Summary

1. Socioeconomic Conditions of Cambodia

1.1 Location

1. The Kingdom of Cambodia is located in the southeastern part of the Indochina Peninsula between northern latitudes 10°25′ and 14°20′, and eastern longitudes 103°20′ and 107°30′. Covering a land area of about 181,000 km², it stretches a maximum of 575km in the east-west direction and 446km in the north-south direction. The nation borders Vietnam to the east, Laos to the north and Thailand to the west. It faces Thailand Bay to the south. The total length of its coast line is 435 km.

1.2 Topography

2. The dominant topographical feature of the country is its relative flatness. Except for the coastal ranges where the elevation is between 500 and 1,000 meters, and which divide the country into the Central Plain Region and the Coastal Region, the elevation of the main plain region is generally less than 100 meters. Compong Som Bay, where Sihanoukville Port is situated, is located in the middle of the Coastal Region.

3. Central Plan Region, which occupies about three-quarters of the country's land area, is the basin of the river system consisting of the Mekong River, Bassac River and Tonle Sap Lake (Great Lake).

1.3 Climate

4. The climate in Cambodia is characterized by tropical monsoon. From mid May through early October, the southwest monsoon blows from the Indian Ocean, bringing much rain to the country. Annual rainfall is between 1,000 and 2,000 mm in the Central Plain Region and over 3,000mm in the Coastal Region. In the dry season between November and March, northeast monsoon rings dry and cooler air to the country. Typhoons which attack the coast of Vietnam rarely reach Cambodia.

5. The annual average temperature is 25℃ while it generally ranges from 22 to 28℃. The highest temperature is usually observed in April, when the daily maximum temperature sometimes exceeds 32℃ and occasionally reaches 38℃. The temperature is the lowest in January, but rarely falls below 10℃.

6. About 80% of the annual precipitation is contributed by the rainfall during rainy season.

The water level and the discharge of the Mekong widely vary from rainy season to dry season. At Kratie located at the main stream of the Mekong, the discharge varies from 1,250 t/s to 66,700 t/s, and the difference of the water levels is almost 10 meters. Tonle Sap Lake functions as the buffer of the Mekong. The lake is 10,000 m^2 at its largest point and 2,600 m^2 at its smallest.

1.4 Population

7. No national census has been conducted since 1962. All the population statistics published thereafter have been estimated on the basis of the census in 1962. The latest estimate was published by the Ministry of Planning. According to this information, the population and the population density of the nation in 1994 were estimated to be 9,753 thousand and 54 person/km^2, respectively. The estimated population growth rate estimated for the period between 1980 and 1989 is 2.8%, and that since 1990 is 2.5%.

8. Fifty-three percent of the national population or 5.2 million people live in Phnom Penh and its suburbs in the Plain Region, which has a land area of 24,653 km^2 or 14% of the country. Phnom Penh is densely populated. The population of the city is 813,000 and the density is 3,045person/km^2.

9. The outstanding characteristic of the population structure is that the age group between 5 to 14 years old accounts for more than 30% of the whole population. In the year 2000, the labor force in Cambodia will be inflated since this generation will have grown up and entered the labor market.

1.5 Economy

10. In the 1960s, Cambodia was rich in agricultural production such as especially rice and rubber. However, due to the civil war and the intrusion of Vietnam during the 1970s, the country experienced an economic recession that lasted until 1991 when the Paris Peace Agreement was signed.

11. Under the Agreements, the United Nations Transitional Authority in Cambodia(UNTAC) first organized the election of the National Assembly. Following the election, the Royal Government of Cambodia was established in September 1993. The principal theme of the new government is to rehabilitate the nation and to convert the former planned economy into a market economy.

12. According to the statistics of the Ministry of Economy and Finance, the Gross Domestic

Product (GDP) in 1995 was 324.8 billion Riels in terms of 1989 constant price, or 7,200 billion Riels (US$2,923 million) in terms of current price. GDP per capita was US$287.

13. GDP in recent years and the actual growth rates are shown in Table - 1.1. The actual GDP Growth Rate in 1995 was 5.9%: the contribution of each business sector is listed in Table - 1.2. The average GDP growth rate of the period between 1989 and 1995 was 5.1%. The high growth rate of 7.0 % from 1991 to 1992 was due to the construction boom and commercial activities in Phnom Penh stimulated by the group of foreign officials under UNTAC.

Table - 1.1 GDP and growth rate

Year	GDP(1989 Price)		Growth
	mil. Riel	mil. US$	Rate (%)
1989	240,909	1,075	
1990	243,700	1,088	1.2
1991	262,200	1,171	7.6
1992	280,600	1,253	7.0
1993	291,600	1,302	3.9
1994	306,800	1,370	5.2
1995	324,800	1,450	5.9

Table - 1.2 GDP share by sectors(1995)

Sector	Share (%)
Agriculture	53.5
Energy, Water	0.6
Manufacturing	4.9
Construction	6.1
Transportation	3.2
Trade	11.2
Government	4.0
Other services	16.7

1.6 National Rehabilitation and Economic Development

14. In February 1996, the Royal Government of Cambodia published "The First Socioeconomic Development Plan, 1996 - 2000 (FSDP)". The principal themes of the five-year Economic are

1) commercialization of agricultural products,
2) establishment of an attractive environment for domestic and foreign investment,
3) promotion of labor-intensive, export-oriented, natural-resources-based industries,
4) promotion of self-employment in both rural and urban areas through vocational training,
5) development of tourism to generate jobs, incomes, tax revenue and foreign exchange in the short term.

15. The Plan foresees an annual GDP growth rate of 7.5% in the coming five years. The public investment planned over the five years amounts to US$2.2 billion. Of this amount, US$506 million is allocated to transportation and communication sectors.

1.7 Industry

16. The economy of Cambodia is highly dependent on agriculture. In 1995, this sector's contribution to GDP exceeded 50%. However, as shown in Table - 1.3, the growth rate of the agriculture sector in the period between 1989 and 1995 remained lower than other sectors: Manufacturing, Construction and Services. This is, supposedly, because of the slow recovery of devastated farm land during the war period while the rehabilitation of national highways and the construction of buildings were proceeding full blast and the tourism related businesses have been the major targets of foreign investors.

Table - 1.3 Growth rate of sectors(1989-1995)

Sector	Growth over 6 years	Average annual Growth Rate	Sub-sector with high growth
Agriculture, Forestry and Fishery	1.15 times	2.4%	Forestry
Manufacturing and Construction	1.64 times	8.6%	Construction
Trade and Services	1.53 times	7.4%	Hotel, Restaurant

1.8 Private Investment

17. In order to encourage both local and foreign investment in Cambodia, the "Law on the Investment of the Kingdom of Cambodia" provides a legislative background for the incentives to the investors. Some of the incentives are: exemptions from duties and taxes, land ownership, hiring foreign employees, and remittance abroad of the wages and salaries, among others.

18. With the Law of Investment, 85 local and foreign or joint investment applications with a total pledged amount of US$2,274 million have been approved by the Council for the Development of Cambodia (CDC). The number of applications and the pledged amount in various sectors are as follows:

a. Garment; 17 applications and US$75.6 mil.,
b. Construction materials; 14 and US$244.0 mil.,
c. Agriculture; 12 and US$66.7 mil.,
d. Food Industry; 9 and US$76.6 mil.,
e. Manufacturing and Chemical Industry; 11 and US$4.5 mil.,
f. Mining; 1 and US$4.5 mil.,
g. Shipbuilding and Motorcycle; 2 and US$3.0 mil.,
h. Tobacco; 5 and US$8.0 mil.,

i. Telecommunications; 3 and US$147.0 mil.,
j. Tourism; 8 and US$1,635.1 mil., and
k. Energy; 2 and US$44.0 mil.

19. The outstanding investment projects are:

a. Kaoh Poah Island (in Sihanouk Ville, Malaysian Investor with US$1,300 mil.)
b. Cement plant (Cambodian Investor with US$148 mil.),
c. Pochentong(Phnom Penh) Airport (Consortium of French and Malaysian Investor with US$117 mil.), and
d. Dry port (Consortium of Singapore and Cambodian Investors with US$20 mil.).

1.9 Transportation Sector

(1) Ports

20. International ports of Cambodia are the Phnom Penh Port and Sihanoukville Ports. Almost all the seaborne cargoes are handled at either of these two international ports. The Phnom Penh Port, situated on the Mekong River, has the advantage of its proximity to the nation's commercial center and its access to the agricultural and industrial production regions via inland waterways through the Mekong-Tonle Sap system. Sihanoukville Port, on the other hand, is able to accommodate ocean going ships of larger size as it is located on the open sea.

21 Based on their respective advantages, the principal commodities handled at the two ports are characterized as follows:

Phnom Penh Port;
Oil, general cargoes, agricultural products, rubber products and wheat.
Sihanoukville Port;
Container cargoes, timber, heavy machinery, rice, fertilizer, cement.

22. In recent years, import volume of oil at Sihanoukville Port has been increasing and the expansion project of oil storage facilities is about to start.

(2) Highways

23. The national road network is comprised of the arterial roads (No. 1 through No. 7) and secondary roads (No. 10 to No. 78). These roads and the bridges were damaged during the war and need rehabilitation and repair. Since 1991 when UNTAC was established, the rehabilitation and reconstruction work under various foreign assistance programs such as UNDP, USAID and

NGO have been carried out, and the rehabilitation of over 300 km and repairs over 550 km were scheduled to be completed by the end of 1996.

24. The National Road No.4, which is the arterial highway between Phnom Penh and Sihanoukville Port , is the only highway that has been rehabilitated completely over the whole length of 224 km and that allows the passage of vehicles having 25 ton gross vehicle weight. Via the National Road No. 4, vehicles can travel between Phnom Penh and Sihanoukville City in about three hours. Between Phnom Penh and Sihanoukville City, scheduled express buses are operated several times a day.

(3) Railways

25. The Royal Railway of Cambodia(CFRC) operates its 385 km long Northern line and 246 km long Southern Lines. The former links Phnom Penh with rich agricultural provinces in the northwester regions of the country. However, without renewal since its completion in 1943, the condition of the Northern Line is very poor, and at present they stop operation between Batanbong and Thai border.

26. Completed in 1969 to link Sihanoukville Port with Phnom Penh, the rails of the Southern Line are still in good condition and the rehabilitation of the track bed is presently being implemented under the National Transportation rehabilitation project financed by ADB, WB and the French government. The maximum allowable axle load of the Southern Line is 20 tons. In early 1996, the CFRC started container freight service between Sihanoukville Port and Phnom Penh. The Phnom Penh Station is being renovated for the convenience of container handling. The Southern Line is, thus, expected to provide an alternative route to the highway between Sihanoukville Port and the Capital.

2. Present Situation of Sihanoukville Port

2.1 Natural Conditions

(1) Climate

a. Wind

27. The climate throughout Cambodia is characterized by tropical monsoon. During the rainy season from May through October, the southwest monsoon is predominant, while during dry season over November through April, the northwest monsoon is predominant. The records obtained over the period from 1963 through 1970 at the weather station at the heliport near Sihanoukville Port show that strong winds rarely blow and the probability of occurrence of winds higher than 9 m/s is less than 1 %. Maximum wind speeds range from 10 to 20 m/s and blow in the southwest and west direction .

b. Temperature

28. According to the weather record for the period between 1985 and 1995, the annual mean temperature is 24 °C while the minimum monthly mean temperature of 23.3 °C is observed in January and the maximum of monthly mean temperature of 25.5°C occurs in May.

c. Rainfall

29. According to the records from 1985 through 1995, the total precipitation over a year varies from a low of 2,936 mm recorded in 1992 to a high of 4,235 mm recorded in 1991. The average over 11 years is 3,361 mm. Heavy rainfalls are observed from May to November, especially between June and September: total precipitation of the month sometimes reaches 700 to 800 mm. The maximum volume was observed in July, 1991, when monthly precipitation recorded 1,316 mm.

(2) Waves and Tide

a. Waves

30. Sihanoukville Port is located at the mouth of Compong Som Bay and there are some islands in front of the mouth of the bay. Typhoons rarely visit this area. Due to the topographical features and the climate, the sea area near Sihanoukville Port is fairy calm throughout the year. The weather and waves are not the main cause of the suspensions of cargo handling work. The total duration of suspension of handling work at wharves over a year is usually less than 200 hours. The suspension often occurs during the rainy season, and thus, heavy rain seems to be the main cause.

31. Generally, the wave period observed outside of breakwaters of the Port is less than 2

seconds, and the wave height rarely exceeds 50 cm. The wave hindcast on the basis of the wind records showed that the probability of occurrence of waves having wave heights 50 cm or larger is 7.7 % and that of waves having wave periods 3 seconds and longer is 2.2 %.

b. Tidal current

32. Fifteen-day current observations were conducted at two locations: in front of the entrance of the port in the north navigation channel and near Kaoh Poah Island in the south navigation channel. At both locations, current was measured at two levels: 1 m below surface and 1 m above the sea bottom.

33. The results show that the north-south current is predominant at both locations. The maximum tidal currents in the north navigation channel were about 40 cm/s in both north and south directions. In the south channel, the maximum current toward south was higher and sometimes registered 60 cm/s.

c. Tide level

34. Observation of tide started in May 1996 when a tide gauge was installed and records over the period from May through December, 1996, were analyzed. Tide in Sihanoukville Port is diurnal and the range of spring tides is 100cm.

(3) Soil condition

35. Boring was once conducted in 1988 by the former U.S.S.R , and the data are available for the subsoil conditions at the existing basin and near the entrance of the New Port area. Additional boring tests were conducted during the period of the current study at two locations: one at the proposed project site of new container terminal and the other at the existing basin for the confirmation of the existing soil data.

36. The results of the additional boring conformed with the existing data. The soil layer from the sea bottom to -10m consists of very soft mud and its N-value is almost zero. Between -10 and -15m, there is a layer of silty sand with N-value of 5 or less. Between -15 and -20m, another layer of sandy silt or sandy-clay with N-value of about 10 was observed. Underneath these layers, there is a layer of weather rock. The materials of the upper layer of the sea bed is too soft and fine for the fill of the reclamation.

37. The soil data indicate that there is a rock layer underneath the sea bed all over the port area. In order to ensure that the dredging can be done with ordinary dredgers, a seismic survey was carried out to detect the level of the rock layer at the basin and along the navigation channels. In addition, boring tests were also conducted at 8 locations to countercheck the results of the

seismic survey.

38. The results show that the level of the rock layer is shallower along the south channel than along the north navigation channel. This implies that special dredger is required to deepen the south channel in the rock layer.

(4) Sounding and topographic survey

39. A sounding survey was conducted with an echo-sounder in the water area from Kaoh Poah Island to the Oil Port in south-north direction (over a distance of about 6 km), and from the shoreline to the location of the contour line of -12m in the east - west direction (over a distance of about 6 km). The result of sounding was drawn in maps with the scale of 1/5,000. A topographic survey was also conducted in the land area of the port, and the result is drawn in topographic maps with the scale of 1/1,000

2.2 Environmental Conditions

(1) Water Quality and sediment on sea bed

40. At ten locations in the water area of the port, water and sediment were sampled. The laboratory test showed that the turbidity of the water is considerably high for all the locations, and that the water and sediments in this area contain chemicals such as oil, cyanide, and lead.

(2) Air and road traffic

41. Sihanoukville City, with a population of 120 thousand, is not a densely populated city and except for a commercial zone, farm land is overspread. The objective of this study is not to develop an industrial port but to expand and upgrade the function of Sihanoukville Port as the seaborne cargo terminal of the country. Thus the air quality was not surveyed since the effect of the port development on the air is considered to be minimal.

42. The road traffic on the National Road No. 4, which is the access to the Port from Phnom Penh, is about 2,000 cars per day (sum of both directions) , and 5,400 motorbikes per day(ditto). The traffic during the night (between 9 p.m. through 5 a.m.) is very light, and is only 2 - 3 % of the daytime traffic. Traffic peak occurred between 08:00 and 12:00, and the maximum traffic per hour reached 230 cars and 500 motorbikes per hour. Motorbikes are used as taxis in the city, and this results in heavier traffic of motorbikes, half of which are running without passengers.

43. Heavy cargo trucks and trailers encompass 13 to 17 % of vehicle traffic depending on the day of the week.

(3) Biological survey

44. The water area near Dek Koul Island is the potential dumping site of dredged material because the water depth is deep enough to place the whole volume of dredged material. Fauna and flora in this water area and at the coastal line of the two island nearby, namely Kaoh Poah Island and Dek Koul Island, were visually observed by divers as well as sampling of plankton in the water and benthic animals in the sediment on the sea bottom.

45. It was observed that the turbidity of the water in this area was considerably high. It was also found that, there were only few plants and animals near the coast of these island and practically no plants were found on the sea bed at the proposed dumping sites.

