (2 Lanes) 1988 (4 Lanes)	
Grand Total			130,360	100.0		

Note: Engineering fee and physical contingency are not included in the Table.

Table - C.3 Construction Schedule for Master Plan

Item		Quantity	1980	1981	1982	1983	1984	1985	1986	1987	Target year
Civil Engineering Works	QEO #5	200 m		=====							1981
	KQ	1,910 m 2,600,000 m ³ 1 Set		=====	=====	=====			=====		Quaywall 550m 1985 350m 1987
	NP	410 m 198,000 m ³						=====			1985
	Road Dredging	5,700 m 1,500,000 m ³		=====	=====				=====		1982 2-Lanes 1986 4-Lanes
Equipment	Conventional QEO #5	1 Set	=====								1980
	KQ	1 Set		=====					=====		1981 1 Berth 1985 2 Berths 1987
Oil Berth	Feasibility Study	1 Set	=====								
	Berth	1 Set									
	Dolphins	1 Set			=====						
	Pipelines	1 Set			=====						
	Dredging (Turning Basin) Dredging (Waterway)	2,000,000 m ³ 1,240,000 m ³		=====	=====	=====					
Improvement of Port Entrance	SW Breakwater Extension	150 m		=====							
	NW Breakwater Removal	75 m			=====						
	NW Breakwater Seawall/ Wave Dissipating Work	700 m			=====						

Table – C.4(a) Rough Estimate of Construction Costs

	No.	Facility	Main item	Quantity		Unit Price	Rough Cost Estimate
						(US\$)	(Thousand US\$)
Container & Conventional Berths	1	QEQ #5	Crane foundation	200	m	6,540	1,308
			Heavy Pavement	40,000	m ²	8	320
			(Sub Total)				(1,628)
	2	KQ Container Terminal	-12.0m Quaywall	900	m	20,750	18,675
			-7.5m Revetment	610	m	9,960	6,076
			-10.0m Revetment	400	m	14,200	5,680
			Reclamation	2,600,000	m ³	2.5	6,500
			Heavy Pavement	235,000	m ²	31	7,285
			C.F.S	16,000	m ²	220	3,520
	(Sub Total)				(47,736)		
3	North Pier	-4.0 ~ -10.0m Revetment	360	m	5,680	2,045	
		-10.0m Revetment	50	m	14,200	710	
		Reclamation	198,000	m ³	2.5	495	
		Pavement	18,000	m ²	16	288	
(Sub Total)				(3,538)			
4	Road		5,700	m		1,981	
5	Dredging	-12.0m Dredging	1,500,000	m ³	1.92	2,880	
		Total				57,763	
Oil Berth	6	Oil Berth	Main dolphins	1	Set		937
			Bunkering dolphins	1	Set		686
			Pipelines	1	Set		11,515
			(Sub Total)				(13,138)
	7	Dredging (Turning Basin)	-14m Dredging	2,000,000	m ³	1.9	3,800
	8	Dredging (Waterway)	-15.5m Dredging	1,240,000	m ³	2.5	3,100
	9	SW Breakwater	150m Extension	150	m	41,142	6,171
10	NW Breakwater	75m Removal	75	m	6,857	514	
		Seawall/Wave Dissipating Work	1	Set		5,326	
11	Tug boat		1	No.		1,919	
		Total				33,968	
Grand Total						91,731	

Table – C.4 (b) Conventional Cargo Handling Equipment and Cost Estimates for Master Plan

(Unit: Thousand US\$)

Equipment	Nos. to be purchased	Cost per Unit	Total Cost
Forklift Trucks	38 (3T)	12.2	464
	47 (5T)	22.1	1,039
		(Sub Total)	1,503
Mobil Cranes	8 (30T)	182.8	1,462
			1,462
Floating Cranes	1 (100T)	4,572.0	4,572
Total Cost			7,537

Table – C.4 (c) Container Equipment and Cost Estimates for Master Plan

(Unit: 1,000 US\$)

Equipment	QEQ		Korteboom		Total	
	Quantity	Cost	Quantity	Cost	Quantity	Cost
Container Crane	1	3,017	6	18,102	7	21,119
Straddle Carrier	3	960	22	7,040	25	8,000
Yard-use Tractor	2	52	15	390	17	442
Yard-use Trailer Chassis 40'	2	18	20	180	22	198
" 20'	8	56	30	210	38	266
Forklift Truck 15 ton	2	274	—	—	2	274
" 1.5 ton	6	84	36	504	42	588
Weighing Scale	—	—	5	205	5	205
Total		4,461		26,631		31,092

Table - C.5 Summary - Urgent Plant

Item	Unit	Q'ty	Cost		Target Year	Note
			Value (1,000 US\$)	Share (%)		
Conventional Berths						
KQ #2 (New Berth, Temporary)	Berth	1	-		1983	Modified to CTNR Berth after 1988 Transferred to CDL
NGP #1 (Cargo Berth -> Ship Repair Berth)	Berth	1	-		1983	
Cargo Handling Equipment	Set	1	7,537	10.7	1980	
Forklift (3t)	(No.)	(38)	(464)			
Forklift (5t)	(No.)	(47)	(1,039)			
Mobile Crane (30t)	(No.)	(8)	(1,462)			
Floating Crane (100t)	(No.)	(1)	(4,572)			
Sub Total			7,537	10.7		
Container Berth						
QEQ #5 (Crane Foundation, etc.)	Set	1	2,293	3.2	1981	Includes Construction Cost for 250m of #2
KQ #1 (Bulkhead, etc.)	Set	1	33,912	48.1	1983	
Dredging			2,860	4.1	1983	
Container Equipment	Set	1	13,794	19.6	1981, 1983	
(Container Crane)	(No.)	3	(9,051)			
(Straddle Carrier)	(No.)	11	(3,520)			
(Others)	(Set)	1	(1,223)			
Sub Total			52,879	75.0		
Road (2 Lanes)	km	5.7	1,524	2.2	1982	2 Lanes, Ditches and Sidewalks
Engineering	Set	1	2,111	3.0		
Physical Contingency	Set	1	6,407	9.1		
Grand Total			70,458	100.0		

Table - C.6 Construction Schedule for Urgent Plan

No.	Item	Unit	Quantity	1980			1981			1982			1983			1984				
				2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10
1	Crane foundation	m	200																	
2	O&O Paving	m ²	40,000																	
3	Offices & Others	m ²	1,135																	
4	Access road	m	150																	
5	South revetment	m (caisson)	310 (16)																	
6	North revetment	m (caisson)	350 (20)																	
7	Quaywall	m (caisson)	550 (39)																	
8	KO Reclamation	m ³	1,830,000																	
9	Yard paving	m ²	165,000																	
10	C.F.S	m ²	6,000																	
11	Electric & Others	Set	1																	
12	Offices & Others	m ²	3,450																	
13	Road	m	5,700																	
14	Dredging	m ³	1,500,000																	
15	Survey	Set	1																	
16	Design	Set	1																	
17	Construction Supervision	Set	1																	

