

## 2.2 Port Activities

### 2.2.1 Sea Transport Sector

Currently, the followings are the main overseas shipping lines which have vessels calling at Beira Port.

- (1) CMB-Transport
- (2) Doal Conventional
- (3) MSC Mediterranean Shipping
- (4) Messina
- (5) Maersk
- (6) NYK
- (7) Unicorn

Shipping routes interviewed with principal shipping companies and agents are shown in Table 2.2.1-1. A transit time from the major hub ports in South Africa to overseas countries is shown in Table 2.2.2-2.

The shipping route of ocean liners calling at Beira Port is through East African ports such as Mombassa, Dares Salaam and Maputo to the international ports in Cape Town and Durban of South Africa, Jedda and Jebel Ali of Middle East and European ports. A new service connecting East Africa to the international network is put into operation to ease the congestion of the hub ports in South Africa, of which shipping route is from Colombo to Jebel Ali to Mombassa to Dar es Salaam to Beira to Durban to Mambasa to Colombo.

Tankers of regular calling at Beira Port are on a route from the Cape Town or Durban to Beira to Aden to Beira to Cape Town or Durban. Another tanker is on the excursion voyage from Durban to Maputo to Beira to Nacala to Durban.

Regular feeder ships visit Beira Port connecting to a hub port from Durban, South Africa through Maputo Port.

Cabotage of coastal traffic provide links between the regional ports in Mozambique.

Table 2.2.1-1 Shipping Route of Principle Liner Ship (Year: 1996)

Shipping Company	Shipping Route												
	Antwerp	Hamburg	Beira	Mombasa	Durban	Beira	Durban	Antwerp	Cape Town	Beira	Mombasa	Jeddah	Marseille
Doal Conventioal	Antwerp	Hamburg	Beira	Mombasa	Durban	Beira	Durban	Antwerp	Antwerp				
	Antwerp	Hamburg	Atwara	Dar-Es-Salaam	Mombasa	Beira	Mombasa	Antwerp					
	Antwerp	Hamburg	Dar-Es-Salaam	Mombasa	Beira	Antwerp							
Messina	Marseille	Genova	Naples	Jeddah	Mombasa	Dar-Es-Salaam	Durban	Cape Town	Beira	Mombasa	Jeddah	Marseille	
	Marseille	Genova	Naples	Jeddah	Mombasa	Dar-Es-Salaam	Durban	Cape Town	Beira	Dar-Es-Salaam	Mombasa	Jeddah	Marseille
	Marseille	Genova	Naples	Jeddah	Mombasa	Dar-Es-Salaam	Durban	Cape Town	Beira	Mombasa	Jeddah	Marseille	
Maersk	Colombo	Jebel Ali	Mombasa	Beira	Durban	Durban	Mombasa	Colombo					
N.Y.K.	Mombasa	Dar-Es-Salaam	Beira	Durban	Richard Bay	Singapore	Kobe						
	Yokohama	Singapore	Mabe	Mombasa	Dar-Es-Salaam	Beira	Maputo	S.Africa Port	Singapore	Kobe			
	Yokohama	Singapore	Mahe	Mombasa	Dar-Es-Salaam	Beira	S.Africa Port	Singapore	Kobe				
Unicorn & CMBT	Durban	Nacala	Dar-Es-Salaam	Mombasa	Karachi	Jebel Ali	Mumbai	Mombasa	Nacala	Beira	Durban		
	Durban	Nacala	Dar-Es-Salaam	Mombasa	Karachi	Jebel Ali	Mumbai	Mombasa	Dar-Es-Salaam	Nacala	Beira	Durban	
Uni-Feeder	Durban	Maputo	Beira	Durban									

Table 2.2.1-2 Transit Time from Hub Port in South Africa to International Port

	N.W. Continent				West Mediterranean							United States of America					Canada	
	Felixstone	Antwerp/Rotterdam	Hamburg	Bremerhaven	Las Palmas	Valencia	Barcelona	Leghorn	Genoa	Naples	Marseille	New York	Baltimore	Norfolk	Charleston	Houston	Montreal	Toronto
Durban	21	19	23	24	12	15	16	17	19	19	20	21	23	24	26	31	30	31
Port Elizabeth	20	18	22	23	11	14	15	16	18	18	19	20	22	23	25	30	30	31
Cape Town	18	16	20	21	10	13	14	15	17	17	18	8	20	21	23	28	27	28