46. There exists coral along the shoreline of these island where the water depth is shallower than 7 meters. However, there were no special species and, in southern side of Dek Koul Island, about 10% of the coral is dead.

(4) Residents, Buildings and Cultural Assets

47. Within the area surrounded by the breakwaters, there are four villages where fishing ports, municipal ports, shipyards, hatchery of fish and shrimp, private houses, school buildings, and some government offices are found. About 800 families live in the village at the north part of the area, which is called Village No. 1 hereafter, and about 40 families live in another village next to the New Quay of Sihanoukville Port, which is called Village No. 2, hereafter. Two more villages exist near the railway station and in the middle of inland area of the port, respectively.

48 Village No. 2 is very close to the proposed project site. Potential elements of the impact caused by the project on the socioeconomic activities in the village are: the traffic of the fishing boats to and from the fishing port in the village, and sedimentation in the basin of the fishing port. There are no historical or cultural assets in the project area.

2.3 Port Facilities

49 At present, Sihanoukville Port consists of a commercial port and an oil port. In addition to these major port facilities, there are several docking facilities of smaller scale in the vicinity of Sihanoukville Port. These smaller scale facilities are administrated by other agencies: Department of Fishery and Municipality of Sihanoukville.

(1) Commercial port

50. Sihanoukville Port administrate the commercial port which consists of the Old Jetty, the New Quay and the Oil Port. The 290m long Old Jetty was constructed in 1960 and has berth

depth of -9.0m. The New Quay was completed in 1969 and is a reclaimed wharf having a 350m long berth with water depth of -7.5m.

51. Emergency repair of the timeworn Old Jetty and the construction of a container yard with 2.3 ha were been completed in 1996 under ADB loan. However, the Old Jetty still requires full rehabilitation or replacement, and the newly completed container yard is not large enough to handle the growing volume of container cargoes at the port.

(2) Oil Port

52. Oil storage facilities(16 storage tanks with capacities ranged from 1,000 to 20,000 m^3) which are owned and operated by private oil companies are found about 6 km to the north of the commercial port. Sihanoukville Port operates a jetty having a berth depth of -5m in front of the storage facility. Tankers with 2,000 to 3,000 DWT call on the Oil Port once or twice a week.

(3) Other facilities

53. Two municipal ports are operated by the municipality of Sihanoukville. Scheduled passenger boats going to Koh Kong and Koh Rong Island and small size cargo ships from Thailand are docking at the municipal ports. Fishing ports are used by hundreds of fishing boats for mooring, supply of water and bunker oil, unloading fish.

2.4 Trade Routes and Vessel Traffic

54. Trade with Singapore has the largest share in the international trade of Cambodia. Next to Singapore, Thailand, Australia and China are the major origin and destination of the cargoes handled at Sihanoukville Port. Cargoes to Malaysia also represent to a large share of the export cargo.

55. The share of the cargo by major origins and destinations is shown in Table - 2.1.

Table - 2.1 Cargo share by major origin and destination

(Sihanoukville Port , 1995)

	Import		Export	
	All cargo	Container	All cargo	Container
Singapore	44%	86%	14%	49%
Australia	15%	—	—	—
China	5%	—	26%	—
Thailand	24%	14%	42%	15%
Malaysia	2%	—	4%	34%
Total of above	90%	100%	86%	98%

56. The sea routes of container carriers visiting Sihanoukville Port are either the direct routs to and from Singapore and Bangkok or triangular routes: Singapore - Sihanoukville - Malaysia and Saigon - Sihanoukville - Lam Chabang. The number of calling ships at Sihanoukville port in 1995 and 1996 is shown in Table - 2.2. It is expected that the number of container carriers increases by 10% in 1996 while number of general cargo ship declines considerably. It seems that containerization of general cargoes at the port has been progressing rapidly.

Table - 2.2 Number of calling ships (Sihanoukville Port)

	General Cargo Ship	Container carrier	Tanker	Total
1995	330	212	66	608
1996*	236	358	67	661

*Note: * Number of calling ships is estimated by extrapolating the calling ships between January and October 1996.*

2.5 Cargo Traffic

57. Containers, wood products, and bitumen are the major commodities handled at the New Quay, and bagged cargoes such as cement, rice, sugar and fertilizer are major commodities handled at the Old Jetty. Petroleum products are handled at the Oil Port.

58. Sihanoukville Port used to handle about one million tons of cargoes in the middle of the 1960s. After the war and through the 1980s, however, the port handled only 100 to 200 thousand tons. Since 1992, the cargo volume has been increasing rapidly(see Table - 2.3).

Table - 2.3 Cargo throughput at Sihanoukville Port

(Unit: ton)

	Type of cargo	1991	1992	1993	1994	1995
Import	General Cargo	44,582	71,071	209,531	281,961	273,203
	Container	0	30,459	89,546	126,659	208,832
	Oil	1,095	5,112	23,119	41,684	72,243
	Sub-total	45,677	206,642	322,196	450,304	554,278
Export	General Cargo	86,873	77,350	120,158	96,026	133,623
	Container	0	212	36,151	12,338	19,804
	Sub-total	86,873	77,562	156,309	108,364	153,427
	Grand Total	132,550	284,204	478,505	558,668	707,705

Source: Sihanoukville Port

2.6 Port Operation

59. The New Quay is used for both general cargoes and container cargoes. Majority of the container ships calling on the ports have DWTs between 2,000 and 4,000, carrying capacities of which are about 200 TEUs. Containers are handled by ship gears and the mobile cranes of the port are sometimes used as auxiliary handling equipment.

60. In 1996, since the new container yard was still under construction, containers were placed in three sites in the port area. A large-scale empty container yard was also being developed. In these yards, containers are handled by a pair of reach stackers and some forklifts.

61. The container handling at the berth is performed in three shifts. Once a container ship docks, the loading and unloading continue without recess until all the handling work is completed. However, by regulation, ships may only enter and leave the port between 07:00 and 22:00. Thus, many of the container ships tend to dock in the morning and leave on the following morning.

62. The export container cargoes amount to only 10% of the import container cargo volume, and the majority of the export containers is empty. Therefore, in addition to the scheduled operation, large size container carriers having DWTs larger than 10,000, sometimes visit the port to pick up empty containers.

63. Average dwelling time(duration a container stays in a yard) of import containers is 6.2 days. That of export containers is 4.3 days. Empty containers stay in the in yard longer and the average dwelling time is 8.4 days.

2.7 Port Management

64. The two international ports of Cambodia, Phnom Penh Port and Sihanoukville Port, are operated and administrated by respective port authorities. These authorities are under the Ministry of Public Works and Transport. However, they are financially autonomous entities. They prepare financial statement every year and are obliged to pay tax according to their profits.

65. They are in charge of all kinds of port activities: operation and maintenance of the facilities, berth allocation, pilotage, tug, cargo handling, storage, delivery and security of the port area. In addition, they are given the right to conclude concession contract with private sector. At present, under the contract, two bitumen companies installed their own storage facilities in the port area and a company which supports oil exploitation is given priority use of a berth and exclusively operates one of the sheds of the port.

66. The total number of personnel of Sihanoukville Port is 1,008 in 1996. They are classified into four categories: Directors, Officers, Staff and Laborers. The numbers of personnel of these four categories were 4, 21, 101 and 882, respectively. The Rate of Return on Net Fixed Assets of the Port was 51% in 1995, and the port is financially sound. Tariff such as dues, rates and charges are determined by the central government. The present tariff system came into effect on May 8, 1993.

3. Long-term Development Plan

3.1 Requirement for the New Port Facilities

67. In the master planning, the following items are taken into consideration.

(1) The Timeworn Old Jetty

68. The structural survey of the existing Old Jetty showed that the damage is considerably serious. Even with the emergency repair which is being done, it is quite risky and dangerous to assume the jetty will be still usable beyond the year 2000. In the master planing, alternative facilities to the existing Old Jetty should be proposed.

(2) Dry Bulk Terminal

69. Such commodities as fertilizer, cement and rice, which are brought to the port in the form of bags at present, are often handled in the form of dry bulk in many ports in the world. Thus, these commodities are expected to change the form from bag to bulk as the handling volume increases. Bitumen is also brought in the form of liquid bulk by tankers.

70. Therefore, it is recommendable to construct a bulk terminal where fertilizer , cement and bitumen are handled with high handling efficiency. At the same time, by removing bagged cargo, which sometimes requires a longer handling time, from the general cargo berths, the latter can accommodate more ships carrying other commodities.

(3) Zoning for the port facilities

71. In the Long-term development plan, the port area should be divided into three zones: general cargo, container cargo and bulk cargo zones, and the routes of land transportation of these three types of cargoes should be separated from each other.

(4) Railway

72. The existing port is so designed that the railway is accessible to all the facilities: the Old Jetty, the New Quay and the sheds. Though railway carries very small amount at present, the mass transportation of containers by rail will be needed in the future. The land space for rail container terminal should be reserved within the proposed new container terminal.

(5) Consideration of the fishing port and residential area near the port

73. There is no authorized land use plan or implementing plans of whole port area , which includes water area surrounded by breakwaters and the water front area. Thus, in the master plan, relocation of the existing private properties should be minimal.

(6) Topography and Hydrology of the port area of Sihanoukville.

74. The land area to the north of the New Quay is low and swampy. During the rainy season, all the rainfall flows down to this area from the hills surrounding the port area, and then flows into the basin of the port. With this topography, the swampy area functions as the buffer of the discharge of water, and the sedimentation in the port basin is moderated. Therefore, the impact caused by the project on the hydrology should be carefully assessed.

3.2 Cargo Traffic Forecast

(1) Population

75. The result of the forecast of population growth is shown in Table - 3.1. It is expected that the population will increase to 1.65 times over that of 1995.

Table - 3.1 Forecast of population growth

(unit: 1,000)

	1994	1995	2000	2005	2010	2015
Population	9,870	10,107	11,403	12,964	14,763	16,504
Annual growth rate(%)		2.4	2.4	2.6	2.6	2.3

(2) Gross Domestic Product (GDP)

76. "The First Socioeconomic Development Plan, 1996-2000"(FSDP) assumes the annual GDP growth to be 7.5% over the five years from 1996 to 2000. However, the plan does not mention the growth rate of each sector and no economic development plan beyond 2000 has yet been published.

77. The GDP growth forecast for each sector was thus carried out on the basis of trend observed in the statistics with the breakdown of sectors for the past nine (9) years. The average growth rates over the nine years were 3.0% for the agriculture sector, 8.7% for the mining and construction sector and 6.7% for the service sector. On the basis of these growth rates, the growth rate up to 2015 was estimated under three scenarios. The results are shown in Table - 3.2.

Table - 3.2 GDP growth rate forecast by sectors

Scenario	Sector	Annual GDP Growth Rate(%)					
		1995	1996 -1999	2000 -2005	2006 -2010	2011 -2015	Average
High Growth	Agriculture	3.0	5.0	5.0	5.0	5.0	5.0
	Industry	8.7	9.5	9.5	9.5	9.5	9.5
	Service	6.7	8.5	8.5	8.5	8.5	8.5
	All the sector	5.2	7.1	7.3	7.5	7.7	7.4
Middle Growth	Agriculture	3.0	4.0	5.0	5.0	5.0	4.8
	Industry	8.7	8.0	9.5	9.5	9.5	9.2
	Service	6.7	6.5	8.5	8.5	8.5	8.1
	All the sector	5.2	5.7	7.3	7.5	7.6	7.1
Low Growth	Agriculture	3.0	4.0	4.0	4.0	4.0	4.0
	Industry	8.7	8.0	8.0	8.0	8.0	8.0
	Service	6.7	6.5	6.5	6.5	6.5	6.5
	All the sector	5.2	5.7	5.8	5.0	6.0	5.8

78. The assumptions for the three scenarios are as follows:

a) High Growth Scenario;
Weighted average growth rate of all the sectors is 7.4% which is almost the same growth rate assumed in the FSDP.

b) Middle Growth Scenario;
Up to 1999, the weighted average growth rate is equal to that of the Low Growth Scenario (5.7%), and 2000 and after, the growth rate is about 7.5%, as the same as the High Growth Scenario.

c) Low Growth Scenario;
The growth rate is assumed to remain at almost the same level as the average growth rate for the past nine years.

(3) Cargo Volume Forecast at Sihanoukville Port

a. Seaborne international cargoes of Cambodia

79. The cargo volume forecast was carried out for each commodity classified in the existing cargo statistics of both Phnom Penh and Sihanoukville Port. The classification of commodities is as follows:

Import commodities;
fertilizer, cement, sugar, wheat, steel, machinery, bitumen, petroleum products, other general cargoes(including container cargoes)

Export commodities;

log and wood products, rubber, agricultural products(other than rice), other general cargoes (including container)

80. The forecast method of these commodities is as follows:

a) Cement, sugar, wheat, steel, bitumen;
The import volumes of these commodities were correlated to the GDP of industry sector.

b) Machinery, petroleum products, other general cargoes;
The import volumes of these commodities were correlated with the GDP of all the sectors.

c) Fertilizer, rice, log and wood products;
The import and export volumes of these commodities were correlated with the farm land area and forest area. The productivity and consumption per unit area are also taken into consideration. The export volume of Rice and wood products were estimated as the difference between the production and domestic consumption.

b. Cargo volume handled at Sihanoukville Port

81. The forecast cargo volumes denote the sum of the cargoes handled at Phnom Penh Port and Sihanoukville Port. The percentile of the cargo share between the two ports were assumed for commodity by commodity on the basis of the statistics and the capacity of each port.

82. The forecast of the cargo volume at Sihanoukville Port is shown in Table - 3.3. Figure - 3.1 is drawn to exhibit the cargo volume growth excluding oil. Figure - 3.2 shows the growth of oil.

Table - 3.3 Cargo forecast at Sihanoukville Port

(Unit: 1,000 tons)

Scenario	Import Export	Type of Cargo	1995	2000	2005	2010	2015
High	Import	General Cargo	273	600	809	1,202	1,989
		Container	209	550	914	1,431	2,177
		Oil	72	286	679	1,336	2,385
	Export	Container	134	51	50	67	187
		General Cargo	198	184	245	309	398
	Total	Except oil	635	1,384	2,018	3,008	4,740
	Total	Incl. oil	708	1,670	2,697	4,345	7,125
Middle	Import	General Cargo		536	716	1,061	1,756
		Container		434	777	1,234	1,893
		Oil		237	578	1,153	2,074
	Export	Container		49	47	62	181
		General Cargo		174	228	283	360
	Total	Except oil		1,212	1,767	2,641	4,190
	Total	Incl. oil		1,449	2,345	3,794	6,265
Low	Import	General Cargo		530	659	913	1,226
		Container		443	688	1,008	1,436
		Oil		231	512	943	1,575
	Export	Container		48	45	58	172
		General Cargo		171	215	255	307
	Total	Except oil		1,192	1,607	2,234	3,340
	Total	Incl. oil		1,423	2,119	3,177	4,915

(4) Calling Ships

83. The number of calling ships is also estimated on the basis of the cargo volume forecast and the assumption of the sizes of calling ships in the future. The result is shown in Figure - 3.3. As observed in the figure, the number of calling ships does not increase steadily. This results from the assumption that the ship sizes should change when new port facilities are completed and operation begins.