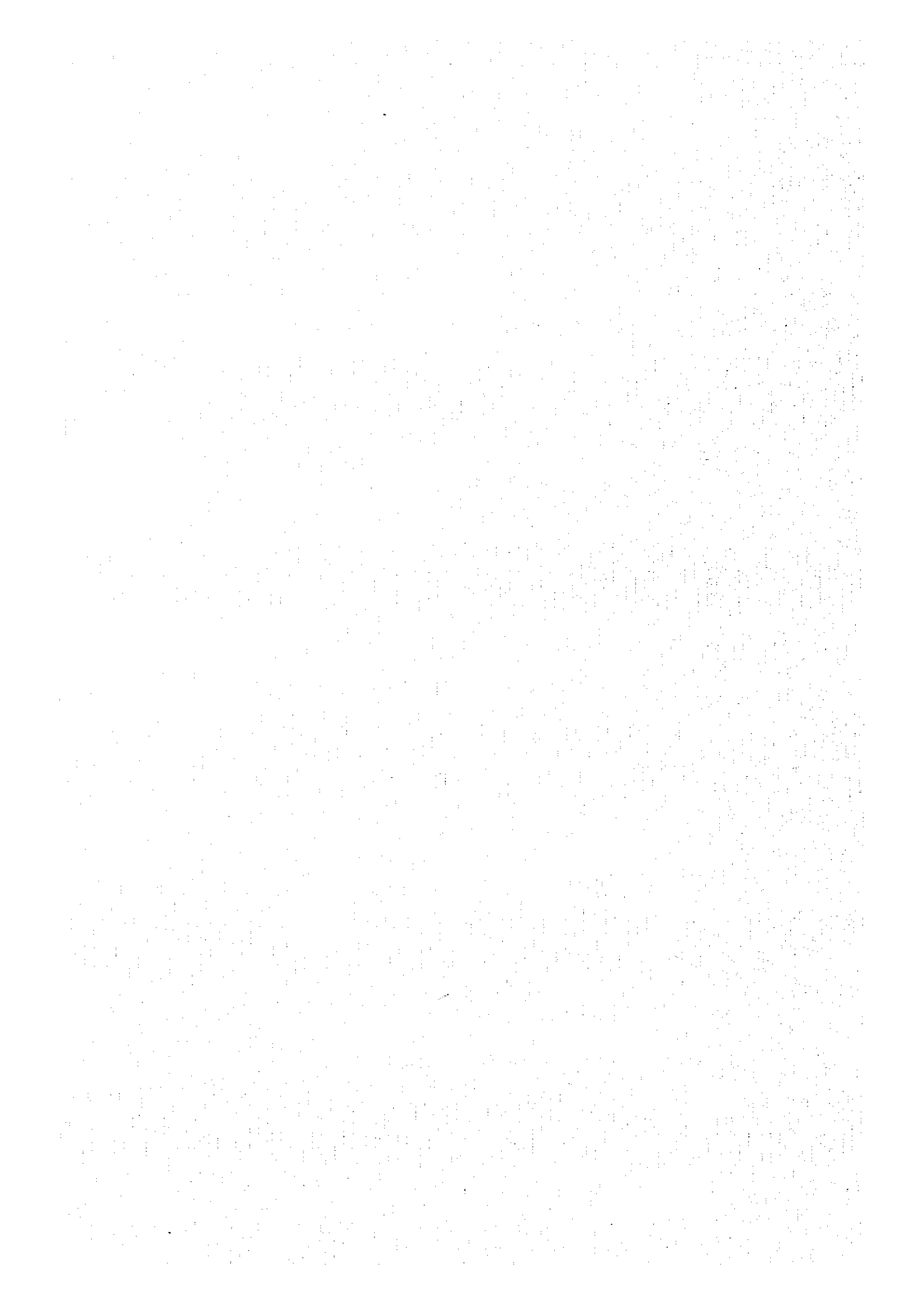
Note: Shown in () is caisson production

Table - C.7 Yearly Investment Plan

(Unit: Thousand US\$)

Construction year	Quantity	1980			1981			1982			1983			Total				
		Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total		
		QEQ																
Crane foundation	200 m			1,248	60	1,308										1,248	60	1,308
Heavy paving	40,000 m ²				320	320											320	320
Offices & Others	1,135 m ²			226	146	372										226	146	372
Power, lighting and water supply	1 Set			251	42	293										251	42	293
Sub total				1,725	568	2,293										1,725	568	2,293
KQ																		
Access road	150 m			378	62	440										378	62	440
South revetment	310 m			4,055	521	4,576	51	39	90							4,106	560	4,666
North revetment	350 m			1,856	251	2,107	1,190	168	1,358							3,046	419	3,465
Quaywall	550 m						7,913	1,004	8,917	2,118	340	2,458	10,031	1,344	11,375			
Reclamation	1,830,000 m ³						525	50	575	3,672	351	4,023	4,197	401	4,598			
Paving of yard	165,000 m ²										5,050	5,050			5,050			
GFS	6,000 m ²									792	516	1,308	792	516	1,308			
Offices and Others	3,450 m ²									589	382	971	589	382	971			
Power, lighting and water supply	1 Set									1,913	126	2,039	1,913	126	2,039			
Sub total				6,239	834	7,123	9,679	1,261	10,940	9,084	6,765	15,849	25,052	8,860	33,912			
Dredging	1,500,000 m ³																	
Roads	5,700 m																	
Sub total (1)				8,014	3,124	11,138	9,679	2,983	12,662	9,084	7,725	16,809	26,777	13,832	40,609			
Equipment																		
QEQ (Container)	1 Set			4,461		4,461										4,461		4,461
KQ (Container)	1 Set															9,333		9,333
Conventional berth	1 Set			7,537		7,537										7,537		7,537
Sub total (2)				7,537		7,537	4,461		4,461	9,333		9,333	21,331		21,331			
Survey and design	1 Set			594	169	763	238	69	307							832	238	1,070
Construction supervision	1 Set			278	69	347	278	69	347	278	69	347	278	69	347	834	207	1,041
Sub total (3)				594	169	763	516	138	654	278	69	347	278	69	347	1,666	445	2,111
Physical contingency [15% of (1) + (3)]				89	25	114	1,280	489	1,769	1,493	438	1,931	1,404	1,169	2,573	4,266	2,141	6,407
Total				8,220	194	8,414	14,271	3,751	18,022	11,450	3,510	14,960	20,099	8,963	29,062	54,040	16,418	70,458

SUMMARY



SUMMARY

1. General

The present Government, since it took office in July 1977, has been vigorously implementing the nation's economic development with special emphasis on such policies as the Mahaweli Development scheme the purpose of which is the irrigation for paddy cultivation together with hydroelectric power generation, the Free Trade Zone and the Investment Promotion Zone to induce export-oriented industries and to increase employment opportunities, the Urban Development and Housing scheme to shift the municipal functions and to construct housing units, and the import liberalization together with the unification of the dual exchange rate system. In particular, the import liberalization has had an immense impact on the Port of Colombo.