	South America West Coast						Australia				East Africa		Indian Ocean					Mid East	
	Guayaquil	Callao	Arica	Antofagasta/Iquique	Valparaiso	Talcahuano	Fremantle	Sydney	Melbourne	Adelaide	Dar es Salaam	Mombasa	Pointe des Galets	Tamatave	Port Louis	Diego Suarez	Dzaoudzi	Mumbai	Dubai
Durban	40	43	45	46	48	50	11	18	22	22	6	6	6	7	4	8	10	15	21
Port Elizabeth	42	45	47	48	50	52	13	20	24	24			9	10	7	11	13	18	24
Cape Town	37	40	42	43	45	47	14	21	25	25			10	11	8	12	14	19	25

Source: Mediterranean Shipping Company SA

## 2.2.2 Ships' Call

### (1) Number of Ships' Call

Table 2.2.2-1 and Figure 2.2.2-1 show ships' call at Beira Port by ship's type during the period from 1986 to 1996. The average number of ships calling in the last 5 years is approximately 400 per year. The maximum ships' call recorded 503 in the year of 1989. Recently, the total number of calling ships has been decreasing. However, the number of ships' call of ocean going vessels is steadily increasing.

Based on ships' call records of the Maritime Service Department of CFM-C, 1996, a list of repeat calling ships of more than 2 visits is shown in Table 2.2.2-2. Total number of ships' call is recorded at 364, in which the numbers of calling ships more than 2 times and 5 times are 44 ships and 12 ships, respectively. It means that chartered or irregular visits of ships take up a predominant portion of the port calls.

### (2) Sizes of Calling Ships

Ship sizes of Dead Weight Tonnage (DWT) and Length Overall (Loa) of calling ships at Beira Port are examined by using the ship call records of CFM-C, 1996.

Table 2.2.2-3 gives the maximum and the average of DWT and Loa of calling ships. Tankers recorded the largest DWT ship of 30,611 tons in the total calling ships. Regarding Loa of calling ships, container carriers are the longest of 206.1 m.

DWT and Loa of calling ships by ship types are tabulated respectively in Tables 2.2.2-4 and 2.2.2-5. Among the calling ships bigger than 16,000 DWT, tankers take up 85 % (31/37 ships), which suggests that the size of tankers would provide the predominant factors to the design dimensions of the Access Channel. Loa of most of the bigger ships concentrated at the range from 160 to 180 m.

Figure 2.2.2-2 gives a relation between DWT and Loa of overall calling ships. Figures 2.2.2-3 to 2.2.2-12 show the distribution of DWT and Loa by each ship type. According to "Beira Port Study, Access Channel Study, NEDECO", the ship dimensions for the design of the Access Channel is 30,000 DWT tankers or bulk carriers sized as follows.

### Size of 30,000 DWT Tanker or Bulk Carrier

Length Perpendicular ( $L_{pp}$ ) = 200.0m

Length Overall ( $Loa$ ) = 210.0m

Breadth ( $B$ ) = 27.0m

Full Load Draft ( $T$ ) = 11.0 m

From a relationship between DWT and  $Loa$  of calling ships, all of the calling ships have entered in the port within the design  $Loa$  of 210.0 m. In regard to the DWT of calling ships, only one ship with DWT rated more than 30,000 tons was recorded in 1996, whose  $Loa$ , however, is within the design  $Loa$ .

Table 2.2.2-6 and Figure 2.2.2-13 show a comparison of a number of calling ships by DWT between 1991 and 1996. The total number of calling ships in 1996 has decreased by 127 from the total number in 1991. However, the number of small ships whose DWT is less than 2,000 tons records a decrease of 196 ships and the number of bigger vessels has increased, which indicates that an up-sizing trend of calling ships has been very significant in the recent years.

#### (3) Arrival Draft of Calling Ships

Arrival drafts of calling ships by ship types are tabulated in Table 2.2.2-7 and a relationship between DWTs and arrival drafts is shown in Figure 2.2.2-14. In spite of the shallow water depth of the Access Channel, calling ships of draft deeper than 10.5 m were recorded in 1996. It is presumed that these deep draft ships passed through the critical points of the navigation channel during the high tide at the spring tide period. It shows that the bigger ships are forced to enter the port in a partially loaded condition to reduce their draft.