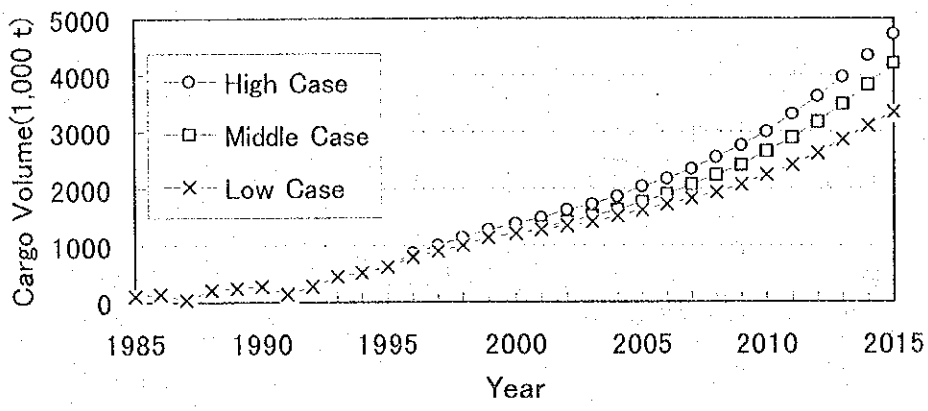


Figure - 3.1 Cargo Volume Forecast at Sihanoukville Port (Excluding Oil)

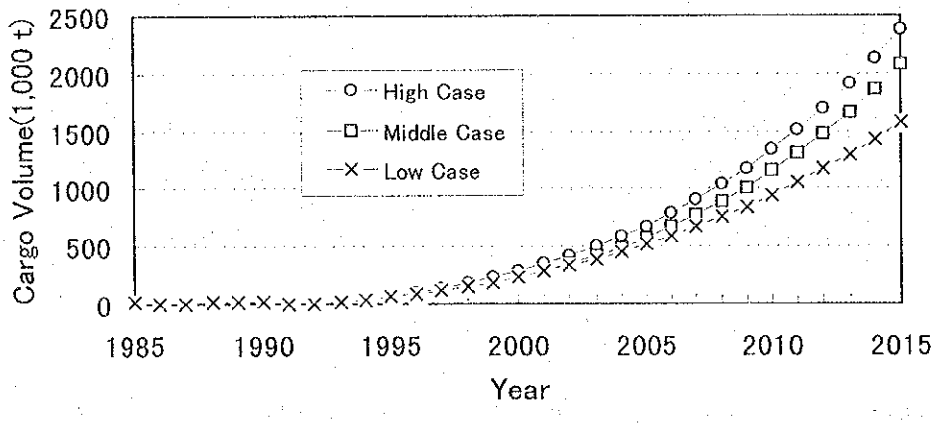


Figure - 3.2 Oil Import Volume Forecast at Sihanoukville Port

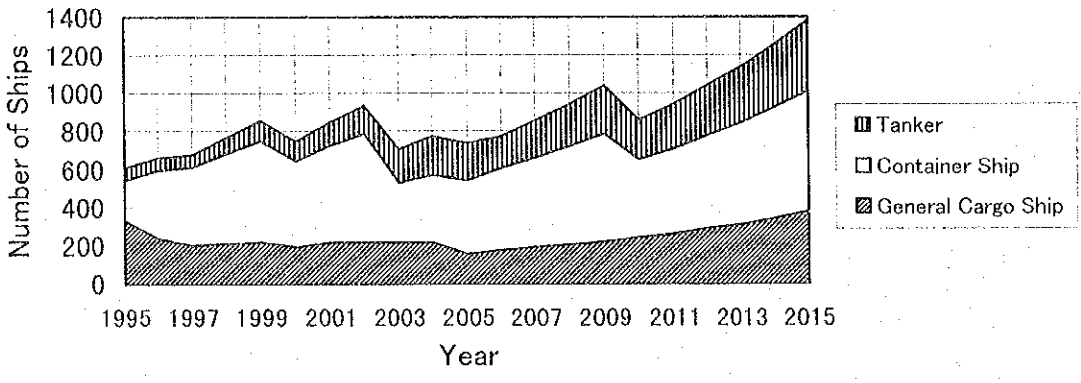


Figure - 3.3 Number of Calling Ships at Sihanoukville Port (Medium Growth)

3.3 Long-term Development Plan for 2015

(1) Requirements of facilities and layout plan

84. The number of berths required to handle the cargo volume estimated above for the target year 2015 is shown in Table - 3.4.

Table - 3.4 Number of Berths Required for the Long-term Development Plan

	Number of Berths Required		
	High	Middle	Low
General Cargo Berth	5	5	4
Container Berth	3	3	2
Bulk Cargo Berth	2	2	2
Total Number of Berths	10	10	8
Total Berth Length(m)	1,440	1,440	1,170

85. The proposed Layout Plans are shown in Figures - 3.4 - 3.7. Figures - 3.4 and 3.5 are the alternative layout plans drawn for the High and the Middle Growth Scenarios. The number of berths required is the same for both High and Middle Growth Scenarios. Figures - 3.6 and 3.7 are the alternative layout plans drawn for the Low Growth Scenario.

86. The difference between the two alternative layout plans, namely Plan 1 and Plan 2, is the location of the bulk terminal: Plan - 1(H-1 and M-1 shown in Figure - 3.4 and L-1 in Figure - 3.6) proposes that the bulk terminal be located to the north of New Quay, and Plan - 2 (H-2 and M-2 shown in Figure - 3.5 and L-2 in Figure - 3.7) proposes that it be located in the west part of the New Port, which is within the present commercial port area.

87. The locations and the layout of the general cargo berths and container berths are the same for both Plan - 1 and Plan- 2.

(2) Advantage and disadvantage of each alternative plan

88. Plan -1 will provide a larger land area nearby for the industries related to bulk cargoes and this will attract the private sector to establish such factories as packing of cement and fertilizer, concrete plant, distribution center, etc. The plan also has great potential for the future expansion of the bulk cargo terminal beyond 2015.

89. The water area between the container terminal and the bulk terminal is reserved for the future expansion of container terminal and mooring facilities for working vessels. Above all, by reserving the water area as it is, the topography of the flat and swampy land area remain unchanged

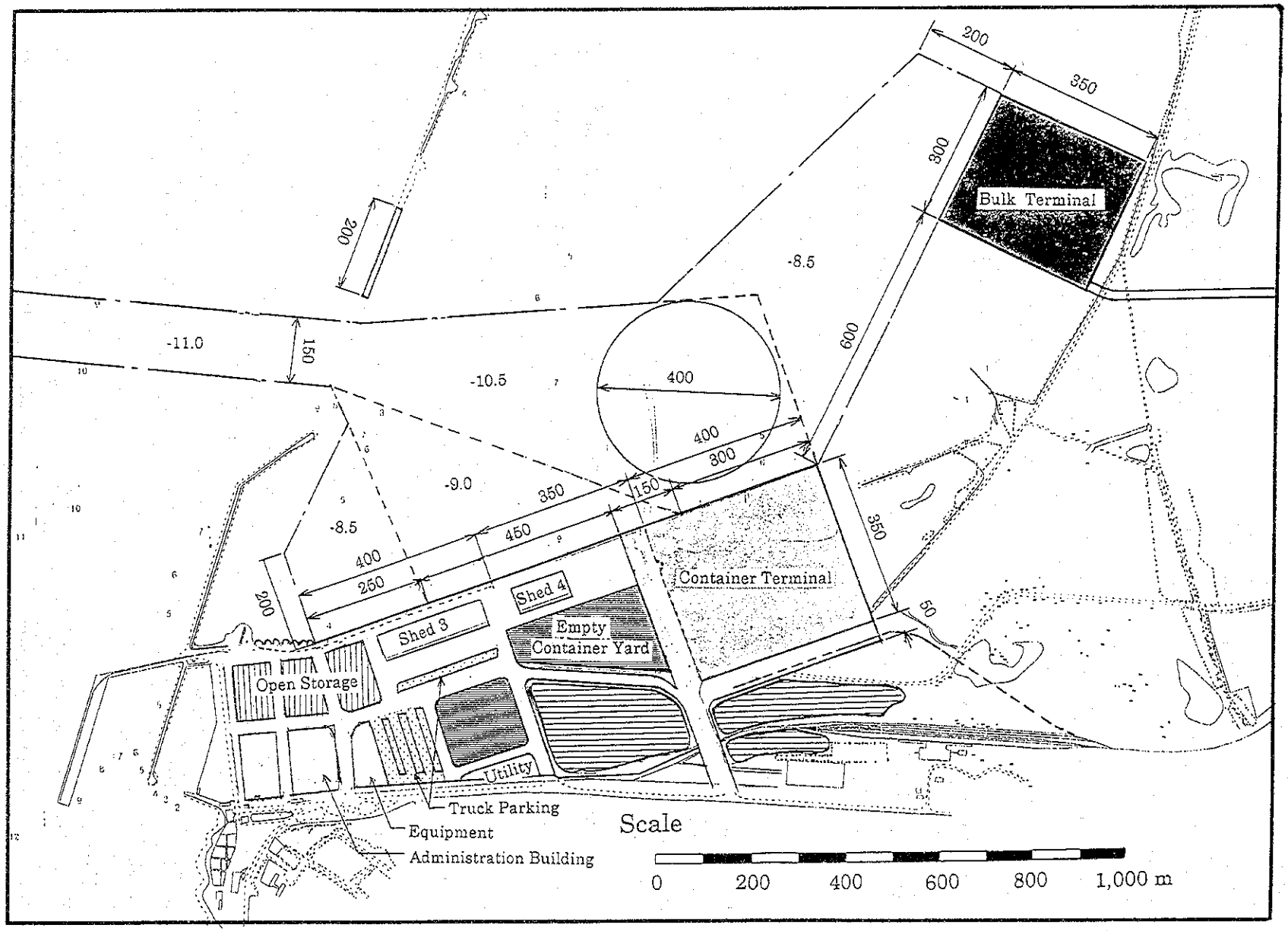


Figure - 3.4 The Long-term Development Plan (High and Middle Cases, Plan - 1)

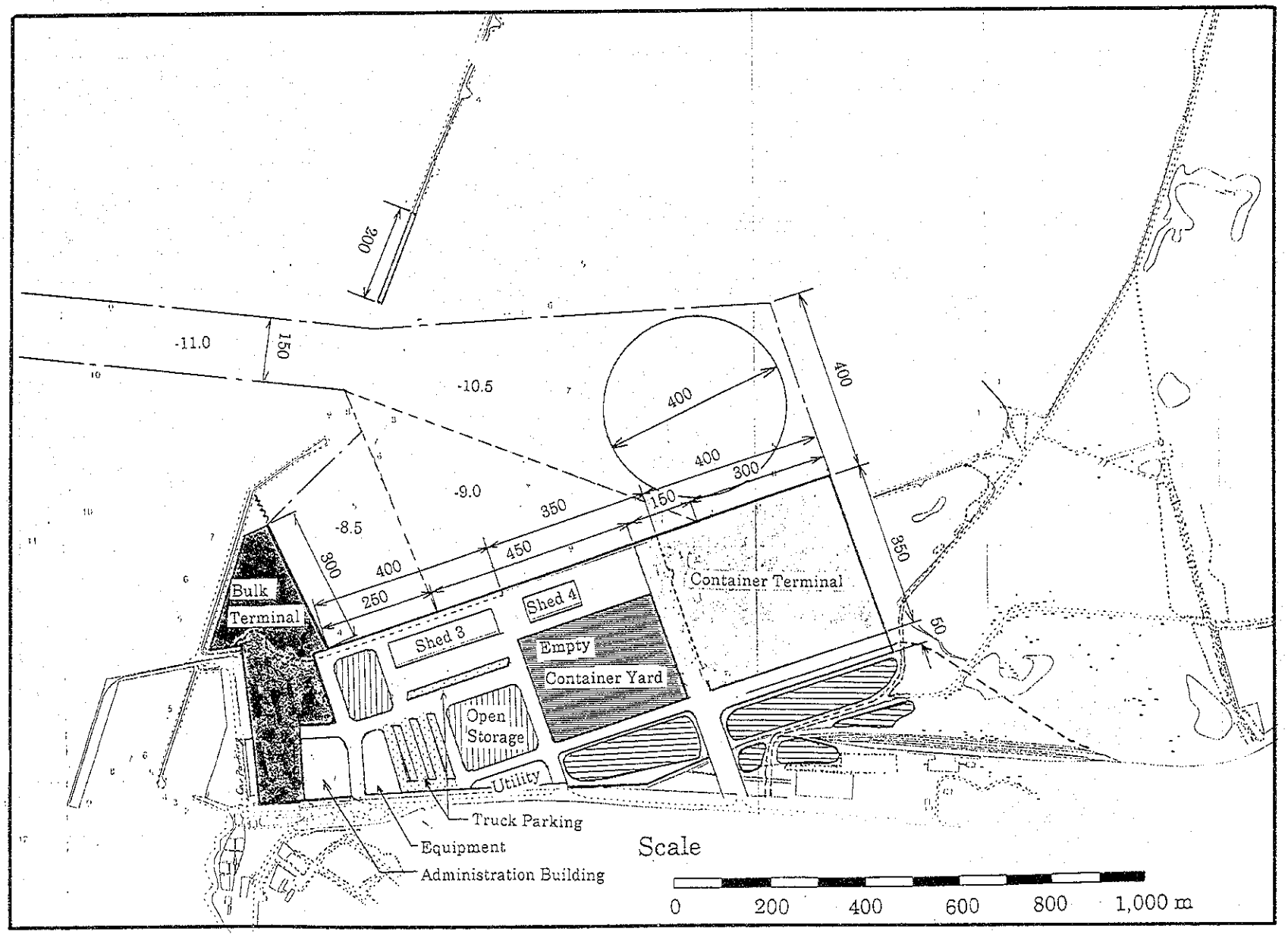


Figure - 3.5 The Long-term Development Plan (High and Middle Cases, Plan - 2)

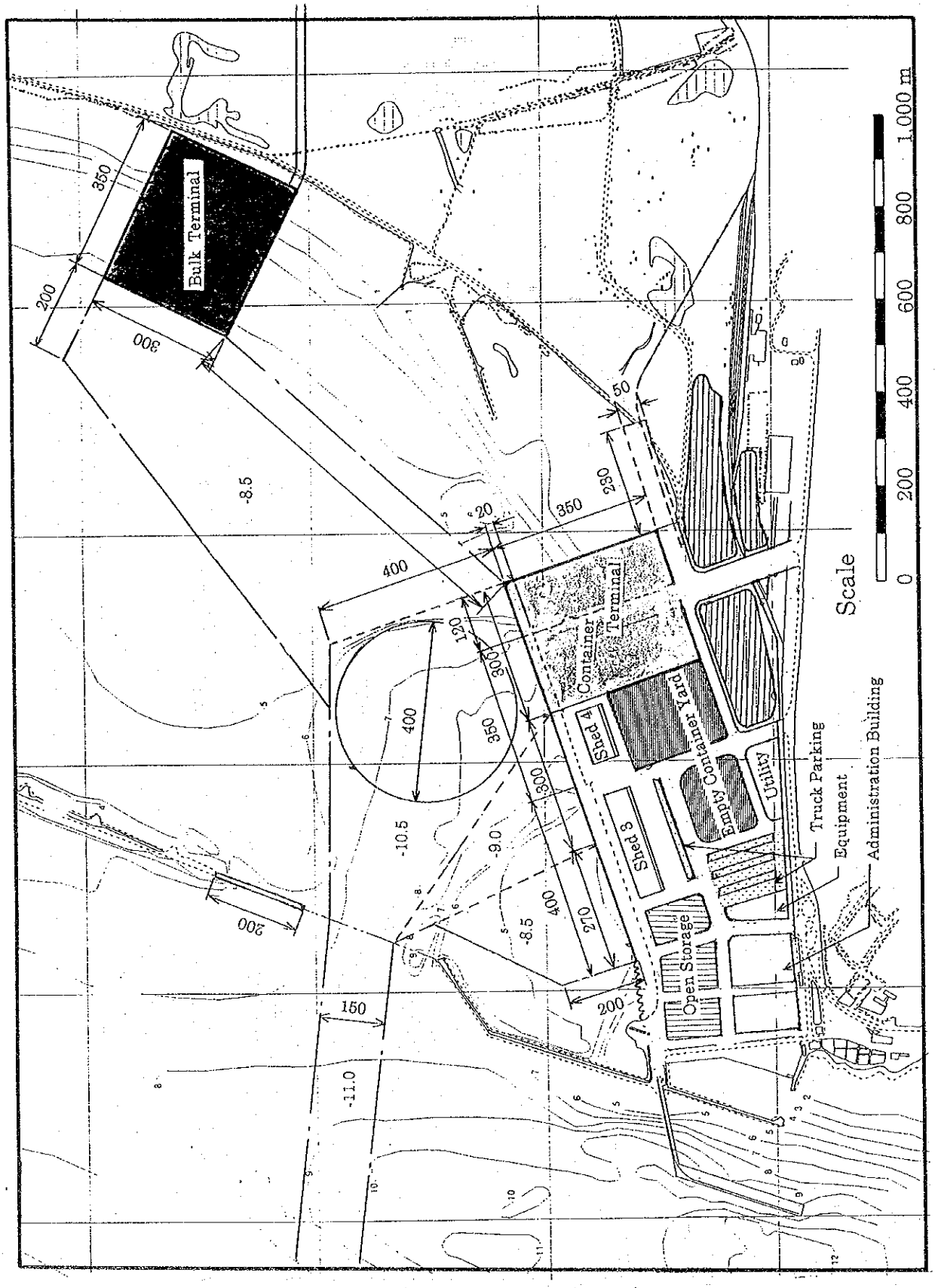


Figure - 3.6 The Long-term Development Plan (Low Cases, Plan - 1)