According to the port statistics, the dry cargo handled in the Port recorded a sharp drop of about 25% from 3 million freight tons or more in late sixties to 2,245 thousand freight tons in 1976, the year previous to the change of government. Particularly, the decrease of imports is remarkable, that is the import decreased by nearly 50% from the unprecedented level of 2,366 thousand freight tons in 1966 to 1,245 thousand freight tons in 1976. After the present Government came to power in 1977, however, the dry cargo handled in the Port has been greatly recovered. The total export and import recorded 2,945 thousand freight tons and the import recorded 1,895 thousand freight tons in 1978.

The waves of containerization that have swept over the developed countries are now washing the shore of the country. It is encouraging for the containerization of the Port that the share of containerizable cargo such as tea, rubber and a part of coconut products is very high in the total export. In addition, regional container feeder services (tranship containers) is likely to increase because of the advantageous location of the Port in relation to international shipping routes.

From the above discussion, it could be concluded that the biggest problem for the Port to solve promptly is how to meet the expected increase of port cargo and the urgent need for containerization.

The Port of Colombo, together with the other outports, is now under the control of the Sri Lanka Ports Authority which was established on the 1st of August 1979 by amalgamating the following three organizations: the Colombo Port Commission (CPC) which was a division of the Ministry of Trade and Shipping and was in charge of the administration/operation of the Port, the Port (Cargo) Corporation (P(C)C) which was a public body corporate and was in charge of the cargo handling in the Port, and the Port Tally and Protective Services Corporation which was in charge of the tally and protective services in the Port.

2. Sea and Soil Conditions of the Port of Colombo

Sri Lanka belongs to the Indian monsoon area and consequently has two main seasons, the southwest monsoon season from May to September and the northeast monsoon season from November to March. Being on the west coast, the Port of Colombo is affected by the southwest monsoon.

The wave hindcasting, based on the wind records observed at the Port over 13 years, gives, as a deepwater wave with a return period of 25 years, a significant wave height of 6.1 m, a significant wave period of 9.1 sec, and a predominant wave direction of WSW. There are, on the average, 56 days annually in which the significant wave height of deepwater waves exceeds 2 m. The tidal current seldom exceeds 0.5 kt in the vicinity of the Port. The tidal range is not so great, for example, the mean higher high water springs (MHHWS) is +72 cm.

The underlying bedrock of the Port of Colombo is very hard gneiss with the standard penetration value (N-value) of far more than 50. The bedrock surface generally lies -10 to -15 m except a few places, such as the area adjoining the North Pier or the starting point of the Queen Elizabeth Quay, where it is very shallow. The bedrock itself inclines with gentle slope toward the sea. On this hard gneiss there exists a weathered gneiss layer with the N-value of 27 to 50. The uppermost layer consists of loose and soft sediments, such as sand, silt and clay, with the N-value less than 14.

3. Current Situation of the Port of Colombo

The Port of Colombo, facing the Indian Ocean, is located on the west coast of Sri Lanka. It is the biggest port in the country and covers almost all part of the country as its service area. 96% of the nation's port cargo which amounts to 4,991 thousand freight tons was handled in the Port in 1978. Leading commodities in export are tea, rubber and coconut products, while those in import are rice, flour, sugar, fertilizer, general cargo and crude oil. The cargo handled in the Port in 1978 were 2,945 thousand freight tons of dry cargo and 1,852 thousand metric tons of wet cargo.

The Port is accommodated with 14 large alongside berths, 3 small alongside berths and about 20 midstream berths. The length of alongside berths totals about 3 km.

The shares in cargo handling were about 90% for alongside berths and about 10% for mid-stream berths in 1978.

The existing land use within the port area could be modified to a more effective and adequate one by, for example, integrating the small boat repair shops which are currently under dual operation by CPC and P(C)C.

Little cargo handling equipment is in commission mainly due to the age of the existing equipment and the difficulty in parts acquisition. The unavailability of cargo handling equipment results in the low productivity in cargo handling and the ineffective use of transit sheds. In addition to the shortage of alongside berths, this ineffectiveness leads, in turn, to the existing port congestion. Thus, the amount of dry cargo handled in 1978 is likely to be the nearly full capacity of the Port under the existing situation.

About 5,000 TEU of containers were handled at the #4 berth of the Queen Elizabeth Quay in 1978. At present, the Port has no container cranes and containers are loaded/unloaded by RO/RO or ship's gears. The backup yard of the Queen Elizabeth Quay is so narrow that the marshalling yard is always full of containers, thus further aggravating the traffic jam inside the Port.

The total wet cargo handled in the Port in 1978, excluding coconut oil in drums, amounts to 1,852 thousand metric tons, most part of which is crude oil imported from the Middle East. Almost all imported crude oil is unloaded at the North Pier. This pier involves safety problems

because of its adjacency to the dry dock belonging to the Colombo Dockyard Ltd.

The port has three dry docks (one 30,000 DWT dry dock and two 6,000 DWT dry docks) used mainly for the repair of large vessels. Further, there is a plan to construct a 65,000 DWT dry dock.

Both road and railway transports are available as the means to link the port and the hinterland. The roads transport almost all the port cargo. The railway is mainly used to haul foods, and its share in cargo transport is only about 3%.

4. Cargo Traffic Forecast

Since Sri Lanka is now in the stage of reforming its economic policy, the nation's economic plan has not been available yet. It is likely to be very hard at this time to forecast cargo traffic without some ambiguity. At present, "Public Investment 1979-1983" has been published by the Ministry of Finance and Planning.

The present forecast employs the "Public Investment 1979-1983" as its basis, together with the following premises:

1) A macro estimate utilizing the correlation between the port cargo traffic and the relevant economic indicators is impossible. Therefore,

2) a micro estimate, or a commodity-wise cargo traffic forecast based on the individual demand/supply plan is done. Further, the forecasted cargo is allotted to each port.

3) In doing so, the existing shares of each port are not changed except for imported wheat to the Port of Trincomalee.

4) The following figures in the "Public Investment 1979-1983" are employed in the forecast:

a. GDP growth rate	5.5% per annum
b. Growth rate in industry including construction	8.6% per annum
Manufacturing industry	8.0% per annum
Construction	12.0% per annum
c. Growth rate in Agriculture	4.5% per annum
d. Rate of population growth	1.5% per annum
Population projection	1978: 14,400,000
	1983: 15,500,000

5) Mainly from the viewpoint of the reliability of the forecast, the year of 1983, the final year foreseen in the "Public Investment 1979-1983" is employed as the target year in the forecast for the Urgent Plan, and 1988, 10 years after 1978, the starting year of almost all informations on which the present study is based, is employed as the target year in the forecast for the Master Plan.

The results of the forecast are shown in Table-S.1.

5. Master Plan

5-1 Requirements for the Master Plan

Requirements for the Port are listed in Table-S.2.