Table 2.2.2-8 and Figure 2.2.2-15 show an accumulated distribution of arrival draft excluding fishing boats calling to Beira Port in 1996. It indicates that 70 % of the total calling ships entered the Port with a draft less than 8.0 m and ships whose draft is more than 10.0 m shared 2 % of the total number of calling ships.

#### (4) Waiting Time of Calling Ships

Waiting time and cargo handling time are calculated by the arrival and departure time of calling ships recorded by CFM-C. Most of the large sized ships entering Beira Port have to wait at the entrance of the Access Channel for the tide level reaches the necessary water depth for sailing through the Channel. Other reasons for ships waiting include night time arrival waiting due to the

prohibition of night sailing in the Channel and other factors such as berth arrangement and preparation.

The condition of the Access Channel in 1991, immediately after the capital dredging, was sufficient in water depth for the sailing of bigger vessels, because the Access Channel was deepened up to 8.0 m below Chart Datum Level (CDL) during the period from March 1989 to August 1990. The existing channel has been suffering from serious siltation and the water depth at the critical points becomes as shallow as 4.8 m below CDL due to insufficient maintenance dredging carried out so far. Data from 1996 represents the insufficient condition in which navigation of calling ships along the channel is restricted by the depth of the channel.

Table 2.2.2-9 and Figure 2.2.2-16 show a number of tide waiting ships and the average waiting time of arriving ships whose draft is deeper than 5.0 m during the period from 1988 to 1996. In further details, the average waiting time by ship types are tabulated in Tables 2.2.2-10 to 2.2.2-13. Relationships between tide waiting hour and arrival draft of calling ships from 1988 to 1996 are shown in Figures 2.2.2-17 to 2.2.2-20 and a distribution of arrival draft of calling ships is given in Table 2.2.2-14.

In 1988 corresponding to before capital dredging of the Access Channel, 70.2 % of the total arriving ships have to wait at the port entrance due to above reasons at the average tide waiting time of 9.2 hours, although a voyage schedule of ships is adjusted to reduce waiting time prior to their arrival at the port. Immediately after the completion of the capital dredging in 1991, a ratio of number of tide waiting ship to total calling ships shows a rapid decrease, reflecting the improvement of the accessibility of the Channel. After the capital dredging from 1989 to 1990, no significant maintenance dredging has been installed, so that the water depth of the Access Channel becomes shallower year by year due to the deposition of sediment. Waiting time of calling ships in 1994 and 1996 shows the same trend of the water depth of the Access Channel that a number of tide waiting ships is getting worse, counting for 28 ships in 1991, 91 ships in 1994 and 202 ships in 1996 and an average waiting time of arriving ships in 1996 becomes 2.4 times of 1991, accounting 15.0 hours and 6.2 hours, respectively.

Focused on the statistics of tankers, which have relatively deeper drafts than other kinds of ships and are sensitively affected by shoaling of the Access Channel, almost 90 % of the arriving tankers in 1996 have to wait subject to tide waiting, night waiting and other reasons as shown in Table 2.2.2-13 with an average total waiting time of 41.4 hours. The average waiting times due to tide,

night and other reasons are 18.8 hours (80 %, 48 out of 60 ships), 9.8 hours (35 %, 21 out of 60 ships) and 58.6 hours (37 %, 22 out of 60 ships), respectively.

Figures 2.2.2-17 to 2.2.2-20 reveals the accessibility of the Access Channel before and after the capital dredging. The tide waiting time distribution ranged very limited during the year of 1991 corresponding immediately after the capital dredging was well improved by the capital dredging, comparing to the tide waiting time distribution with a wide and high range in 1988 as shown in Figure 2.2.2-17. Figure 2.2.2-18 indicates that calling ships which have to wait subject to the tide waiting are concentrated into the arrival draft range from 8.0 m to 9.0 m and seemed to be almost negligible because of the deep channel water depth of 8.0 m below CDL which was sufficient for sailing through the Access Channel. Figures 2.2.2-19 and 2.2.2-20 corresponding to the tide waiting time distribution after the capital dredging indicate that the tide waiting time is prolonged by the shoaling of the Access Channel. In the year of 1996, waiting hours distribution have a peak in the range from 9.0 m to 10.0 m and are widely spread in the range from 5.5 m to 11.0 m due to the restriction of insufficient channel depth of about 4.8 m below CDL in some portions of the Channel.