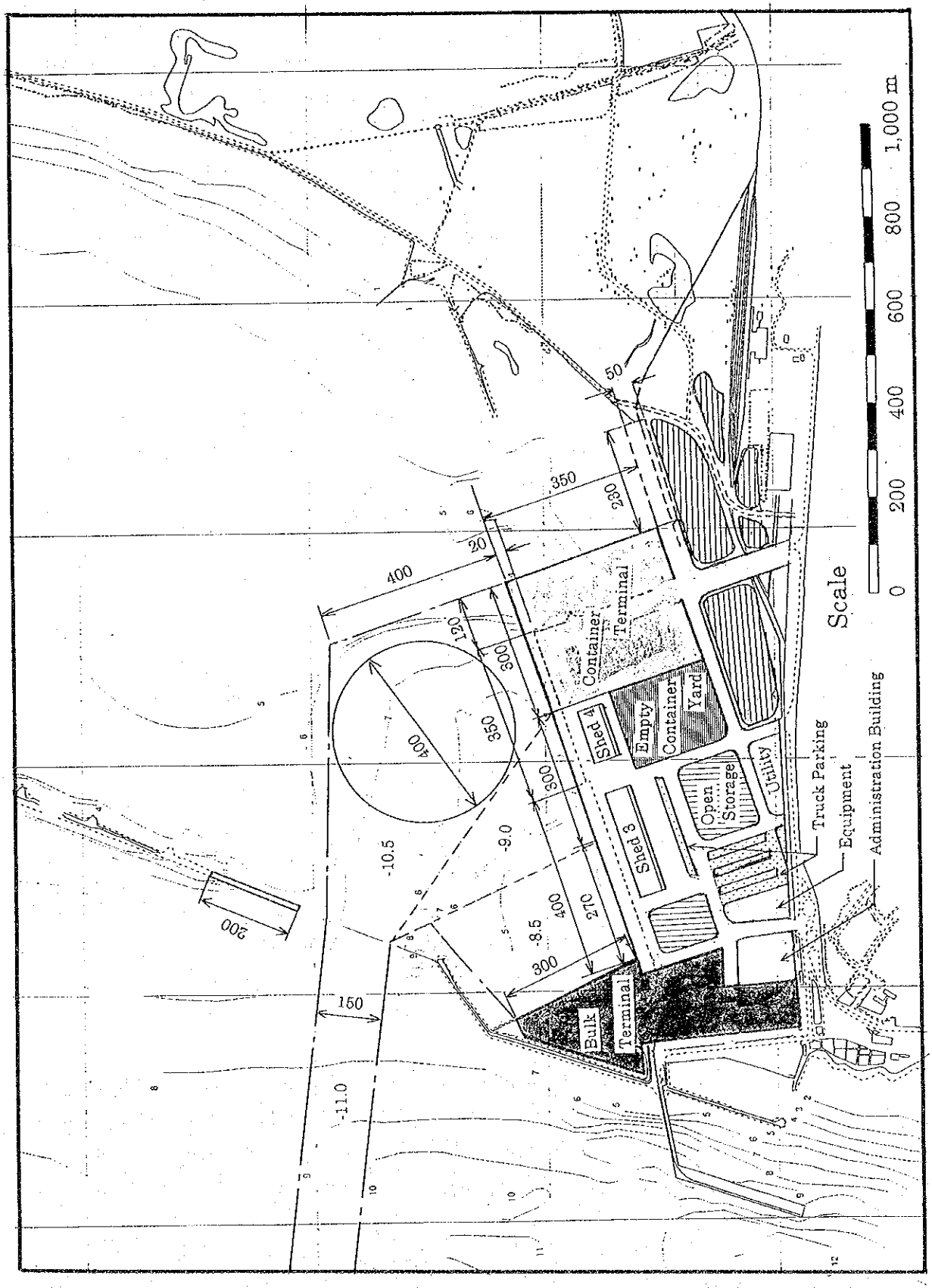


Figure - 3.7 The Long-term Development Plan (Low Cases, Plan - 2)

and thus the hydrological conditions are not affected much.

90. Plan-2 is intended to make much use of the present port area and to complete the full development of this area. The plan, however, cannot provide enough land space for the industries related to bulk cargoes and the sole function of the bulk berth remain as cargo handling. The future expansion of the bulk terminal is very limited, unless the existing old port area, which includes the Old Jetty and docking facilities of working vessels, are demolished or removed. Neither of these two plans require relocation of Village No.2, i.e., the village next to the New Quay.

3.4 Preliminary Structural Design for Port Facilities

91. In the preliminary structural design, the following items are taken into consideration as well as the port safety, existing situation of structures, and the reduction of construction costs.

(1) Wave, tide, current, water depth
(2) Soil conditions
(3) Earthquake
(4) Filling material for reclamation
(5) Berth and yard construction
(6) Impact of the new structure on the existing natural and socioeconomic environment
(7) Difficulty of construction
(8) Berthing force of the maximum size ship

92. The following design standards and technical literature were applied in the preliminary structural design:

(1) "Technical Standards for Port and Harbour Facilities in Japan(1991)"
(2) "Port Development Volume" Handbook of UNCTAD
(3) "Guideline" , International Association of Lighthouse Authority (IALA)

93. The opening of the breakwater is facing to the west which is the direction of predominant southwest monsoon during rainy season. It is recommended to reduce the wave reflection at the container wharf for the tranquillity of the basin. Thus, deck-on-pile type structure should be employed for the container wharf, and the rubble mound type is chosen for the revetment of the reclamation.

94. On the other hand, concrete block type was chosen for the new general cargo wharf,

because of the existence of sub-soil rock layer beneath the seabed makes it more costly to construct pile type structure.

3.5 Preliminary Economic Analysis

(1) Preliminary cost estimate

95. The project costs are estimated for all six cases: the layout plans corresponding to High, Middle and Low Growth Scenarios and for both alternative plans of each scenario. The conditions employed for the cost estimate are as follows:

a. The project cost consists of the foreign currency and the local currency portions. The exchange rate between the foreign and local currencies employed is;
   US$ 1.0 = ¥107 = 2,594 Riels (as of May 20, 1996)
b. The unit prices of material, equipment, labour, etc. as of March, 1996 are employed.
c. Project cost includes the engineering service, which is the sum of 8% of the cost of civil work and 3% of the equipment procurement, and the contingency, which is 10% of the sum of cost of civil work, procurement of equipment and engineering service.
d. No inflation is taken into account for all the elements of the project cost.

96. The results of the cost estimate for all the cases are shown in Table - 3.3 together with the results of the preliminary economic analysis. The project cost ranges from US$190 million (Plan - 2 of Low Growth Scenario) to US$250 million (Plan - 1 of High Growth Scenario).

(2) Conditions for Economic Analysis

97. The economic analysis was carried out to examine the benefit from the viewpoint of the national economy generated by the implementation of the project. The cargo volume demand is assumed to remain unchanged regardless of the cargo handling capacity of Sihanoukville Port. The benefit generated by the project is defined to be the benefit brought by the increase of the cargo volume handled at the new facilities constructed by the project, i.e. the cargo volume which would exceed the handling capacity of the existing port facilities.

98. The Economic Internal Rate of Return(EIRR) is used for the economic evaluation. The conditions for the calculation of EIRR are as follows:

a. The calculation is done over 35 years, the construction period and the operation periods are assumed to be 5 years and 30 years, respectively.
b. The exchange rate between foreign and local currencies are the same as is used for the cost estimate.

c. Calculation cases

With project case; all the six cases.

Without project case; existing facilities only.

(In the without case, the Old Jetty, regardless of the damage, is assumed to be operational over the project period of 35 years.)

99. The capacity of the berthing facilities is defined as the volume when the berth occupancy rate is 85%. The capacity of the existing facilities was estimated to be about 1,200 thousand tons. Incidentally, in the without case, the sizes of calling ships remain unchanged.

(3) Benefit

100. The following three elements are taken into account for the calculation of benefit:

a. The cost reduction results from the reduction of ship waiting time,
b. The reduction of the transportation cost by the use of larger ships, and
c. The reduction of the transportation cost of the import and export cargoes which are otherwise transported overland from the ports in Vietnam.

(4) Cost

101. In addition to the project cost estimated above, the operation and administration cost, and maintenance and replacement cost are taken into account.

(5) Economic Evaluation

102. As shown in Table - 3.5, the EIRRs for all the cases fell within the range between 14% and 17%. These values are higher than 10% which is generally used as the benchmark to evaluate if the project is economically feasible. Therefore, it is concluded that all of these plans are economically feasible.

Table - 3.5 Preliminary Cost Estimate and Economic Internal Rate of Return

Case	Plan - 1				Plan - 2			
	Project Cost (million US$)			EIRR %	Project Cost (million US$)			EIRR %
	Civil	Equip-ment	Total*		Civil	Equip-ment	Total*	
High	140.3	72.7	249.1	17.0	128.4	72.7	234.9	17.8
Middle	140.2	68.9	244.7	15.7	126.7	68.9	228.6	16.6
Low	125.6	55.8	212.4	14.0	107.8	55.8	191.3	15.3

* *Total project cost includes the engineering service(8% of the cost for civil work and 3% of the equipment procurement) and the contingency(10% of the sum of cost of civil work, procurement of equipment and engineering service).*

3.6 Port Management and Operation

103. At present, the financial situation Sihanoukville Port is sound. The port has been also making great efforts to upgrade port safety and the productivity of cargo handling to cope with the rapidly increasing cargo volume since 1991. As the cargo volume increases toward the future, the port is requested to make further efforts in its management and operation.

104. Some items requiring attention are:

(1) Improving the cargo handling productivity, to achieve maximum service for minimum cost,
(2) Rationalizing the tariff system,
(3) Scheduled assignment of berth to eliminate ship waiting time, and
(4) Port safety.

105. In order to achieve the above, it is necessary to establish legislative foundation which enables the port to operate with the following fundamental principles:

(1) Autonomy

106. The port is responsible to improve the services. Therefore, the port should be given the right to appoint personnel in accordance with their professional abilities, to implement projects in proper and flexible manner to the economic environment. Thus, the control of the port by the central government should be limited. The government, on the other hand, must administrate the port from the viewpoint of the national economy.

107. The items which require the government's approval should be limited to the following items:

a. Major expansion and improvement projects of the port facilities,
b. General level of major port dues and tariff,
c. Annual budget,
d. Loans and other financial obligations exceeding a certain limit, and
e. Sales and long-term concession of property exceeding a certain amount.

(2) Financial independence

108. Autonomy of the port cannot be achieved unless it maintains financial independence from the government. The income earned by the port should cover all the expenses of the port operation and maintenance, repayment of loans and depreciation reserve, etc. Above all, the net

benefit, if generated, should be saved as the fund for future development projects.

(3) Authority

109. Port administration body should have authority over the whole port area and major function of the port. The highest efficiency of the port can only be achieved by proper coordination of all the activities in the port. Therefore, it is necessary that all the major facilities should be owned by the port authority, and major port services should be fully controlled by the authority. In addition, the port authority should have the authority to plan the expansion of its facilities, to implement the project and to operate the facilities.

110. However, very specialized facilities which are used by a single customer with substantial cargo volume, for example, unloading of oil, cement, fertilizer and bitumen, can be owned and operated by the private sector under a certain degree of supervision by the port authority.

(4) Management based on market economy

111. Various decisions related to management and operation of the port should not be made in accordance with formality or rigid regulations but on the basis of the benefit and advantage. Timely decisions and flexible management are often required. Port management is a kind of business: the fighting against the rising cost is indispensable to maintain the port charges at a reasonable level.

3.7 Staged Development Plan

112. The Long-term development plan consists of the following four elements:

(1) A 400 m long general cargo wharf (renovation of the revetment in front of Shed No,. 3),
(2) A 400m long container terminal (extension of existing New Quay),
(3) A 300 m long bulk terminal and the relocation of bitumen storage facility to the bulk terminal, and
(4) Dredging of navigation channel and basin.

113. The construction of the general cargo wharf is given the highest priority. The construction of the container terminal has the next priority. The staged construction plan is schematically exhibited in Figure - 3.8 for the case of Middle Growth Scenario.

114. In accordance with the staged development plan, the facilities to be constructed at each stage are shown with shadows in Figs. -3.9 through 3.12.

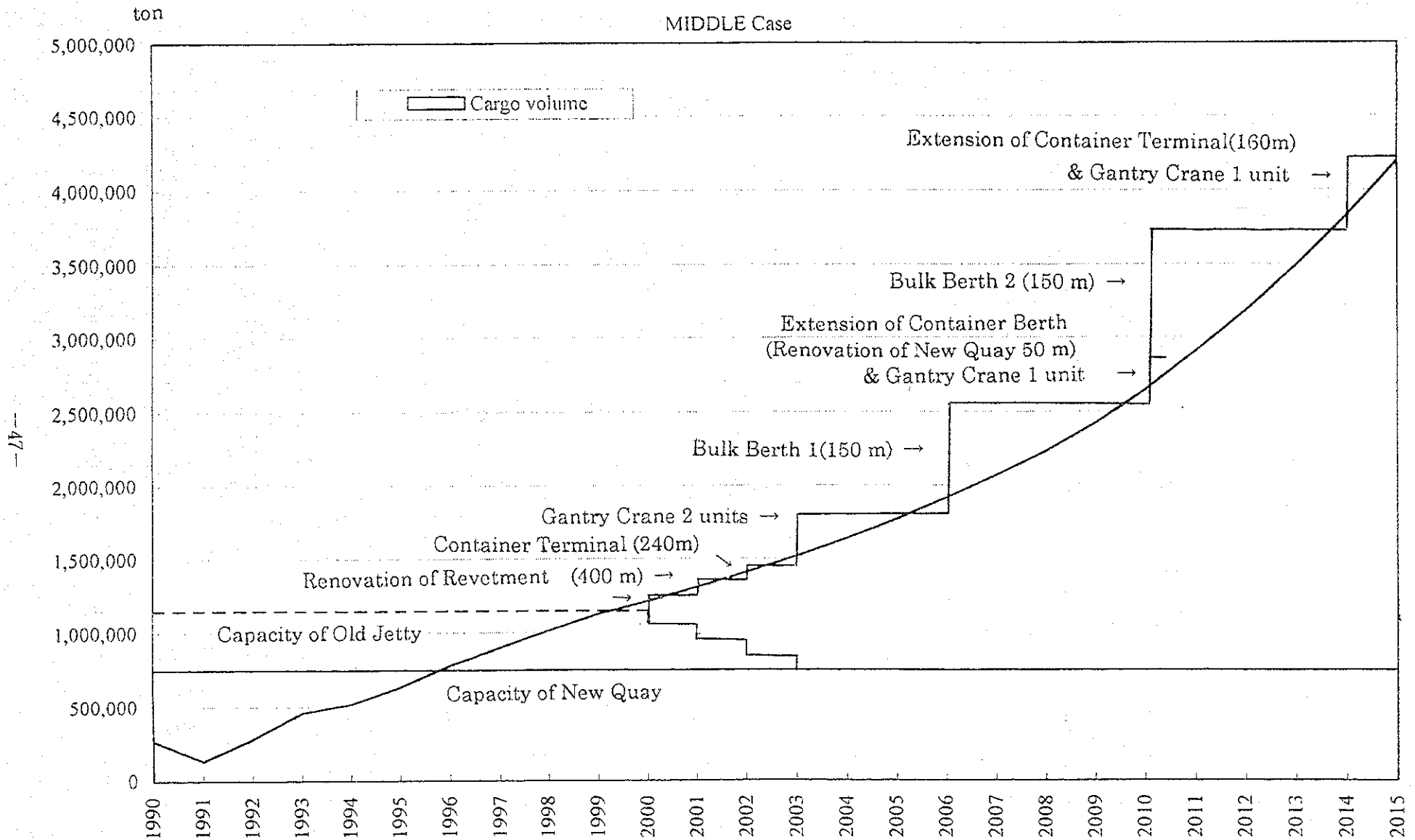


Figure - 3.8 Staged Development Plan in accordance with Growth of Cargo Volume (Middle Case)