5-2 Basic Lines of the Master Plan

With these requirements in view, the basic guidelines of the Plan are selected as follows:

1) The future increases in the cargo traffic, together with a reduction of existing and anticipated Port congestion, shall be met by raising the cargo handling productivity through mechanization and by constructing additional berthing facilities.

For crude oil import, the necessary expansion of the facilities shall be considered corresponding to the expansion of the existing oil refinery.

2) An urgent demand for containerization shall be met by providing container berths through the modification of existing berths and through the construction of new container terminals.

3) A more effective and adequate land use shall be considered.

4) The existing road network shall be improved, to increase road transport capacity and to insure proper interfacing of Port and city road plans.

5) The existing safety problem, involving the existing Oil Dock and midstream berths, shall be reduced.

6) An urgent need for the expansion of large vessel repair facilities shall be considered. The need consists of two proposals, to construct a dry dock, and to modify existing cargo handling berths to ship repair berths.

5-3 Master Plan

The proposed layout of the Master Plan is shown in Fig-S.1. The summary of the Plan is listed in Table-S.3. Table-S.4 shows the breakdown of the number of alongside berths.

(1) Conventional Berths

1) As a substitution for one berth in the North Guide Pier, which has been requested to be transferred to the Colombo Dockyard Ltd., one alongside berth, for conventional cargo handling with the water depth of -12m and the length of 250m, is planned in the Korteboam Quay which will be constructed by the end of 1983.

2) After the removal of the Oil Dock, two alongside berths, for bulk cargo handling with

the water depth of -9m and the length of 165m each, are planned in the North Pier.

3) The whole Guide Pier including the South Pier is to be modified to ship repair berths by 1988.

4) The #5 berth of the Queen Elizabeth Quay is planned to be modified to a conventional cargo handling berth from a container handling berth after 1988. The container equipment of the berth, however, is assumed to be retained there in the cost estimate of the Master Plan. The above mentioned modification of the #5 berth of the Queen Elizabeth Quay and the retention of the container equipment must be judged at the final stage of the Plan taking into consideration the movement of the resultant containerization.

(2) Container Berth

1) In response to the urgent need, the 200m extended part of the Queen Elizabeth Quay is planned for a container berth. The crane foundations and other civil engineering works will be completed by the end of 1981.

2) As for full scale container berths, a new quay (Korteboam Quay) with 3 full size container berths is planned in front of the existing Coaling Jetties. The expansion of the whole Queen Elizabeth Quay to provide sufficient backup yard has been revealed to be unfeasible, as the results of the subsoil tests carried out during the present study.

3) The Korteboam Quay is accommodated with 3 full size berths with the water depth of -12m and the length of 300m and will be completed by the end of 1987. The northernmost (#1) berth will be completed by the end of 1983 together with 250m of the #2 berth, which shall be a temporary berth for conventional cargo handling.

(3) Oil Berth

1) Dolphine berths for a 60,000 DWT tanker and bunkering vessel, located immediately behind the North-West Breakwater, are employed in the Master Plan after comparing, under the assumption that the dredging of the approach channel does not involve rock blasting, with an off-shore buoy berth for a 100,000 DWT tanker.

2) Besides the existing pipelines, a pipeline with 20" diameter is necessary for the quick unloading of crude oil. All the pipelines will be submerged under the sea bottom at the North Entrance of the Port.

3) Widening of the approach channel to 200m (>5.8B) by removing 75m of the southern end of the North-West Breakwater and by extending the South-West Breakwater by 150m along the channel is planned. To prevent overtopping waves and to keep the approach channel calm, a seawall on the North-West Breakwater and a wave dissipating work in front of the Breakwater are proposed in the Plan.

4) The result of the comparison of a dolphin berth with an off-shore buoy berth largely depends on the depth of the sea bottom rock surface in the approach channel. For this and some other reasons, the construction of a new oil berth is not included in the Urgent Plan, though it is urgently needed.

A feasibility study on an oil berth including in situ verification of the depth of the bed-rock surface in the channel must be commenced immediately.

(4) Land Use Plan

1) Boat/barge repair shops under dual operations are to be integrated to the Barge Repairing Basin.

2) Other workshops are integrated, and will replace the site where the Walker Sons & Co., Ltd. has been located.

3) The area between the Block Jetty and the Baghdad is reserved for the demands from beyond the scope of the Master Plan. The area could be temporarily used for various construction work shops/stores during the implementation of the Plan.

4) The construction of the new 65,000 DWT dry dock is accepted at the northern part of the existing Coaling Jetties as is planned in its feasibility study.

5) The Beira Lake (East Lake) is considered to be an environmental reservation at least in the long run.

(5) Road

1) The road inside the Port is widened to 4 lanes from the existing 2 lanes.

2) The main entrance to/from the Port is to be set up near the existing Blomendahl Railway Gate.

(6) Cargo Handling Equipment

1) Conventional Cargo Handling Equipment is listed in Table-S.5.

2) Container Equipment is listed in Table-S.6. A full size container berth is equipped with two container cranes, and straddle carriers are selected as the main equipment for the marshalling yard.

5-4 Structural Design

(1) Korteboom Quay

A reinforced concrete caisson quaywall is selected for the Korteboom Quay taking into account the soil condition, the construction cost/period, and the relative difficulty in construction work. The revetment of the Quay shall be constructed of the same type.

(2) Widening of the North Pier

For the revetment facing the Prince Vijaya Quay, a sloping rubble type is selected to dissipate the wave energy coming through the North Entrance.

(3) Extension of the South West Breakwater

A reinforced concrete caisson, the most favourable type on hard base, is used.

(4) Oil Berth

Since the bedrock surface is not deep, a reinforced concrete caisson type is chosen as the working platform and for the breasting dolphins.

(5) Soft surface layer

Soft surface layers, if any, are to be dredged and replaced by engineered fill.

5-5 Construction Method

(1) Construction of Korteboom Quay

The construction procedures of the Korteboom Quay are as follows:

1) First of all, caissons for the south side of the Quay in the Urgent Plan are to be made by floating docks in front of the Coaling Jetties. Concrete and other construction materials must be supplied by barges. The number of caissons to be made at this stage is 16 for 300m.

2) After placing every caisson at the prescribed position along the face line of the Quay and casting the backfill rubble, the south side revetment of the Quay itself can be used as mooring berths for the floating docks as well as the road for supply of construction materials. Thus, the remaining caissons are made there.

3) For the expansion of the Korteboom Quay in the Master Plan, the south side of the Quay after the completion of the Urgent Plan can be utilized as mooring berths for the floating docks. Thus the caissons necessary for the expansion in the Master Plan, except the southernmost side of the Quay, can be built there.

4) After placing all the caissons along the west/east face line of the Quay, the caissons of the south side of the Quay can be transferred to the southernmost side.

(2) Reclamation Fill for Korteboom Quay

The sea bottom sand to the north of the North-West Breakwater or in front of the Kelani Ganga is to be used as a reclamation fill.