The average tide waiting time in 1996 was 2.4 times higher compared to that in 1991, which concludes the channel siltation is a very serious problem for ships operation and navigation as well as sailing costs.

#### (5) Cargo Handling Time of Calling Ships

Cargo handling time is calculated based on the arrival and departure time of calling ships recorded by CFM-C. Table 2.2.2-15 shows cargo handling times by arrival draft as well as ship type. Tankers take 21 hours to discharge oil products on average. Bulk carriers need much more time for loading and unloading cargo where the current average handling time of the ships less than 10 m draft and the same more than 10 m reach 159 hours and 250 hours respectively, equivalent to 6.6 days and 10.4 days.

Table 2.2.2-1 Number of Ships' Call at Beira Port

Year	Ocean Going	Cabotage	Passenger,etc	Total
1986	177	...	...	274
1987	238	110	44	392
1988	272	102	72	446
1989	270	149	86	505
1990	266	116	84	466
1991	260	116	104	480
1992	297	89	35	421
1993	365	83	22	470
1994	341	56	26	423
1995	311	38	18	367
1996	322	37	12	371

Source: Final Progress Report, Beira Corridor Authority

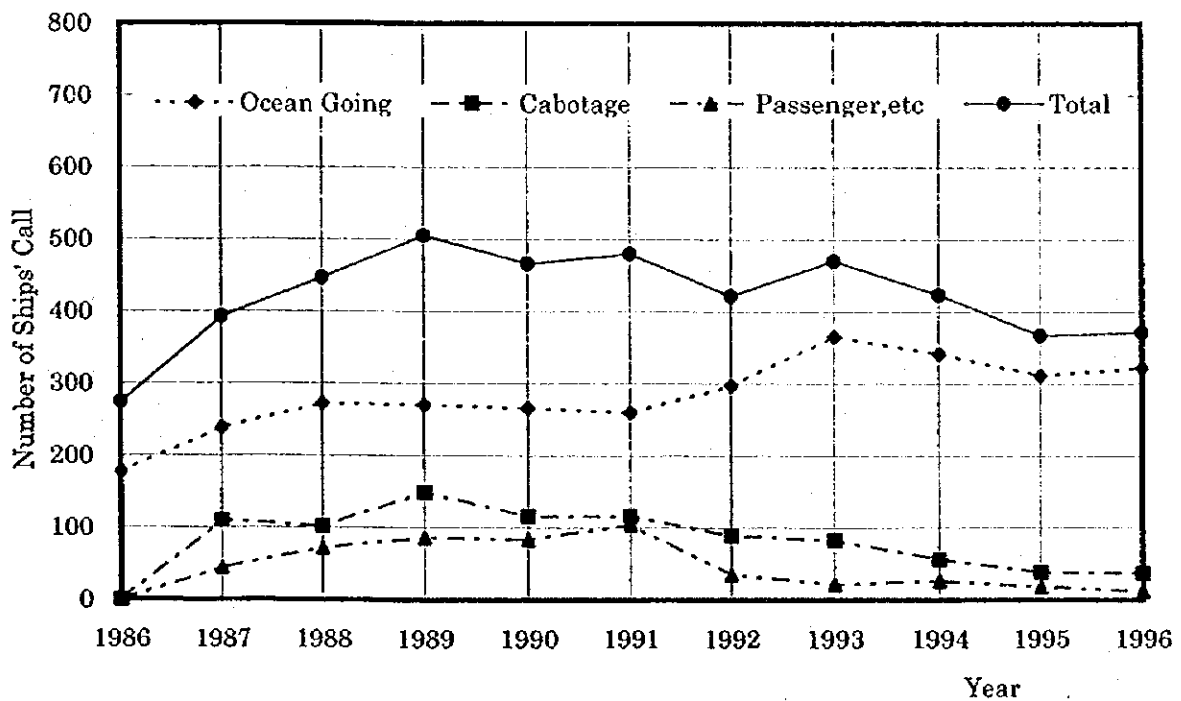


Figure 2.2.2-1 Number of Ships' Call at Beira Port



Table 2.2.2-2 List of Repeat Calling Ships

Year: 1996

Type	Vessel name	Loa (m)	GRT (ton)	DWT (ton)	Draft (m)	Visits
Tanker	RESPECT	176.80	13,115	22,607	10.40	19
	BRITISH ADV.	176.52	11,581	23,967	9.27	5
	ENERGOS	170.73	11,171	18,939	6.86	5
	ERIKA JACOB	171.04	12,605	18,302	9.05	4
	SINORA	178.05	12,813	23,575	9.70	4
	C.ANN	176.22	11,125	25,060	8.59	2
	C.HELEN	176.22	11,123	25,060	9.83	2
	JIAN SHE	115.24	1,791	5,971	7.67	2
	JO COLLUNA	136.59	4,373	8,002	7.67	2
	PACIFICA	174.09	11,572	16,809	8.54	2
Container Carrier	KAIROS	129.57	4,228	6,417	7.16	27
	PHAROS	129.57	4,162	6,001	7.55	26
	BARBARAD	110.98	2,080	3,784	6.81	23
	J.MARRONE	199.70	18,515	21,334	8.89	5
	SONGO	92.68	1,117	2,726	4.29	5
	DOAL MANGAN	168.29	7,060	11,055	8.61	4
	VALERIA	167.99	7,819	13,267	6.53	4