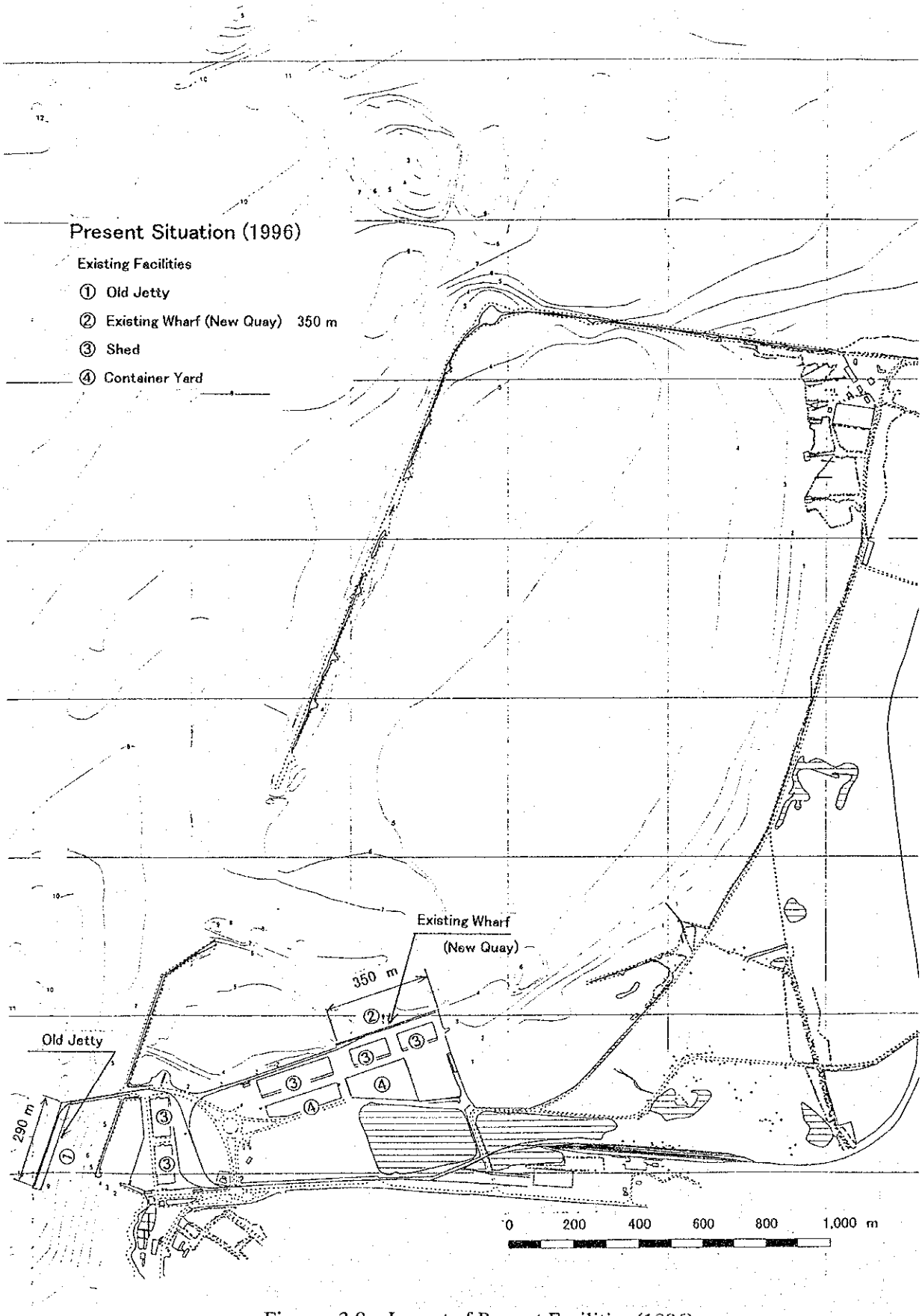


Figure - 3.9 Layout of Present Facilities (1996)

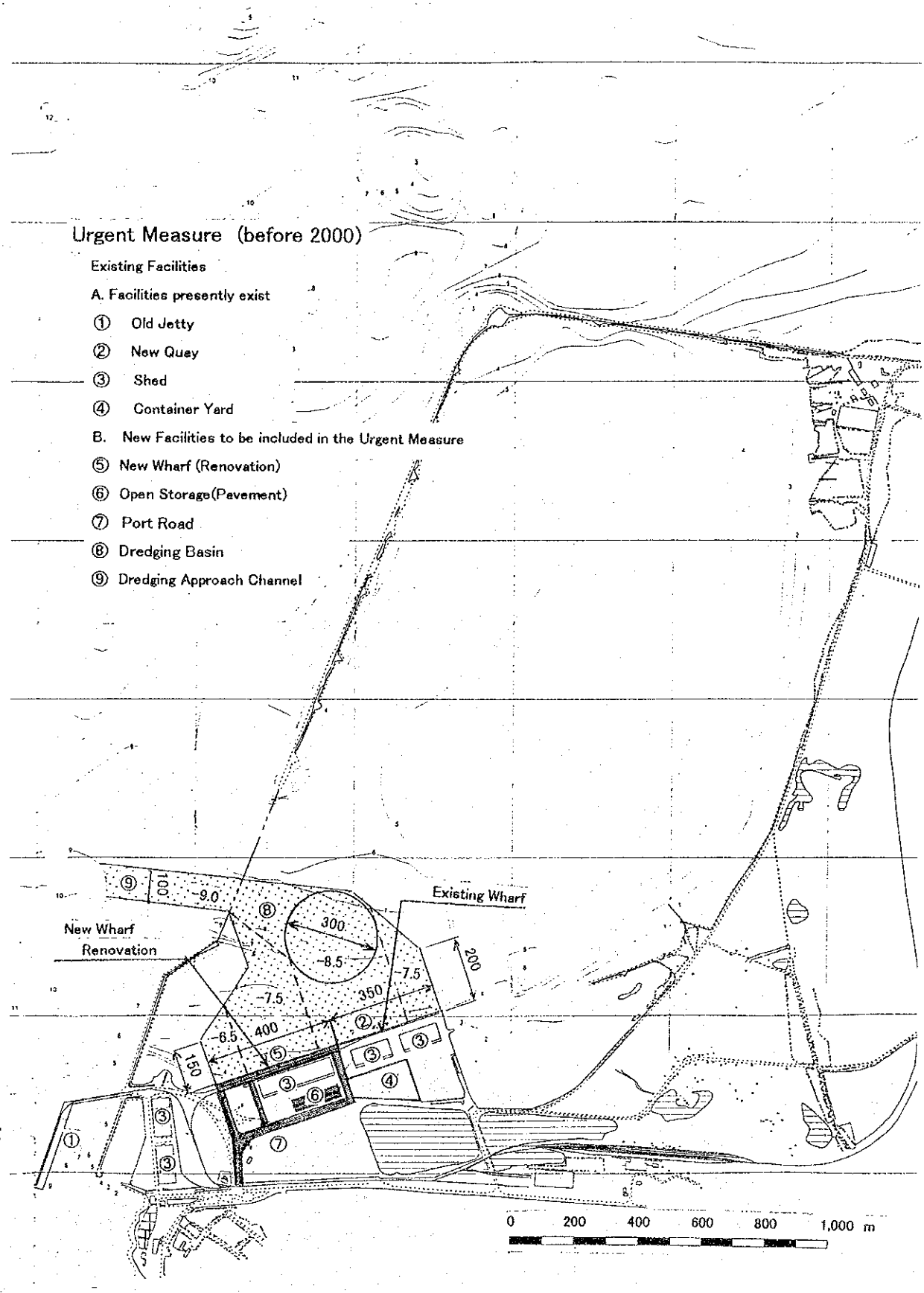


Figure - 3.10 Layout of the Urgent Improvement Plan ((up to 200)

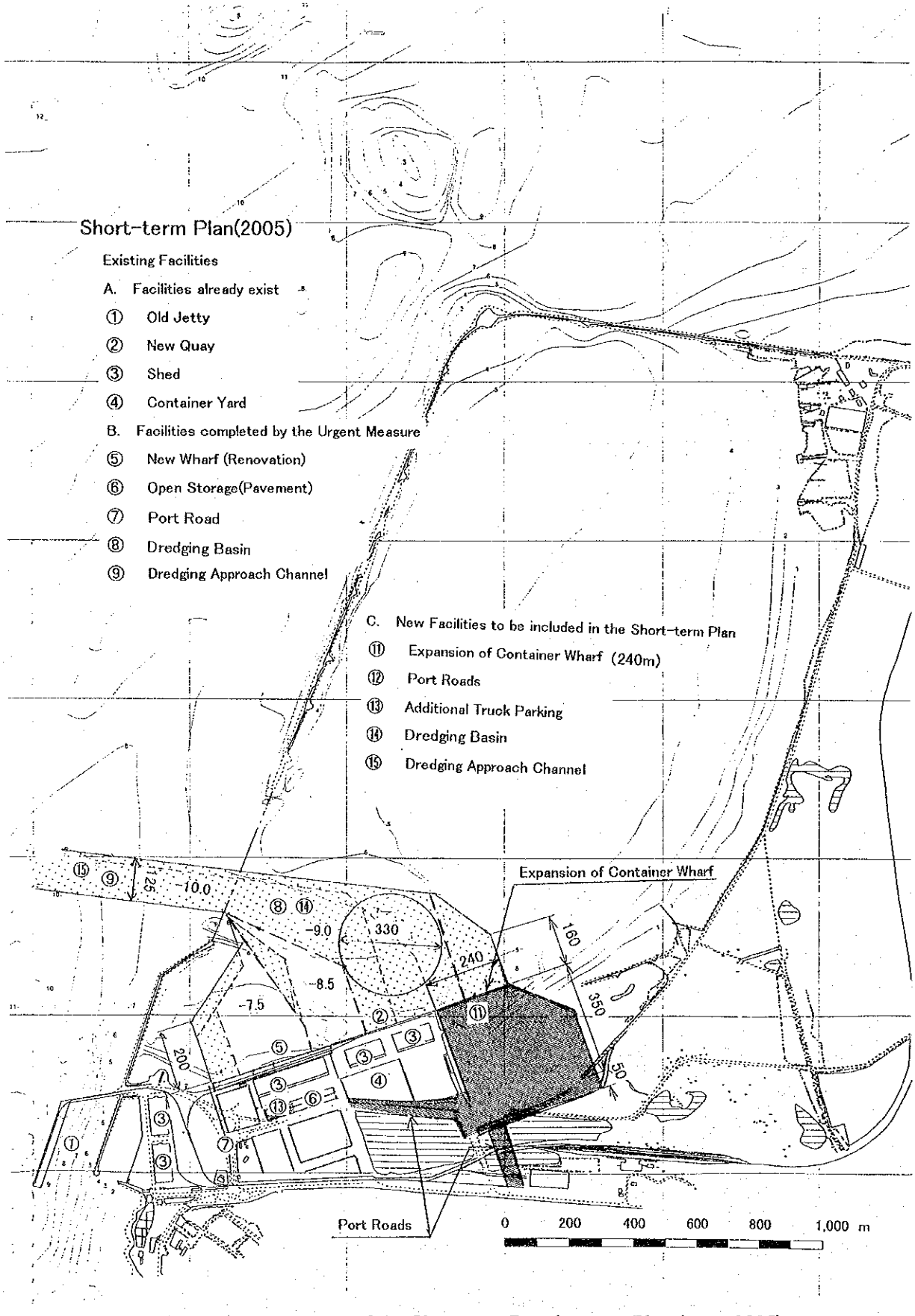


Figure - 3.11 Layout of the Short-term Development Plan (up to 2005)

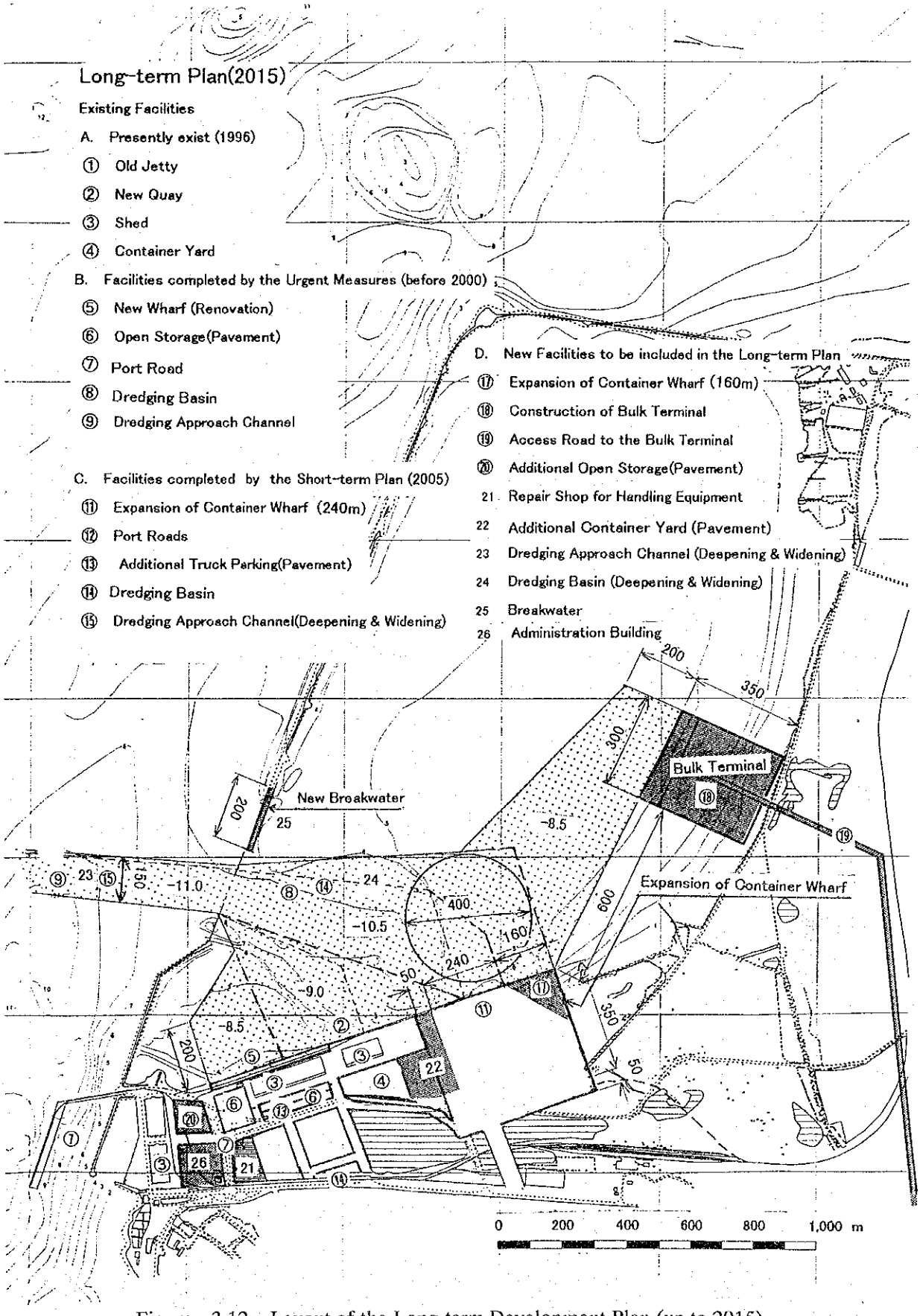


Figure - 3.12 Layout of the Long-term Development Plan.(up to 2015)

3.8 Initial Environmental Evaluation

115. In order to identify the items which require Environmental Impact Assessment (EIA) prior to the implementation of the project, Initial Environmental Evaluation (IEE) was carried out. The items examined are as follows:

(1) Impact on social environment

116. a. Resettlement of inhabitants, b. Economic activities, c. Traffic and life facilities, d. Division of regional area, e. Historical and cultural heritage, f. Water right and common right, g. Hygiene and health, h. Waste and garbage, i. Risks and hazards.

(2) Natural environment

117. a. Topography and geology, b. Beach erosion, c. Underground water, d. Hydrological regime for river and lake, e. Coastal zone, f. Ecology, fauna and flora, g. Meteorology, h. Landscape.

(3) Pollutant

118. a. Air pollution, b. Water pollution, c. Soil contamination, d. Noise and vibration, e. Land subsidence, f. Offensive odor. Among these, no potential elements are prone to relatively high magnitude of impact by the implementation of the project.

119. The items identified to be prone to relatively medium magnitude of impact are the ecology, fauna and flora, especially during the construction period. Thus, the magnitude of impact of the dumping of the dredged material on the ecology in the vicinity of the dumping site shall be examined in the stage of the feasibility study.

120. Items on which relatively low magnitude of impact may occur are:

a. Resettlement of inhabitants and other private properties and impact on socioeconomic activities

121. Due to the reclamation of the new container terminal, the passage of the fishing boats to and from the fishing port in the village nearby may be inconvenienced. In addition, the reduction of the water area between the container terminal and the fishing port may accelerate the sedimentation in the basin of the fishing port. Thus, some modification of the layout of the fishing port may be required, though complete relocation of the fishing port is unnecessary.

122. When the bulk terminal is constructed, an access road shall also be constructed. Relocation of some houses on the route of the access road may be required.

b. Traffic and life facilities

123. Rerouting of existing municipal road is needed to construct the new container terminal. The traffic of cargo trucks and trailers along National Road No. 4 will increase as the cargo volume at Sihanoukville Port increases. This may cause traffic congestion on the highway.

124. The bulk terminal is constructed in the middle of the water area inside the breakwater, and its access road divides the land area at the back. The existing community may be divided by the road and this, in turn, may split the socioeconomic activities of the villages.

c. Hydrological regime for rivers and ponds

125. Due to the reclamation of the bulk terminal the current pattern in the water area in the breakwater may change. The construction of the container terminal may cause some change in the hydrological system of the existing streams and ponds in the land area.