(3) Cement

For cement, there are likely to be some problems both in quantity and quality, hence the import of cement is proposed in the Plan.

5-6 Construction Schedule

The construction schedule is shown in Table-S.7.

5-7 Rough Cost Estimates

(1) Exchange Rate

The foreign exchange rate used in the study is the average of June 1979.

$$1 \text{ US\$} = 15.625 \text{ Rupees} = 218.89 \text{ Yen}$$

From this, the exchange rate between Rupee and Yen is as follows:

$$1 \text{ Rupee} = 14 \text{ Yen}$$

(2) Rough Costs Estimates

The overall cost amounts to 130,360 thousand US\$ and is shown in Table-S.3. The construction cost, which excludes the purchase of equipment, totals 91,731 thousand US\$ (70.4%) and is shown in Table-S.8. The cost of purchasing conventional/container equipment amounts to 38,629 thousand US\$ (29.6%) and is shown in Table-S.5 and Table-S.6.

6. Urgent Plan

6-1 Coverage of the Urgent Plan

The Urgent Plan covers all the urgent items in the Master Plan, excluding the new oil berth. The target year of the Urgent Plan is 1983. The proposed layout of the Urgent Plan is shown in Fig-S.2. Table-S.9 shows the summary of the Plan.

(1) Container Berths

Two container berths are planned, one in the Queen Elizabeth Quay and the other in the Korteboam Quay.

The extended part of the Queen Elizabeth Quay, with the length of 200m, is equipped with a container crane and can be opened at the beginning of 1982. The northernmost (#1) berth of the Korteboam Quay, with the length of 300m and the water depth of -12m, is equipped with two container cranes and its construction work can be completed by the end of 1983.

(2) Conventional Berth

One berth in the North Guide Pier is transferred to the Colombo Dockyard Ltd. by the end of 1983. As a temporary substitution for this, one conventional berth in the Korteboam Quay is planned with the length of 250m.

(3) Road

2 lanes out of 4 lanes proposed in the Master Plan are improved in the Urgent Plan.

(4) Conventional Cargo Handling Equipment

All the conventional cargo handling equipment proposed in the Master Plan is purchased within the scope of the Urgent Plan. They are listed in Table-S.5.

(5) Container Equipment

The container equipment proposed in the Urgent Plan are shown in Table-S.10. Three container cranes, one for the Queen Elizabeth Quay and remaining two for the Korteboam Quay, are included in the Plan.

6-2 Construction Schedule

The construction schedule is shown in Table-S.7 and Table-S.11.

6-3 Cost Estimates and Investment Schedule

The cost and the investment schedule of the Urgent Plan are shown in Table-S.12. The total cost is 70,458 thousand US\$ of which 54,040 thousand US\$ (76.7%) is foreign currency and 16,418 thousand US\$ (23.3%) is local currency.

6-4 Economic Analysis

(1) Method of Economic Analysis

The method of the economic analysis for the Urgent Plan is as follows:

- 1) Both the shadow pricing and the market pricing are employed to evaluate all the costs and the benefits.
- 2) The alternative to which the Plan is compared is called the "WITHOUT" Case, that is, the case without any investment.
- 3) The economic returns are evaluated through an internal rate of return (IRR).
- 4) Calculation of IRR is carried out over 25 years from 1980, the first year of the investment, to 2004.

The average service life of the facilities/equipments included in the Plan is 27.9 years.

(2) Benefits

The benefits of the Urgent Plan are as follows:

- 1) Contribution to the economic development – Strengthening the basis for the nation's economic development through modernization of the Port
- 2) Entrepot trade center – Providing the function of a center for an entrepot trade handling tranship cargo and providing container feeder services to the neighbouring countries.
- 3) Reduction in cargo handling costs – Reduction in cargo handling costs by raising cargo handling productivity through mechanization and containerization.
- 4) Reduction in damage to cargo – Reduction in damage to cargo through containerization and mechanization.
- 5) Reduction in ships' staying cost – Reduction in ship costs for awaiting berth and loading/unloading cargo through upgrading the port services.

6) Reduction in transit time – Reduction in transit time through upgrading the port services.

7) Safety – Improvement in the safety of navigation by extending the waterway and expanding the turning basin.

8) Value added earned by ship repair – Increase in the value added earned by the Colombo Dockyard Ltd., through the modification of a cargo handling berth in the North Guide Pier to a ship repair berth.

Among the above mentioned benefits, 3), 5) and 8) are measurable and are taken into account in the economic analysis.

All of the reduction of ships' staying cost, however, is not necessarily attributed to Sri Lanka. As the "feedback ratio", the ratio of what is attributed, irrespective of directly or indirectly, to Sri Lanka to all of the benefit, 10% is employed in consideration of the recent shares of the Ceylon Shipping Corporation in cargo traffic. Further, the feedback ratio of 50% is analyzed as well, considering the likely increase of the ratio in the next 25 years. At the same time, this serves as a sensitivity analysis.

(3) Costs

Costs of the Urgent Plan are as follows:

- 1) Construction cost – Cost of constructing civil engineering facilities.
- 2) Equipment cost – Cost of purchasing cargo handling equipment.
- 3) Operation/maintenance cost – Cost of operation and maintenance of equipment and other various facilities.

(4) Evaluation of Economic Returns

The internal rates of return (IRRs), with the feedback ratio of 10%, are as follows:

Shadow pricing: IRR = 17.1%

Market pricing: IRR = 19.5%

The IRRs in port investment projects usually range from 10% to 20% and it is commonly considered that a port project with an IRR of more than 10% is economically feasible.

Thus, the present Plan can be concluded to be economically feasible.

The IRRs with the feedback ratio of 50% are 40.8% for shadow pricing and 43.1% for market pricing.

6-5 Financial Analysis

(1) Premises

- 1) The Port of Colombo is separately operated under a self-supporting system.
- 2) Taking into consideration the scale of the Urgent Plan, the analysis covers the whole Port, including the Plan itself, rather than the Plan only. The internal rates of return (FRR) of the Plan itself are calculated, as well.

(2) Investigations on the Financial Statements and the Tariff Level

1) The Sri Lanka Ports Authority is now carrying out the revaluation of the fixed assets, which were under the control of the former Colombo Port Commission. Thus, the value of those fixed assets is not available yet, and only the cost of the extension of the Queen Elizabeth Quay and the estimated value of the land previously owned by the Port Commission are included in the analysis, besides the fixed assets previously owned by the Port (cargo) Corporation and the Tally and Protective Services Corporation.

2) It is concluded, by investigating the revenue/expenditure and the source/application of funds, that the self-supporting system of the Port can not be maintained under the current port tariff.

It is also concluded, under the following assumptions, that an average 25% raise in the port tariff, excluding the container tariff, is necessary to maintain the self-supporting system of the Port:

- a. A foreign currency portion of the investment to the Plan is financed by a long-term loan (interest rate: 8%, term: 20 years) from foreign countries.
- b. A local currency portion is financed by a loan (interest rate: 8%, term: 15 years) from the Consolidated Fund.
- c. The income tax of 50% of the profit after depreciation is paid to the government.
- d. A dividend of 4% on the capital investment by the government is paid to the Consolidated Fund.