	VIVIEN	167.99	14,003	20,544	6.53	4
	BRAVO SIF	115.55	2,139	4,953	5.56	3
	MARINA	146.34	4,802	8,425	7.01	3
	SHAULAS	139.63	6,225	9,432	6.40	3
	VERBENA	167.99	7,819	13,267	6.86	3
	DOAL UCRA	152.74	6,314	11,347	8.05	2
	DURBAN STAR	190.55	11,262	17,245	8.16	2
	EUROSHIPPING	206.10	11,064	24,472	9.05	2
	J.VERDE	199.70	9,484	18,467	9.05	2
ORNELA	168.60	7,068	11,067	6.48	2	
Bulk Carrier	SHEAR WATER	92.68	693	1,000	4.67	6
	NOA	161.28	9,403	15,088	7.39	4
	VEZIRA	73.78	1,153	1,733	4.45	3
	AL MOHAMMED	156.10	2,726	5,270	6.53	2
	GEORGE	161.59	6,883	11,420	7.67	2
	REGENT	139.94	9,328	14,417	7.67	2
General Cargo Carrier	CORUNA	72.87	728	1,118	3.99	5
	GEGA I	46.04	272	489	2.44	3
	RYBINSK	117.99	2,264	4,497	6.40	3
	IBN ASAKIR	175.61	9,686	15,122	8.28	2
	PONTA	50.00	162	300	2.80	2
Cabotage	DIMINI III	72.26	726	997	3.97	23
	HOORBAY	37.80	137	299	3.48	9
	LUGENDA	71.65	349	638	4.29	4
	SENA	54.90	678	678	3.60	3

Out of 364 Total Recorded Ships' Calls

**Table 2.2.2-3 Maximum and Average Ship Size by Ship Type**

Year: 1996

	Tanker	Bulk Carrier	Container Carrier	General C. Carrier	Others
DWT max. (ton)	30,611	26,040	24,472	19,370	5,084
DWT ave. (ton)	19,106	12,362	8,429	7,703	863
Loa max. (m)	189.0	194.8	206.1	197.9	109.2
Loa ave. (m)	166.0	151.3	138.0	123.2	63.7

**Table 2.2.2-4 Dead Weight Tonnage of Calling Ships by Ship Type**

Year: 1996

DWT (ton)	Tanker	Bulk Carrier	Container Carrier	G. Cargo Carrier	Others	Total
DWT ≥ 32,000	-	-	-	-	-	-
32,000 > DWT ≥ 30,000	1	-	-	-	-	1
30,000 > DWT ≥ 28,000	-	-	-	-	-	-
28,000 > DWT ≥ 26,000	-	1	-	-	-	1
26,000 > DWT ≥ 24,000	5	-	1	-	-	6
24,000 > DWT ≥ 22,000	25	3	1	-	-	29
22,000 > DWT ≥ 20,000	-	5	5	-	-	10
20,000 > DWT ≥ 18,000	12	3	3	2	-	20
18,000 > DWT ≥ 16,000	10	8	4	2	-	24
16,000 > DWT ≥ 14,000	-	10	3	7	-	20
14,000 > DWT ≥ 12,000	1	6	16	2	-	25
12,000 > DWT ≥ 10,000	-	9	14	3	-	26
10,000 > DWT ≥ 8,000	2	9	12	2	-	25
8,000 > DWT ≥ 6,000	-	1	54	1	-	56
6,000 > DWT ≥ 4,000	3	3	7	7	1	21
4,000 > DWT ≥ 2,000	3	1	30	3	-	37
2,000 > DWT	-	9	2	12	40	63
Total	62	68	152	41	41	364