126. Except for the items mentioned above, the magnitude of impact on other items, if any occurs, is assumed to be very low.

3.9 Overall Evaluation

127. All the alternative plans proposed herein satisfy the requirement of cargo handling capacity and are identified to be economically feasible, and the impacts on the environment are not considerable. In the selection of the alternative plans, it is also important to examine the incentive to the regional economy and local industries brought by the implementation of the project. Furthermore, the potential for the further development beyond the long-term plan is also quite an important element.

128. Based on the above, the Plan - 1(II-1, M-1 and L-1) is recommended. The detailed layout of the facilities is shown in Figure - 3.13.

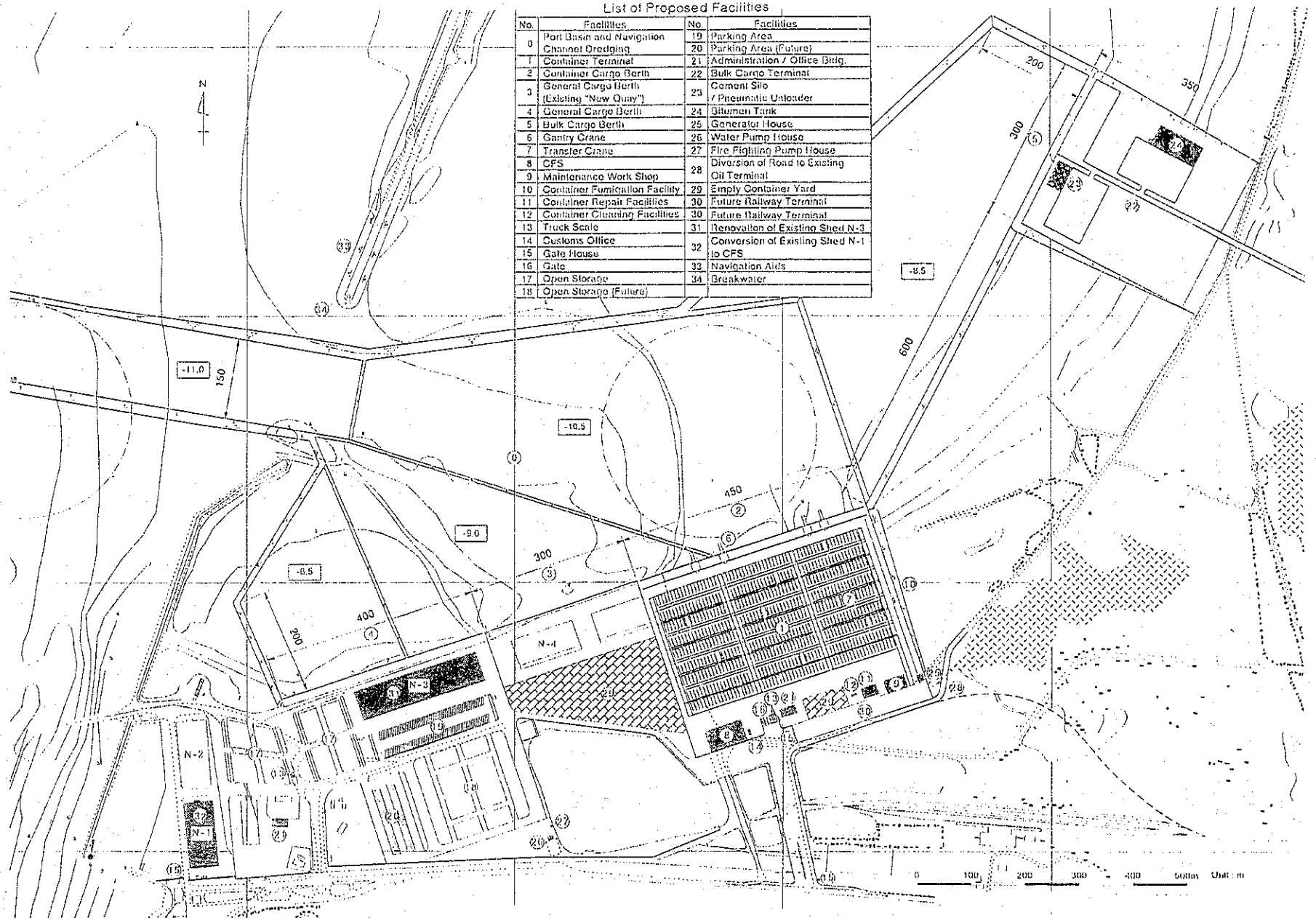


Figure - 3.13 Layout of the Proposed Long-term Development Plan (2015)

4. Short-term Development Plan

4.1 Short-term Development Projects

129. Of the three scenarios of the economic growth of Cambodia, the Middle growth scenario seems to be most realistic considering the decline in the growth rate of the cargo volume at Sihanoukville Port over the period from 1995 to 1996. The Short-term development Plan, thus, is elaborated for the cargo volume forecast on the basis of the Middle Growth Scenario. The cargo volume in 2005 is expected to amount 2.34 million tons (Oil; 0.58 mil., Others; 1.77 mil. including 1.00 million tons of container cargoes) .

4.2 Proposed project

130. It is proposed that the port development should be implemented in two stages: the Urgent Improvement Plan and the Short-term Plan.

(1) Urgent Improvement Plan

131. The construction of a 400 m long general cargo wharf, which is exhibited with shadows in Figure - 4.1, is quite urgent. The general cargo wharf is the alternative to the timeworn Old Jetty.

132. The length of the existing Old Jetty is 290m long and it can accommodate four ships at a time. The proposed general cargo wharf is only 400 m long and it can accommodate three ships at a time. Though the berth length is shorter, it is expected that the cargo handling productivity at the berth can be improved: with the breakwaters, the sea state must be more tranquil than at Old Jetty, thus heavy handling equipment can be operated at the new wharf, and Shed No.3 is available on the same wharf.

133. The Urgent Improvement Plan consists of the following elements:

a. Construction of new general cargo wharf (400m),
b. Deepening the existing berth at the New Quay(from -7.5 m to -8.5 m),
c. Pavement of parking area, open storage and port road, and
d. Dredging of the north navigation channel(width: 100m, depth: -9.0m), and the basin (between -6.5m and -8.5m).

These elements should be required to completed by the year 2000.

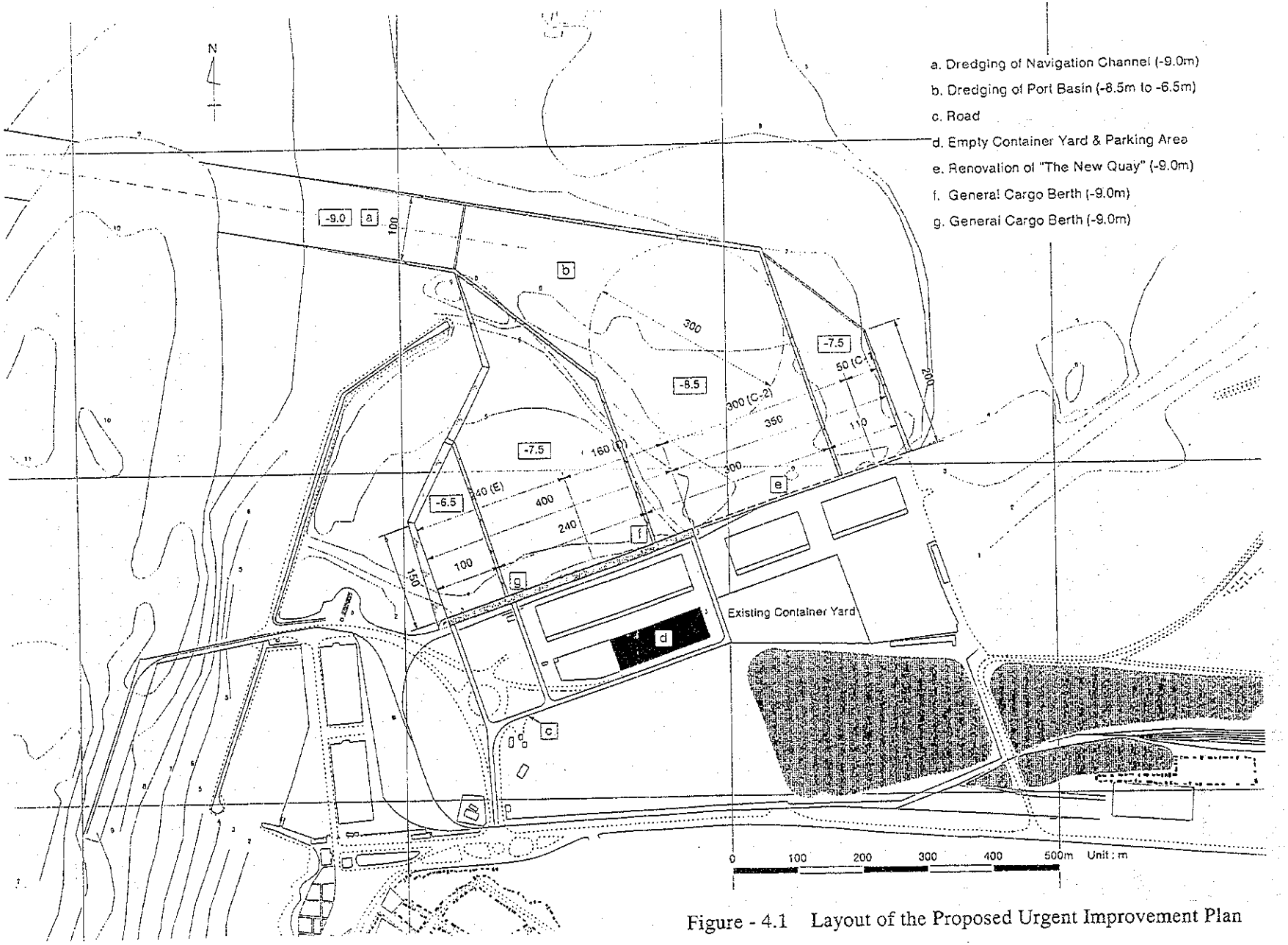


Figure - 4.1 Layout of the Proposed Urgent Improvement Plan

(2) Short-term Development Plan

134. In addition to the Urgent Development Plan, additional facilities which need to be constructed by 2005 are as follows(shadowed facilities in Figure - 4.2):

a. General cargo wharf

135. The berth at the general cargo wharf, which is completed in the Urgent Improvement Plan, is deepened to -7.5m over the full length. The existing 350 m long New Quay is used for general cargoes and its berths shall be deepened from -7.5 (at present) to -9.0m and -8.5m. Container cargo shall be removed to the new container terminal, and, therefore, the total length of the general cargo wharf shall be 750m.

b. Container terminal and container handling equipment

136. A 240m long new wharf shall be constructed next to the New Quay. A pair of container gantry cranes are installed. A 7.5 ha container yard shall be reclaimed at the back of the new wharf. At the container yard, container handling equipment shall also be installed: transfer cranes(6 units), tractors and chassis. In addition, some buildings and work shops and gates shall be constructed.

137. A new port road is constructed to provide a direct access to the container terminal from National Road No. 4.

c. Dredging of navigation channel and basin and Navigation aids

138. North navigation channel shall be widened (from 100m to 125 m) and deepened (from -9.0m to -10m) for larger ships. Navigation buoys shall also be installed along the channel.

d. Other facilities

139.
i) Renovation of Shed No. 1 to Container Freight Station (CFS)
ii) Administration building and maintenance shop for cargo handling equipment of general cargoes
iii) Dredging of basin(from -8.5m to -9.0m)
iv) Expansion of truck parking and open storage
v) Procurement of a tug boat (1,500 PS)

140. In the Short-term Plan, the existing storage facilities owned by private companies remain as they are.

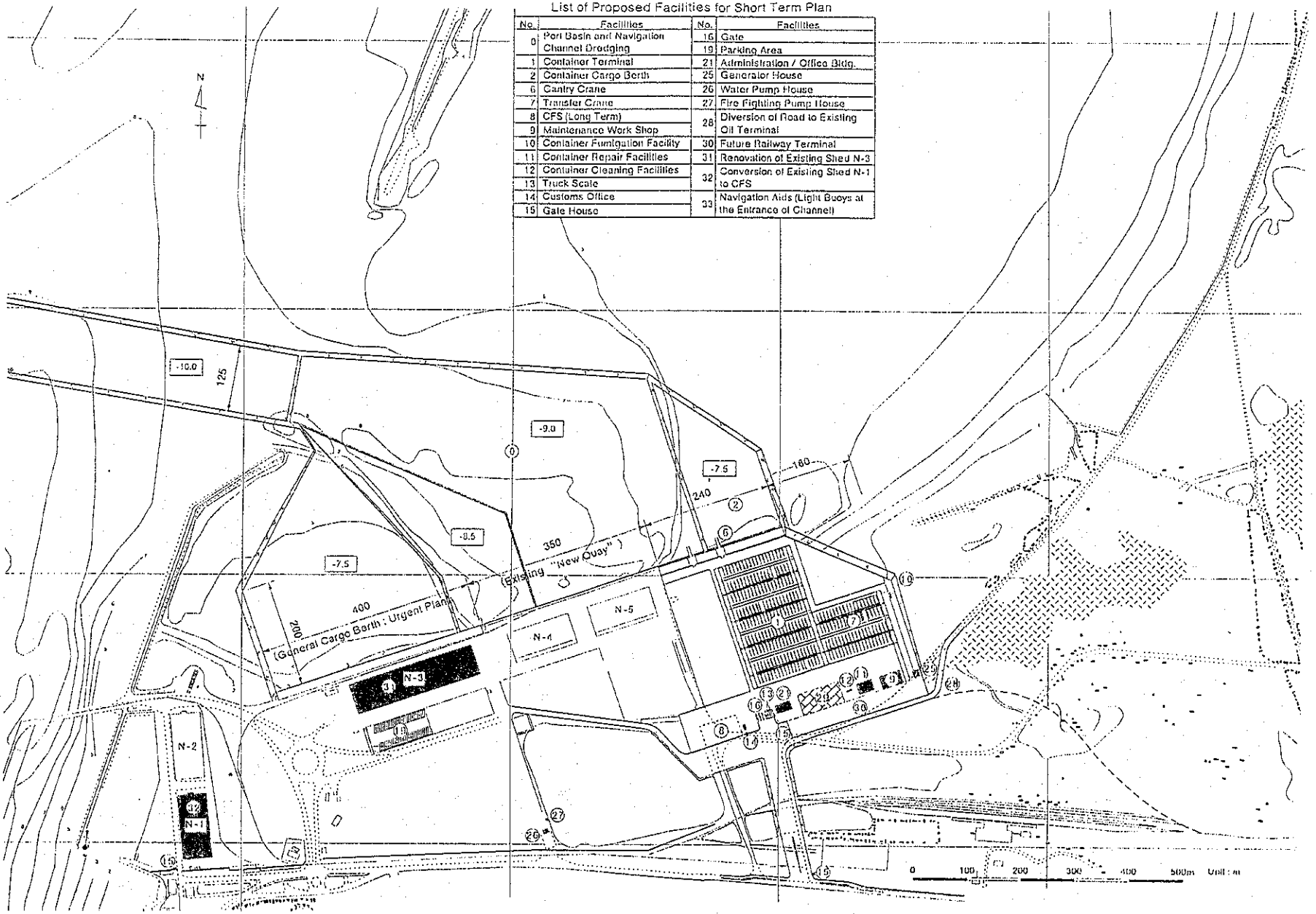


Figure - 4.2 Layout of the Proposed Short-term Development Plan

4.3 Structural Design

141. Conditions employed in the structural design are as follows:

(1) Wind and waves

142. a. Wind: Maximum speed = 50m/s.

b. Waves: Significant wave height = 2.4m, period = 5.6 s

Design wave conditions were determined by hindcast on the basis of wind records.

(2) Maximum ship size and berthing speed

143. For the Long-term Development Plan, the maximum ship sizes are 24,000DWT for container carriers and 20,000DWT for general and bulk cargo ships. The berthing speed of these large ships having DWTs of 10,000 or larger is assumed to be 10cm/s.

(3) Seismic force

144. Taking into consideration that earthquakes seldom occur in Cambodia, the seismic coefficient of 0.05 was chosen for the design.