3) The revenue/expenditure and the financial position of the Port after an average 25% of conceptual raise in the port tariff other than the container tariff are shown in Table-S.13.

4) Assuming that the foreign currency portion can be financed with the interest rate of 3% and the loan term of 30 years, an average 18% raise in the port tariff, excluding the container tariff, is enough for maintaining the self-supporting system of the Port.

5) The conditions under which any raise in the port tariff is unnecessary are as follows:

- a. Foreign currency portion: interest rate: 8%, loan term; 20 years
- b. Local currency portion: interest rate: 0%, loan term: 20 years
- c. Dividend on the capital investment by the Government: 0%

(3) Internal Rates of Return (FRR)

The internal rate of return of the Plan is 8.22%.

The internal rates of return corresponding to average raises in the port tariff, other than the container tariff, are shown in Table-S.14.

Table - S.1 Traffic Forecast of the Port of Colombo

(Unit: Thousand Tons)

Items	Export				Import				Total					
	1978		1983		1978		1983		1978		1983		1988	
	Total	Con- tainer	Total	Con- tainer	Total	Con- tainer	Total	Con- tainer	Total	Con- tainer	Total	Con- tainer	Total	Con- tainer
Dry Cargo														
Tea	464		517		141		55							
Rubber	141		146		538		320 ^{a1}							
Coconut	38		50		157		127							
Coconut Fiber	132		172	(560)	-		75							
Coconut Oil (in Drum)	11		31		-		75							
General Cargo	254		489		435		370							
					624	(339)	886	(928)						
Sub Total Wet Cargo	1,040 ^{a2}		1,405	(560)	1,895	(339)	1,998	(928)	2,935	3,313	1,128	(899)	4,573	1,558 (2,398)
Coconut Oil	23		30		1,457		2,350							
Refined Oil	84 ^{a3}		84 ^{a3}		126		401							
Sub Total	107		114		1,583		2,751		1,690	2,863	1,695	-	3,108	1,839
Grand Total	1,147		1,519	(560)	3,478	(339)	4,659	(928)	4,625	6,178	1,336	(899)	7,681	1,661 (2,398)

^{a1} includes local transport.

^{a2} excludes export of rice (10,000 tons)

^{a3} excludes export of refined oil (162,000 tons)

2) Tranship Container (245,000 tons for 1983 and 408,000 tons for 1988) is included in the Table.

Table – S.2 Requirements for the Port of Colombo

Requirement	Details
1. Increase in cargo handling capacity	a. To meet expected demand in cargo traffic forecast
2. Improvement of service level/coverage	a. To relieve port congestion b. To prepare container facilities
3. Effective use of land	a. Removal of facilities/functions unrelated to the Port b. Effective use of idle spaces c. Unification/integration of boat/barge repairing shops
4. Improvement of road network	a. Improvement/widening of the existing road b. To insure proper interfacing of port and city road plans
5. Improvement of safety	a. Improvement of approach channel and turning/mooring basin b. Removal of the existing Oil Dock
6. Increase in large ship repairing capacity	a. Construction of a 65,000 DWT dry dock. b. Modification of existing cargo handling berths to ship repair berths

Table - S.3 Summary -- Master Plan

Item	Unit	Qty	Cost		Target Year	Note
			Value (1,000 US\$)	Share (%)		
Conventional Berths						
KQ #2 (New Berth, Temporary)	Berth	1	-		1983	Modified to CTNR Berth after 1988
NP (Widening, 1 Berth → 2 Berths)	Berth	2	3,538	2.7	After Removal of Oil Dock	Widening of 50m, Two -9m Berths
NGP/SP (Cargo Berth → Ship Repair Berth)	Berth	3	-		1983 (1B) After Completion of NP (2B)	
QFQ #5 (Container → Conventional)	Berth	1	-		1988	
Cargo Handling Equipment	Set	1	7,537	5.8	1980	
Sub Total			11,075	8.5		
Container Berths						
QEQ #5 (Crane Foundation, etc.)	Set	1	1,628	1.2	1981	
KQ #1/#2/#3	Berth	3	47,736	36.6	1983 (#1) 1988 (#2/#3)	#2 (Conventional → Container)
Dredging	Mn.m ³	1.5	2,880	2.2	1983, 1988	
Container Equipment	Set	1	31,692	23.9	1981, 1983, 1988	
Sub Total			83,336	63.9		
Oil Berth*						
Dolphins	Set	1	937	0.7	Set by F/S*	*A feasibility study including an in situ survey of the bed-rock depth along the approach channel should be carried out.
Pipelines, etc.	Set	1	11,515	8.8	"	
Bunkering Facilities	Set	1	686	0.5	"	
Improvement of Port Entrance	Set	1	12,011	9.2	"	
Extension of SW Breakwater	(m)	(150)	(6,171)			
Removal of the Southwest End of NW Breakwater	(m)	(75)	(514)			
Seawall/Wave Dissipation Work along NW Breakwater	(m)	(700)	(5,326)			
Dredging	M.m ³	3.24	6,900	5.4	"	
Tug Boat	No.	1	1,919	1.5	"	
Sub Total			33,968	26.1		
Road	km	5.7	1,981	1.5	1982 (2 Lanes) 1988 (4 Lanes)	
Grand Total			130,360	100.0		

Note: Engineering fee and physical contingency are not included in the Table.

Table – S-4 Number of Alongside Berths (Dry Cargo)

	Existing		Planned		Transferred		Balance	
	Large*1	Small*1	Large	Small	Large	Small	Large	Small
Alongside Berths	14	3	5	0	3*3	0	16	3
Conventional	14	3	2*2	0	3	0	13	3
Container	0	–	3	–	0	–	3	–

Note: *1 "Large" denotes for quaywalls with the water depth of -7.5m or deeper and "small" for quaywalls with that shallower than -7.5m.

*2 North Pier

*3 2 berths at North Guide Pier and 1 berth at South Pier.

Table – S-5 Conventional Cargo Handling Equipment and Cost Estimates for Master Plan

(Unit: Thousand US\$)

Equipment	Nos. to be purchased	Cost per Unit	Total Cost
Forklift Trucks	38 (3T)	12.2	464
	47 (5T)	22.1	1,039
		(Sub Total)	1,503
Mobil Cranes	8 (30T)	182.8	1,462
			1,462
Floating Cranes	1 (100T)	4,572.0	4,572
Total Cost			7,537

Table – S.6 Container Equipment and Cost Estimates for Master Plan

(Unit: \$1,000 US\$)

Equipment	QE		Korteboom		Total	
	Quantity	Cost	Quantity	Cost	Quantity	Cost
Container Crane	1	3,017	6	18,102	7	21,119
Straddle Carrier	3	960	22	7,040	25	8,000
Yard-use Tractor	2	52	15	390	17	442
Yard-use Trailer Chassis 40'	2	18	20	180	22	198
" 20'	8	56	30	210	38	266
Forklift Truck 15 ton	2	274	–	–	2	274
" 1.5 ton	6	84	36	504	42	588
Weighing Scale	–	–	5	205	5	205
Total		4,461		26,631		31,092

Table - S.7 Construction Schedule for Master Plan

Item		Quantity	1980	1981	1982	1983	1984	1985	1986	1987	Target year
QEQ #S	Containerization	200 m									1981
KQ	Quaywall & Revetment	1,910 m									Quaywall 550m 1983 350m 1987
	Reclamation	2,600,000 m ³									
	CFS and Others	1 Set									
NP	Revetment	410 m									1985
	Reclamation	198,000 m ³									
Road		5,700 m									1982 2-Lanes 1986 4-Lanes
Dredgins		1,500,000 m ³									
Conventional QEQ #S KQ		1 Set									1980 1981 1 Berth 1985 2 Berths 1987
		1 Set									
		1 Set									
Feasibility Study		1 Set									
Berth	Dolphins	1 Set									
	Pipelines	1 Set									
Dredging (Turning Basin)		2,000,000 m ³									
	Dredging (Waterway)	1,240,000 m ³									
Improvement of Port Entrance	SW Breakwater Extension	150 m									
	NW Breakwater Removal	75 m									
	NW Breakwater Seawall/ Wave Dissipating Work	700 m									

Table – S-8 Rough Estimate of Construction Costs

(Unit: US\$)

	No.	Facility	Main item	Quantity		Unit Price	Rough Cost Estimate
						(US\$)	(Thousand US\$)
Container & Conventional Berths	1	QE Q #5	Crane foundation	200	m	6,540	1,308
			Heavy Pavement	40,000	m ²	8	320
			(Sub Total)				(1,628)
	2	KQ Container terminal	-12.0m Quaywall	900	m	20,750	18,675
			-7.5m Revetment	610	m	9,960	6,076
			-10.0m Revetment	400	m	14,200	5,680
			Reclamation	2,600,000	m ³	2.5	6,500
			Heavy Pavement	235,000	m ²	31	7,285
			C.F.S	16,000	m ²	220	3,520
	(Sub Total)				(47,736)		
3	North Pier	-4.0 ~ -10.0m Revetment	360	m	5,680	2,045	
		-10.0m Revetment	50	m	14,200	710	
		Reclamation	198,000	m ³	2.5	495	
		Pavement	18,000	m ²	16	288	
(Sub Total)				(3,538)			
4	Road		5,760	m		1,981	
5	Dredging	-12.0m Dredging	1,500,000	m ³	1.92	2,880	
Total							57,763
Oil Berth	6	Oil Berth	Main dolphins	1	Set		937
			Bunkering dolphins	1	Set		686
			Pipelines	1	Set		11,515
			(Sub Total)				(13,138)
	7	Dredging (Turning Basin)	-14m Dredging	2,000,000	m ³	1.9	3,800
	8	Dredging (Waterway)	-15.5m Dredging	1,240,000	m ³	2.5	3,100
	9	SW Breakwater	150m Extension	150	m	41,142	6,171
10	NW Breakwater	75m Removal Seawall/Wave Dissipating Work	75	m	6,857	514	
11	Tug boat		1	No.		1,919	
Total							33,968
Grand Total							91,731

Table - S.9 Summary - Urgent Plant

Item	Unit	Q'ty	Cost		Target Year	Note
			Value (1,000 US\$)	Share (%)		
Conventional Berths						
KQ #2 (New Berth, Temporary)	Berth	1	-		1983	Modified to CTNR Berth after 1988
NGP #1 (Cargo Berth → Ship Repair Berth)	Berth	1	-		1983	Transferred to CDL
Cargo Handling Equipment	Set	1	7,537	10.7	1980	
Forklift (3t)	(No.)	(38)	(464)			
Forklift (5t)	(No.)	(47)	(1,039)			
Mobile Crane (30t)	(No.)	(8)	(1,462)			
Floating Crane (100t)	(No.)	(1)	(4,572)			
Sub Total			7,537	10.7		
Container Berth						
QEQ #5 (Crane Foundation, etc.)	Set	1	2,293	3.2	1981	
KQ #1 (Bulkhead, etc.)	Set	1	33,912	48.1	1983	Includes Construction Cost for 250m of #2
Dredging			2,880	4.1	1983	
Container Equipment	Set	1	13,794	19.6	1981, 1983	
(Container Crane)	(No.)	3	(9,051)			
(Straddle Carrier)	(No.)	11	(3,520)			
(Others)	(Set)	1	(1,223)			
Sub Total			52,879	75.0		
Road (2 Lanes)	km	5.7	1,524	2.2	1982	2 Lanes, Ditches and Sidewalks
Engineering	Set	1	2,111	3.0		
Physical Contingency	Set	1	6,407	9.1		
Grand Total			70,458	100.0		

Table – S.10 List of Equipment required for QEQ #5 and Korteboam Container Terminals and Cost Estimates for Urgent Plan

(Unit: Thouthand US\$)

Equipment	Principle Particular	QEQ #5		Korteboam		Total Cost
		Q'tity	Cost	Q'tity	Cost	
Container Crane	Rated load under hook 35 tons (under spreader 30.5 tons) Rail span 16 meters	1	3,017	2	6,034	9,051
Straddle Carrier	Rated load under spreader 30.5 tons. Stacking 3 high for 20'/40'	3	960	8	2,560	3,520
Yard-use Tractor	Coupling load 12.5 tons, Hydraulic lifting coupler type	2	52	5	130	182
Yard-use Trailer Chassis	Rated load 30.5 tons for 40' Rated load 20.5 tons for 20'	2	18	15	135	153
		8	56	20	140	196
Forklift Truck	Rated load 15 tons with spreader Stacking 3 high	2	274	—	—	274
Forklift Truck	Rated load 1.5 tons, Battery driven	6	84	18	252	336
Weighting Scale	50 tons load	—	—	2	82	82
(Total)			4,461		9,333	13,794

Table -- S-11 Construction Schedule for Urgent Plan

No.	Item	Unit	Quantity	1980												1981												1982												1983												1984											
				2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12																														
1	Crane foundation	m	200																																																												
2	OEQ Paving	m ²	40,000																																																												
3	Offices & Others	m ²	1,135																																																												
4	Access road	m	150																																																												
5	South revetment (caisson)	m (caisson)	310 (16)																																																												
6	North revetment (caisson)	m (caisson)	350 (20)																																																												
7	Quaywall (caisson)	m (caisson)	550 (39)																																																												
8	Reclamation	m ³	1,830,000																																																												
9	Yard paving	m ²	165,000																																																												
10	C.F.S.	m ²	6,000																																																												
11	Electric & Others	Set	1																																																												
12	Offices & Others	m ²	3,450																																																												
13	Road	m	5,700																																																												
14	Dredging	m ³	1,500,000																																																												
15	Survey	Set	1																																																												
16	Design	Set	1																																																												
17	Construction Supervision	Set	1																																																												