(4) Sub-soil condition

145. On the basis of the boring data, the soil conditions for the structural design are chosen as shown in Table - 4.1.

Table - 4.1 Sub-soil conditions employed in the design

Elevation	Classification of soil	Standard penetration test	Unit weight	Internal friction angle
-5.0～-12.0m	Silty sand	0	1.8tf／m³	20°
-12.0～-15.5m		3		26°
-15.5～-21.0m	Sandy silt and sandy clay	2～14		32°
-21.0m～	Rock	50 and over		40°～

4.4 Construction Plan

(1) Summary of work

146. The construction includes the following work items:

a. Civil works
   i) Dredging 1,061,400 m^3
      (North navigation channel 239,400 m^3 and basin 829,000m^3)
   ii) Revetment of the reclamation; total 1,930m,
      (Container wharf ; 1,370m and port road; 560m)
   iii) Reclamation 846,000 m^3,
      (Container wharf; 750,000 m^3 and port road; 58,000 m^3),
   iv) Pavement of the container wharf; 75,000 m^2,
   v) Pavement of empty container yard, open storage parking; 5,000 m^2,
   vi) Pavement of port roads; 10,000 m^2.
   vii) Container berth; 240 m (-10.5m)
   viii) Navigation aids; two sets
   ix) Power supply unit for reefer container,
b. Buildings
   i) Administration building; 1,500 m^2,
   ii) Maintenance shop; 1,000 m^2,
   iii) CFS (Renovation of Shed No.1)
   iv) Other facilities in the container terminal
c. Supply of power and water
d. Cargo handling equipment
   i) Container gantry crane; 2 units and transfer crane; 6 units,
   ii) Tractor and chassis
e. Tug boat (1,500 PS)

(2) Working yard

147. The basin and the land area behind the Old Jetty, which are presently used for mooring of working vessels, shall be used for working yard during the construction period.

4.5 Cost Estimate

(1) Preconditions for estimation

148. The same as in the cost estimate of the Long-term Plan, the prices in 1996 are employed for the cost estimates of the Short-term Development Plan and the Urgent Improvement Plan.

(2) Project cost of Urgent Improvement and the Short-term Development Plan

149. The total project cost of the Urgent Improvement Plan is US$28.2 million and that of the Short-term Development Plan is US$85.3 million. The breakdown is shown in Table - 4.2.

Table - 4.2 Project costs of the Urgent Improvement and the Short-term Development Plans

(Unit: 1,000 US$)

Item	Urgent Improvement Plan	Short-term Development Plan
Civil work	21,637	43,792
Equipment	2,145	29,380
Engineering Service	1,798	4,385
Contingency	2,562	7,756
Total	28,178	85,312
Foreign Portion	24,776	73,498
Local Portion	3,402	11,815

4.6 Economic Analysis

(1) Prerequisites of analysis

150. The Economic Internal Rate of Return (EIRR) was calculated. In addition to the initial project cost given in Table - 4.2, the operation cost, replacement of the cargo handling equipment, the time schedule of the expenditure and the benefit generated are taken into account.

151. The prerequisites employed in the economic analysis are as follows:

a. For the economic analysis, the Urgent Improvement and the Short-term Development Plans are considered as one integrated project, and EIRR is calculated for the integrated project.
b. The base year is set at 1996, the cost and benefit are calculated over 39 years; construction period; 9 years up to 2005, and operation period; 30 years.
c. The exchange rate employed is the same as employed for the cost estimate, i.e., US$1.0=¥107=2,594 Riels.
d. Cargo volume forecast on the basis of Middle Growth Scenario.
e. The New Quay is assumed to be operational over the full period of 39 years, while the Old Jetty is assumed to gradually deteriorate after 2001 and to become unusable in 2004.
f. In the without project case , the capacity of the existing New Quay is assumed to be about 700,000 tons, which is the capacity when the berth occupancy rate reaches 85%. The overflowing cargoes are assumed to be handled at Phnom Penh Port until the total cargo volume there exceed the handling capacity(630,000 tons). The overflowing cargoes from both ports are assumed to be transported overland from Vietnam. The ship sizes and the cargo handling productivity are assumed to remain unchanged.

(2) Benefit

152. The following three elements of benefit are taken into account as the quantitative benefit generated by the project:

a. Cost reduction results from the reduction of ship waiting time,
b. Reduction of the transportation cost by the use of larger ships, and
c. Reduction of the transportation cost of the import and export cargoes which are otherwise transported overland from the ports in Vietnam.

(3) Cost

153. The following three items are taken into account:

a. Initial project cost,
b. Operation cost and maintenance cost, and
c. Replacement of equipment.

(4) Economic evaluation

154. The EIRR of the project, which consists of the Urgent Improvement Plan and the Short-term Development Plan, is 15.0%. Even in such circumstance that the cost increases by 10% and the benefit decreases by 10%, the EIRR results in 11.0 %. The EIRR of this project is higher than the acceptable benchmark of 10%. The project is, thus, evaluated to be economically feasible.

4.7 Financial Analysis

(1) Prerequisites of financial analysis

155. The purpose of the financial analysis is to examine the financial feasibility from the viewpoint of the port operating body, i.e. Sihanoukville Port. The Financial Internal Rate of Return (FIRR) is calculated as the index for the evaluation.

a. The calculation of FIRR is carried out for the two cases:
   Case-1: The port needs to pay the initial project cost of the Urgent Improvement Plan.
   Case-2: The port is exempted from the payment of the initial project cost of the Urgent Improvement Plan.
b. The conditions employed in the FIRR are the same as those employed in the calculation of EIRR. The tariffs presently applied are employed.
c. It is assumed that Sihanoukville Port itself shall operate all the new facilities provided by the project.
d. The local portion of the project cost is financed by the port's own fund. Thus, the port

need to save its net revenue for the project.

(2) FIRR

156. The FIRR of Case-1 results in 4.4%. However, if the initial project cost increases by 10% and the revenue decreases by 10%, the FIRR becomes to -0.1%. In this circumstance, the project is infeasible, even though the whole project cost is financed at no interest. The FIRR of Case-2 results in 7.9%, and under the circumstance that cost increases by 10% and revenue reduces by 10%, the FIRR is 2.7%.

157. The project, therefore, is feasible provided that the port need not pay the initial project cost and that a low interest loan is available to the port.

4.8 Environmental Impact Assessment (EIA)

158. The impacts which may be caused by both the Urgent Improvement and the Short-term Development Plans were assessed for the items which the Initial Environment Evaluation (IEE) identified to be prone to adverse effects by the implementation of the Long-term Development Project.

(1) Impact of the disposal of dredged material on the ecology in the dumping sites

159. The dispersion of the disposed material was analyzed with a numerical simulation model. In the model, the tidal current, the characteristics of the disposed material and the method of dumping were simulated.

160. The results show that the water area where the maximum density of suspended soil (SS) reduces to 1 ppm (1 mg / l) within distances of 3.5 km in the direction of the tidal current and 0.5 km against the direction from the spot of damping. The water area where the average SS over 12 hours of dredging work exceeds 1 ppm is limited within 1 km from the damping spot.

161. The simulation also shows that the maximum SS at the north shore of Dek Koul Island is 0.07 ppm which appears 9 hours after the dumping and that which occurs at the south shore of the island is 0.05 ppm after 8 hours of dumping. At the west shore of Koah Poah Island no change in SS is detected.

162. Thus, if the dumping of dredged materials is done in such a manner that soils are disposed at the north of Dek Koul Island while the current is northward and at the south of the island while the current is southward, the impact of the suspended soil on the ecology at these islands can be minimized. It is, however, recommended to monitor the SS density during the

dredging work to ensure the extent of the dispersion of the disposed material.

(2) Resettlement of inhabitants and other private properties and impact on socioeconomic activities

163. Neither the Urgent Improvement nor the Short-term Development Plans requires resettlement of any private properties. There remains a water area between the new container terminal and the groin of the fishing port nearby. The distance between the two structures is about 100 m, which is comparable to the width of the navigation channel for the cargo ships entering Sihanoukville Port. Thus, it is assumed that the project will not cause substantial inconvenience to the traffic of the fishing boats.

(3) Road traffic and life facilities

164. The rerouting of the municipal road is very minor, and no considerable impact is foreseen on the traffic in the communities. The route of the heavy cargo trucks to and from Sihanoukville Port is separated from the municipal road. Thus, no impact on the municipal road traffic is expected.

165. According to the four-day traffic survey on National Road No. 4, the volume of daily traffic is about 2,000 cars(both directions). The peak volume, which occurs in the morning, is about 230 cars/hour. Of this traffic, the share of cargo trucks related to Sihanoukville Port is about 15% or about 300 trucks/day.

166. The cargo volume handled at the port in 2005 is expected to be four times greater than that of 1995. This implies that the traffic of the port related cargo trucks also will increase four times, and the peak traffic volume will amount to 1,000cars/hour if other cars are also assumed to increase by four times. Though this level of traffic seems to be quite heavy in comparison with the present situation, it would not result in traffic congestion.

167. In addition, it is also expected that the traffic at peak hours is eased as the peace and order situation of the country improves and the security of night driving is ensured.

(4) Hydrological system of steams and ponds

168 The impact of the new container terminal construction on the sedimentation in the basin of the fishing port was examined with a numerical simulation model. The model simulated the discharge of the stream to the port and the settlement rate of the suspended soil was estimated.

169 The results show that there is practically no change in the magnitude of the sedimentation in the water area within and near the fishing port regardless of the existence of the

new container terminal proposed in the Short-term Development Plan. Thus, it is assumed that no considerable impact is foreseen on the sedimentation at and near the fishing port. However, it is recommended to monitor the sedimentation in this water area during and after the construction to verify the results of the numerical simulation.

5. Conclusions and Recommendations

5.1 Basic Concept of the development of Sihanoukville Port

170 Sihanoukville Port is the principal gateway of Cambodia and as such supports the nation's economic activities. At the same time, the port also plays a role as the leading industry in the Sihanoukville region. Thus, the development plan of the port should be made not only from the viewpoint of the gateway of seaborne trade, but also from the viewpoint of upgrading the national infrastructure and the leading entity of the regional economic activities. The study was carried out on the basis of the following basic concepts for the development of Sihanoukville Port:

(1) Concept of public port

171. Being the sole deep sea port, Sihanoukville Port has been the principal gateway for all of Cambodia together with Phnom Penh Port. Though situated 240 km away from the Capital, the port is connected to the commercial centre of the country with both an access highway and the railway. The port was originally intended to promote industrial and commercial activities in the port area, and thus spacious water and land areas are reserved in the port area.

172. The Sihanoukville City, where the port is situated, is the largest city in the Coastal Region, and infrastructures such as city roads, power and water supply have been provided. Located in the middle of a region with such potential, the port is the core of the regional economic activities. Therefore, since Sihanoukville Port, is so important to both the national and regional economy, it should be developed and operated by the public sector.

(2) Port development policy

a. Scale of the development

173. Being the largest port of the country, the development of the port in accordance with the growth of the national economy is indispensable. On the other hand, quite large scale investment is required for the timely development of the port, and this ,sometimes, brings the port operating body financial difficulties.

174. It is quite important for the port to implement the development project in several stages. Flexibility is also required to adjust the development schedule to the growth of the national economy and the cargo volume.

b. Financing for the project

175. The port should ensure the financing source for the development projects. In addition to the foreign funding agencies such as the World Bank, ADB and other bilateral financing

programmes, the port must have its own fund. At present, Sihanoukville Port is financially sound and has the capability to establish its own fund. In the study, thus, it is assumed that the local portion of the project cost shall be financed by the port's own fund. Invitation of private investment which may lead to hand over the function of port either partially or as a whole should be avoided.

(3) Requirement of the Master Plan of the Port Related Area.

176. In the existing land use plan of the Sihanoukville City Government, the Port Related Area is defined. However, at present, there is no legal background which prescribes the authority to administrate the area.

177. In the Port Related Area, where various public and private properties presently exist, the administrative coordination among the central and local government is not well organized for the land use of the area. At the same time, the perspective of the private investment is not clear enough. In this these circumstance, it seems to be impractical to draw a very-long-term plan of the whole Port Related Area from the standpoint of the port only.

178. Therefore, the study is intended to propose a long-term development plan of Sihanoukville Port up to 2015 and to preserve the maximum flexibility for further development beyond 2015.

(4) Autholization of the project

179. Project implementation sometimes faces obstacles such as policy changes of the government, lack of funds, insufficient infrastructure related port activities, the delay of the private investment, etc. It is necessary, therefore, to have the port development plan authorized by the government. To achieve this end, the port development project must be accepted by all the agencies concerned with the land use of the Port Related Area. It is assumed that Sihanoukville Port shall be coordinating with these agencies to formulate consensus development plan of the area.

(5) Review of the plan

180. The economic and political situation of the country may change in the coming years. It is quite necessary, therefore, that the plan be reviewed and modified, if needed, to adjust to changes related to socioeconomy, maritime service, cargo volume, etc. Especially, whenever regional development plans and private investment plans are published, timely review is indispensable.

181. It is assumed that Sihanoukville Port monitor the economic and political situation of both

the nation and the region. To achieve this end, it is the responsibility of Sihanoukville Port to collect and analyze the statistics of the port activities and production and investment of the private industries.

5.2 Conclusions

(1) Findings of present port

182. The rehabilitation and development of the national economy is the principal theme of the government of Cambodia. The cargo volume at Sihanoukville Port has been growing over the past five years. Such a high growth of cargoes is attributed to the inflation of the economy during the UNTAC, the cargo shift from Phnom Penh Port to Sihanoukville Port due to the full rehabilitation of the highway and the rapid containerization of general cargo. Thus, it is foreseen that the growth rate of cargo volume will decline to the level in accordance with the growth rate of national economy in the coming years.

183. The public investment up to 2000 is limited to the rehabilitation of fundamental infrastructure such as major highways and water and power supply in major cities. The public investment plans pledged to start in the coming year are also in the limited fields such as light industries and tourism.

184. On the other hand, the population pyramid shows that the generation of 14 years old and younger is very large, and it is foreseen that the labor force of the county expands rapidly in the year 2000. This implies that the economic activities of the country will tend to expand rapidly in the first decade of 21st century.

(2) Bottlenecks of the existing port facilities

185. The structural investigation of the timeworn Old Jetty showed that it would not be usable longer than several years. The construction of some alternative facilities to the Old Jetty is urgent. also, to cope with the rapid increase of container cargoes, it is necessary to upgrade the container handling facilities at the port.

(3) Natural conditions

186. The water area where Sihanoukville Port is situated is quite calm throughout the year. Waves and winds are not major causes of the suspension of the port operation, but strong rainfalls occasionally suspend the cargo handling work. The tide is journal and the tidal range is about 100 cm. The north-south tidal current is predominant. The sub-soil condition between seabed and -20m at the project sites is generally silty sand or sandy silt or clay, and there is a rock layer underneath throughout the project sites.

(4) Natural environment

187. The turbidity of the sea water is considerably high both within and outside of breakwaters. The sea water and the sediments on the sea bed tend to contain some chemicals. There are corals along the shore of the islands nearby. Some of these corals are dead due to the sediments brought by the tidal current. Only very common species of coral or fish are found, and their populations are fairly small.

188. The major fishing sites are located at these areas further than 10 km away from the port. Sihanoukville Port is located on the shore of a low and swampy land, and, once it rains, the streams discharge sediment into the basin of the port.

(5) Role of Sihanoukville Port

189. Phnom Penh Port, located near the economic centre, has the role as a hub of the inland water transportation through the Mekong River system. Thus, the agricultural products, general cargoes, petroleum products and construction materials are the major commodities handled at Phnom Penh Port. Being the sole deep sea port, Sihanoukville Port handles container cargoes, heavy machinery, bulk cargoes and wood products.

(6) Cargo volume forecast

190. The cargo volume forecast was done for the three scenarios: High, Middle and Low. The results of the cargo volume forecast in 2015 for these High, Middle and Low case scenarios are 7.1mil. (Oil 2.4 mil., others; 4.4 mil.), 6.3 mil.(Oil; 2.1mil., Others; 4.2 mil.) and 4.7 mil.(Oil; 1.6 mil., Others; 3.3 mil.) tons, respectively.

191. The cargo volume forecast on the basis of the Middle Growth scenario estimated cargo volume in 2005 to be 2.3 million(Oil; 0.6 mil., Others; 1.8 mil.) tons: the Middle Growth Scenario assumes the GDP growth rate to be about 5.5% between 1996 and 1999, and 7.5% in 2000 and after.

(7) Cargo handling capacity of the present port

192. The capacity of a berth was defined to be the cargo volume handled over a year with the berth occupancy rate of 85%. With this definition, the capacity of the New Quay, with its one general cargo berth and two container berths, has the capacity of 700,000 tons, and the Old Jetty, with its four general cargo berths, has the capacity of about 400, 000 tons.

(8) The Long-term Development Plan

193. The number of berths required in 2015 is as follows:

High Growth Scenario;

General cargo berth; 5, Container berth; 3, Bulk berth; 2,

Middle Growth Scenario;

General cargo berth; 5, Container berth; 3, Bulk berth; 2,

Low Growth Scenario;

General cargo berth; 4, Container berth; 2, Bulk berth; 2.

194. To fulfill these requirements, the Long-term Plan proposes to construct the following new facilities:

General cargo wharf; 400m (renovation of existing revetment),
Container terminal; 400m (for High and Middle case), 120m(for Low case), and
Bulk Terminal; 300 m.

The new general cargo wharf and the container terminal should be constructed in the same alignment as the existing New Quay.

195. Two alternative plans were proposed for the location of the bulk terminal. Plan-1 proposes to locate the terminal about 1 km to the north of the proposed container terminal. Plan-2 proposes to locate it next to the new general cargo wharf (at the back of the South Breakwater).

196. In addition to the construction of these wharves, four units of container gantry crane should be installed at the container terminal and handling equipment for bulk cargoes, namely, cement and fertilizer should be furnished at the bulk terminal. The north navigation channel should be deepened and widened to accommodate larger ships.

197. Of the two alternative plans, Plan-1 is recommended from the viewpoint of the incentives to private investment and the potentiality for the future expansion of the bulk terminal.

(9) The Short-term Development Plan

198. The major facilities required to be constructed or procured by 2005 are as follows:

General cargo berth; 5 (existing 350m and new construction 400m),
Container berth; 2 (new construction 240m), and
Container gantry crane 2 units.

(10) Urgent Improvement Plan

199. Of the facilities proposed in the Short-term Development plan, the 400 m long general cargo wharf needs to be operational by 2000, when the existing Old Jetty would not be fully

operational.

(11) Phased construction plan

200. It is recommended that the facilities proposed in the Long-term Development Plan be constructed in the following stages:

1998 - 2000;	the Urgent Improvement Plan (General cargo wharf 400m)
1999 - 2003;	the Short-term Development Plan (Container terminal 240m, gantry crane 2 units)
2004 - 2006;	the Long-term Development Plan (1) (Bulk terminal 150 m),
2008 - 2011;	the Long-term Development Plan (2) (Bulk terminal 150m, additional container gantry crane 1 unit)
2012 - 2014;	the Long-term Development Plan (3) (Expansion of the container terminal 160m, additional container gantry crane 1 unit)

(12) Structural design

201. The concrete block type is recommended for the new general cargo wharf, because the level of the rock layer at this site is too shallow for deck-on-pile type. In order to reduce the reflection of the waves at the wharf, concrete blocks placed near the sea level should be wave absorbing type. At the location of the container terminal, the level of the rock layer is deep enough and deck-on-pile type is recommended because the cost is lower and there is less reflection of wave than by concrete block type.

(13) Construction plan

202. Working yard for the production of the concrete blocks of the new general cargo wharf is required over the construction period. The land area and the basin at the back of the Old Jetty, which is presently used for the mooring of working vessels of the port, can be used for the working yard.

203. The dredged materials are not suitable for the fill of the reclamation of the proposed container terminal. Thus, they should be disposed at the dumping sites: the water area either north or south of Dek Koh Island, where the water depths are -20 m or deeper. To avoid the dispersion of the soil during the dredging work, grab type dredger is recommended for the dredging of the basin and cutter suction type is recommended for the dredging of the north navigation channel. Dumping site should be chosen depending on the direction of the tidal current: when the current is northward, dumping should be at the north site and vise versa.

(14) Project cost

204. The project cost at each stage of development is as follows:

The Long-term Development Plan;	US$245 million (including the Short-term and Urgent Plans),
The Short-term Development Plan;	US$113.5 million, (US$85.3 mil. plus the Urgent Improvement Plan US$28.2mil.),
The Urgent Improvement Plan;	US$28.2 million.

(15) Economic Analysis

205. The EIRR of the Long-term Development Plan fell in the range between 14.0% and 17.8% for various cases. The EIRR for the Short-term Development Plan including the Urgent Improvement Measure results in 15.0%. Even in the worst case, where the project cost is assumed to increase by 10% and the cargo volume reduces by 10%, the EIRR is 11.0%. Since the project ensures an EIRR of 10%, it can be appraised that the Short-term Development Plan is economically feasible.

(16) Financial analysis

206. The Short-term Development Plan is concluded to be financially feasible, provided that the initial project cost for the Urgent Improvement Plan is not paid for by Sihanoukville Port. The FIRR for this case is 7.9%. In the case that the initial project cost increases by 10% and revenue decreases by 10%, the FIRR is 2.7%. In the calculation of FIRR, the present tariff system is employed.

(17) Environmental Impact Assessment (EIA)

207. The Law of Environment was enacted in September, 1996, and all the government projects are requested to prepare EIA reports for submission to the evaluation committee. The standards and guidelines, however, are still being prepared by the Ministry of Environment. Thus, the standard and guidelines of some other countries in Southeast Asia, namely, Malaysia, Singapore, and Indonesia, were used for reference for the EIA in this study.

208. The results of EIA are summarized as follows:

a. Impact of the disposal of dredged material on the ecology in the dumping sites

209. It was found that by choosing the dumping site either north or south of Dek Koul Island in accordance with the direction of the tidal current, the impact of the suspended soil on the ecology at these islands can be avoided.

b. Sedimentation in the port

210. The results of the simulation with a numerical model show that there is no practical change in the magnitude of the sedimentation in the water area within and near the fishing port regardless of the existence of the new container terminal.

c. Impact on socioeconomic activities

211. Neither the Urgent Improvement nor the Short-term Development Plans requires resettlement of any private properties. The construction of the proposed container terminal will not cause substantial inconvenience for the passage of the fishing boats.

212. The rerouting of the Municipal Road is very minor, and no considerable impact is foreseen in the traffic in the communities. The route of the heavy cargo trucks to and from the Sihanoukville Port is separated from the municipal road.

213. The cargo truck traffic on National Road No. 4 becomes heavier as the cargo volume at the port increases. However, it seems that, in 2015, the traffic will not be heavy enough to cause traffic jams. The traffic congestion on National Road No. 4 is expected to be eased as the peace and order situation is improved to allow night driving.

(18) Overall evaluation

214. The projects proposed in the study for the three stages of development have enough capacity to handle the cargo volume expected to occur in the respective target years. Both the Long-term Development Plan and the Short-term Development Plan are beneficial from the viewpoint of the national economy. Provided that the initial project cost for the Urgent Improvement Project is shouldered by other agencies than Sihanoukville Port, the Port will be able to implement the Short-term Development Plan from a financially sound position.

215. Through EIA, no elements were identified on which the project would give considerable impact. If appropriate attention is paid during the construction period, the impact on natural and socioeconomic environment can be minimized.

216. Summing up these evaluations, it is concluded that the Short-term Development Plan is feasible.

5.3 Recommendations

(1) The responsibility of the public port

217. Since 1993, the government of Cambodia has been making efforts to privatize government corporations. The present status of Sihanoukville Port is a government agency, and it, with its autonomous administration, operates the port fairly efficiently with financial soundness. Thus, privatization of the port as a whole or partially should be avoided. On the contrary, it is the responsibility of Sihanoukville Port as a public corporation to promote and lead the private industries in the region and country. Being a public port, the port should make efforts to reduce the operation cost and to maintain its tariff at a reasonable level

(2) Development of the North Navigation Channel

218. The proposed project includes the upgrading of the North Navigation Channel. The channel has a bend at the entrance of the port. In addition, permission for the calling ships to leave and enter the port during night time is requested as the number of calling ships is increasing. Thus, the installation and maintenance of the navigation aids are indispensable.

(3) Observation of weather and tide

219. The observation of tide should be continued to monitor the datum level of Sihanoukville Port and for the navigation safety. Weather observation is also required for the safety of cargo handling and the preparation of future development plans of the port.

(4) Construction

220. During the construction period, a working yard should be provided within the port. Traffic conflicts between the vehicle and vessel for the construction and those for port operation may occur. It is, thus, necessary to well organize the schedule and arrange routes to avoid such conflicts. The water and land area at the back of the Old Jetty can be used for the working yard. The land area there should be cleared when the construction starts. During the construction stage, the port should inform the local people, especially fishermen, of the schedule of the construction and the routes of the working vessels to avoid accidents.

(5) Improvement of handling productivity

221. The cargo handling capacity cannot be increased by providing the new berths only. It is as well important to improve the cargo handling productivity. Therefore, all efforts should be made to make much use of available facilities such as the sheds and open storage and to introduce pallets, belt conveyers, etc.

(6) Harbour services

222. To use the limited number of berths most effectively, it is necessary to start cargo handling as soon as ships dock at the berth and that the ships leave the port as soon as the cargo handling work is over. Thus, it may be necessary to allow ships to leave the port during the night time. In such occasion, due attention should be paid to the the traffic of fishing boats.

223. The unloading facilities of the Oil Port can be owned and operated by the private secior. However, the tug and pilot service and maintenance of navigation channel should be provided by Sihanoukville Port, since the Oil Port is a public facility and Sihanoukville Port is responsible for harbour safety.

(7) Operation and management of the port

224. It is necessary to establish, within Sihanoukville Port, the Container Terminal Division which is responsible for the entire handling process of container cargoes. Increase of the container cargo volume may require a larger labor force. It is necessary to prepare employment schedule and to establish training programs for both new and existing port workers.

225. The development of the port should be done in accordance with the cargo volume increase and this requires timely review of the schedule of the development. Thus, the Planning Division has the responsibility to collect information related to the national economy as well as cargoes.

(8) Fund for the development

226. The financial situation of Sihanoukville Port is evaluated to be sound. It is recommended that the Port save the net income for the future development and establish its own fund. However, some existing facilities still require maintenance and repair. Thus, it is quite important to schedule properly the investment for the port development so that the cost for the maintenance and repair of the existing facilities is not cut down.

(9) Participation of the private sector in the port operation

227. At present, it is not necessary to privatize Sihanoukville Port either fully or partially. It is, however, important for the port to introduce the principle of market economy in its management.

228. There are some elements of the port service which can be privatized. Some of these are: the cargo handling service of specific cargoes for a certain company only, such as bitumen, cement or etc., maintenance and repair of the heavy handling equipment, and services for the welfare of the personnel of the port such as restaurant, garbage and cleaning services.

229. For the effective use of the port's own fund, cooperation with reliable commercial banks is also needed. To promote local commercial banks may be one of the responsibilities of Sihanoukville Port as the leading industry in the region.

(10) Recommendation of technical matters related to the project implementation

a. Soil survey

230. The information of the soil conditions at the construction site of the proposed container terminal is not sufficient for detail design of the structure. During the stage of the detail engineering, additional boring should be carried out to ensure the sub-soil conditions, such as the level of the rock layer and the estimation of the settlement of after the reclamation of the container terminal.

b. Structure type of wharves

231. As the length of the wharf is extended, the reflection of the waves at the wharves become considerable. The type of the structure which reduces the reflection of waves should be chosen.

c. Consideration of the environment

232. During the dredging work, monitoring of the water quality and the sedimentation is needed. The dredgers employed should be either grab or bucket type to reduce the turbidity in the port. Larger barges are recommendable for the disposal of the dredged material to reduce the extent of the dispersion of the suspended soil. The pond in the port area should be reserved as the source of the water needed for port services.

d. Public relations

233. When the project is authorized, Sihanoukville Port should inform the contents of the Plan and the construction schedule to the agencies concerned. The port is also responsible to explain the same to the local people, so that conflicts which may otherwise occur can be avoided.

(11) The responsibility of the Sihanoukville as the port administration entity of the government

a. Authority of the Port to administrate the Port Related Area

234. The Port Related Area, defined in the Land Use Plan of the Sihanoukville City, has great potential for future development in various fields of economic activities. To achieve the most effective use of the area, it is necessary to prepare a master plan and implementation plan. At the same time, piecewise developments by both public and private sectors which deviate from the master plan should be strictly regulated.

235. At present, except Sihanoukville Port, there is no agency in the region which possesses enough resources to keep monitoring the process of the development and to coordinate with all the

agencies concerned.

236. It is required to establish a system whereby any project proposal related port activities must be reviewed by Sihanoukville Port before it is implemented.

i) Oil Port

237. From the view point of harbour safety, and conservation of the natural environment, Sihanoukville Port is responsible to review the expansion plans and monitor the operation of these facilities.

ii) Municipal Ports

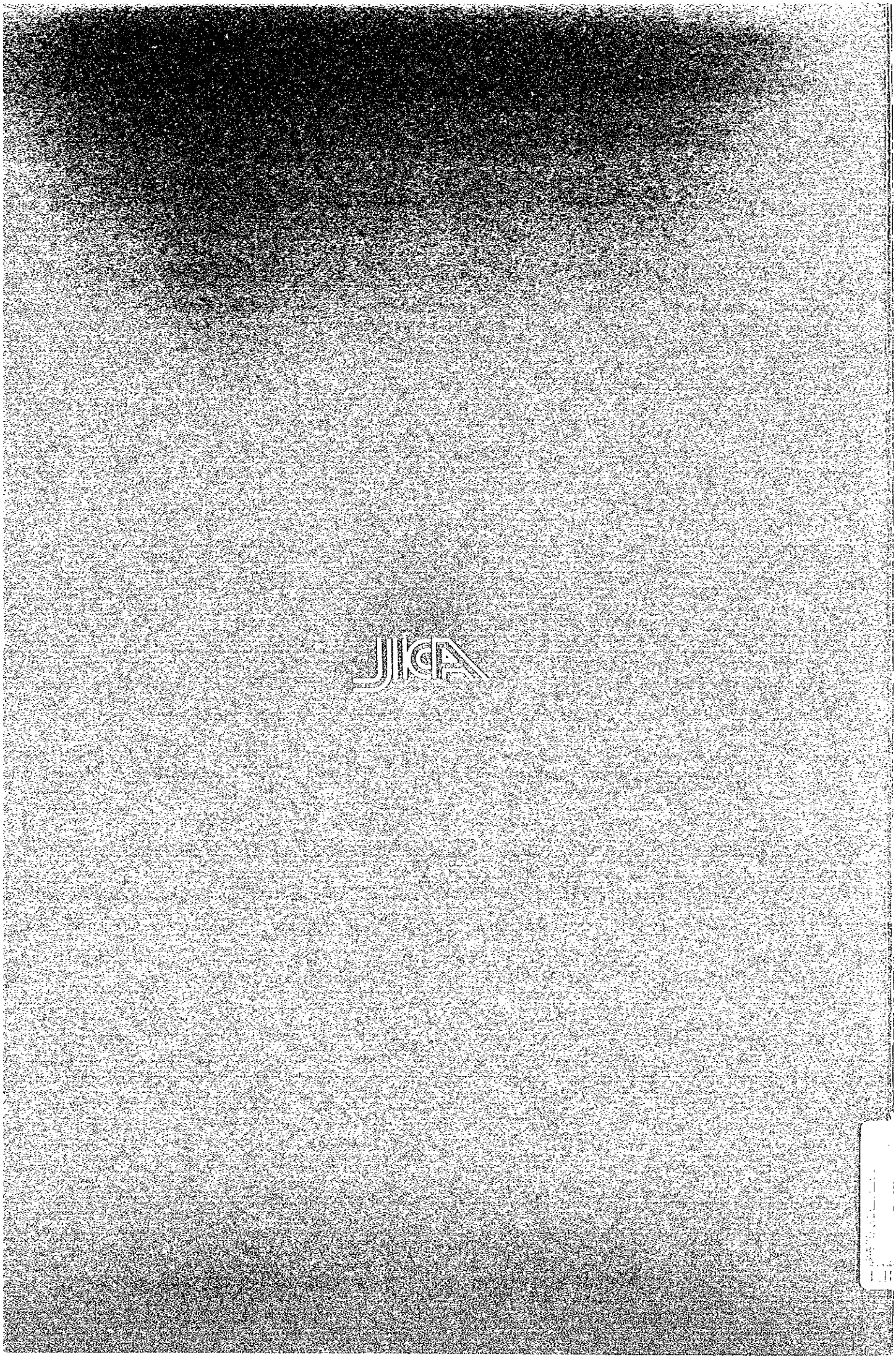
238. From the viewpoint of harbour safety and to achieve the most effective and balanced development of the area, expansion plans of their facilities and the structural design should be reviewed by Sihanoukville Port.

iii) Fishing ports

239. The same system as to the municipal ports should be applied to the fishing ports. In addition, the disposal and wastes at the fishing ports should be monitored by Sihanoukville Port. The latter also should regulate the traffic of the fishing boats.

b. Responsibilities of Sihanoukville Port as the coordinator of the development of the area

240. As stated above, it is very necessary to formulate a master plan of the development of the whole Port Related Area. To achieve this end, Sihanoukville Port has the responsibility to take initiative to organize a committee and to discuss and coordinate all the project proposals in the area to formulate an integrated master plan. The constituents of the committee members are the representatives of local agencies such as governor of Sihanoukville City, directors of Fishery Office, Railways, Public Works and Transport. In addition, if necessary, representatives of the local industries should be invited.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