Note: Shown in () is caisson production

Table - S-12 Yearly Investment Plan

(Unit: Thousand US\$)

Construction year	1980			1981			1982			1983			Total			
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local		
OEQ	Crane foundation			1,248	60	1,308							1,248	60	1,308	
	Heavy paving				320	320								320	320	
	Offices & Others			226	146	372							226	146	372	
	Power, lighting and water supply			251	42	293							251	42	293	
	Sub total			1,725	568	2,293							1,725	568	2,293	
Civil engineering facilities	Access road			378	62	440							378	62	440	
	South revetment			4,055	521	4,576	51	39	90				4,106	560	4,666	
	North revetment			1,856	251	2,107	1,190	168	1,358				3,046	419	3,465	
	Quaywall						7,913	1,004	8,917	2,118	340	2,458	10,031	1,344	11,375	
	Reclamation						525	50	575	3,672	351	4,023	4,197	401	4,598	
	Paving of yard															
	C. F. S.									792	516	1,308	792	516	1,308	
	Offices and Others									589	382	971	589	382	971	
	Power, lighting and water supply									1,913	126	2,039	1,913	126	2,039	
	Sub total				6,289	834	7,123	9,679	1,261	10,940	9,084	6,765	15,849	25,052	8,860	33,912
Dredging																
Roads																
	Sub total (1)			8,014	3,124	11,138	9,679	2,983	12,662	9,084	7,725	16,809	26,777	13,832	40,609	
Equipment	Q. E. Q. (Container)			4,461		4,461							4,461		4,461	
	K. Q. (Container)												9,333		9,333	
	Conventional berth			7,537		7,537							7,537		7,537	
	Sub total (2)			7,537		7,537							9,333	21,331	21,331	
Engineering	Survey and design			594	169	763										
	Construction supervision															
	Sub total (3)			594	169	763										
Physical contingency [15% of (1) + (3)]				89	25	114	1,280	489	1,769	1,493	458	1,951	1,404	1,169	2,573	
	Total			8,220	194	8,414	14,271	3,751	18,022	11,450	3,510	14,960	20,099	8,963	29,062	54,040
															16,418	70,458

Table - S. 13 Revenue / Expenditure and Financial Position

(Unit: Million Rs.)

	1978	1983	1984	1990 ~1994	1995 ~1999	2000 ~2004
Revenue	390	561	667	3,430	3,430	3,430
Profit after Depreciation	132	82	101	829	972	1,040
Fixed Assets	1,296	2,368	2,333	1,983	1,808	1,633
Long-term loan	--	844	844	283	--	--
Consolidated fund	--	257	257	--	--	--
Reserve and Provision	156	312	309	515	736	991

Table - S.14 Internal Rates of Return (FRR)

Tariff Raise	Internal Rate of Return (FRR)
10%	1.87%
18%	5.08%
25%	8.22%
30%	10.47%

Fig. - S.I Port Layout - Master Plan
(L: 250m)

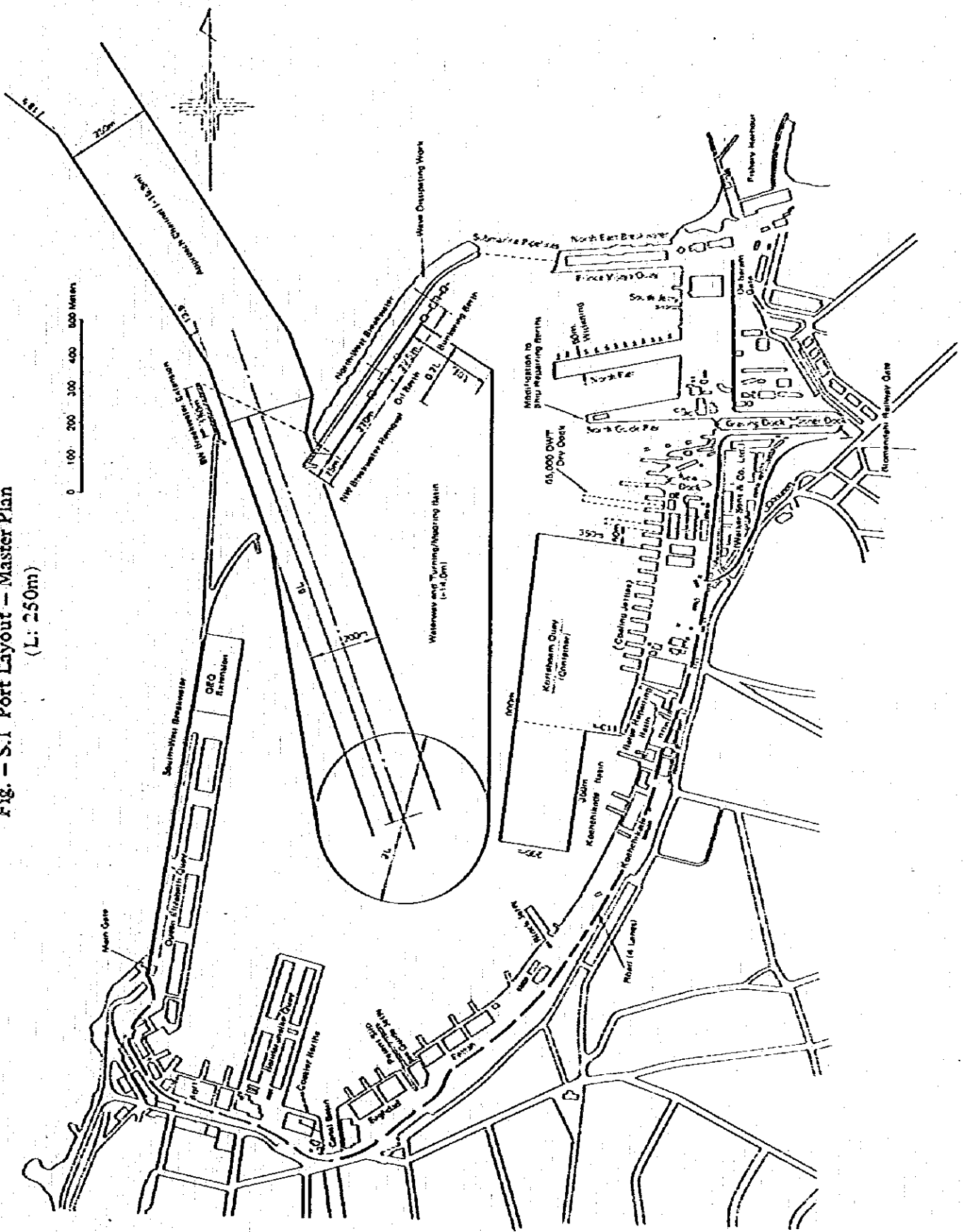


Fig. - S.2 Port Layout - Urgent Plan
(L: 250m)