Table 2.2.2-5 Length Overall of Calling Ship by Ship Type

Year: 1996

Length Overall (m)	Tanker	Bulk Carrier	Container Carrier	G. Cargo Carrier	Others	Total
Loa $\geq$ 220	-	-	-	-	-	-
220 > Loa $\geq$ 200	-	-	2	-	-	2
200 > Loa $\geq$ 180	1	11	10	4	-	26
180 > Loa $\geq$ 160	51	24	27	9	-	111
160 > Loa $\geq$ 140	2	19	13	5	-	39
140 > Loa $\geq$ 120	2	3	62	3	-	70
120 > Loa $\geq$ 100	4	1	29	6	1	41
100 > Loa $\geq$ 80	2	6	7	3	-	18
80 > Loa $\geq$ 60	-	3	1	6	27	37
60 > Loa $\geq$ 40	-	1	1	5	3	10
40 > Loa $\geq$ 20	-	-	-	-	10	10
20 > Loa	-	-	-	-	-	-
Total	62	68	152	41	41	364

Year: 1996

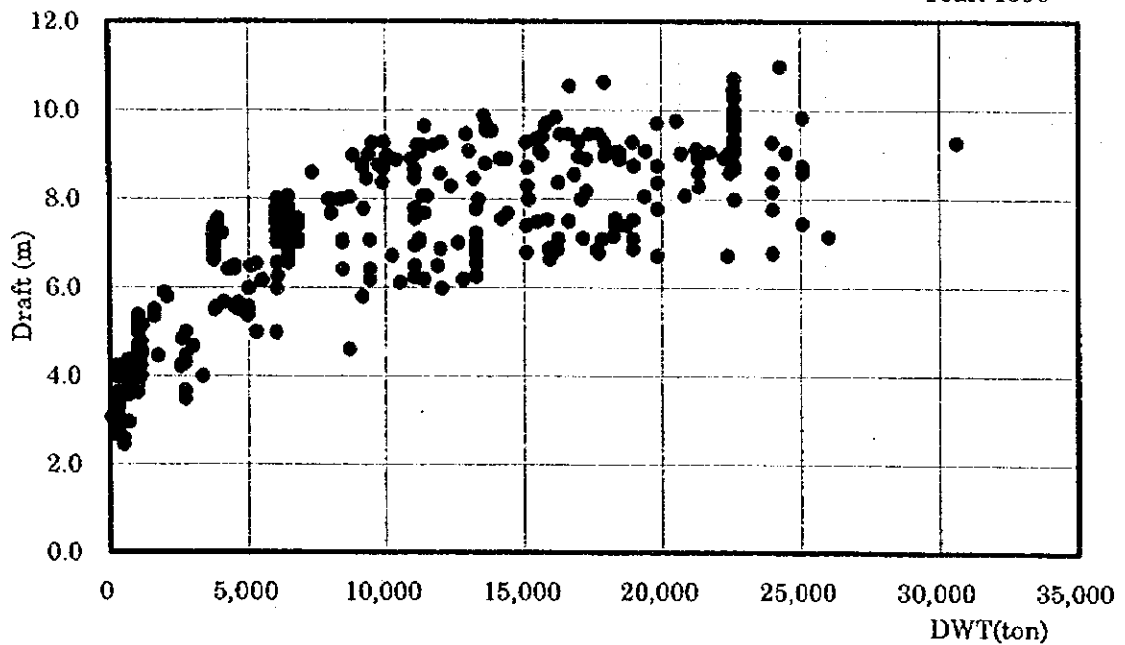


Figure 2.2.2-2 DWT - Length Overall Distribution of Calling Ship

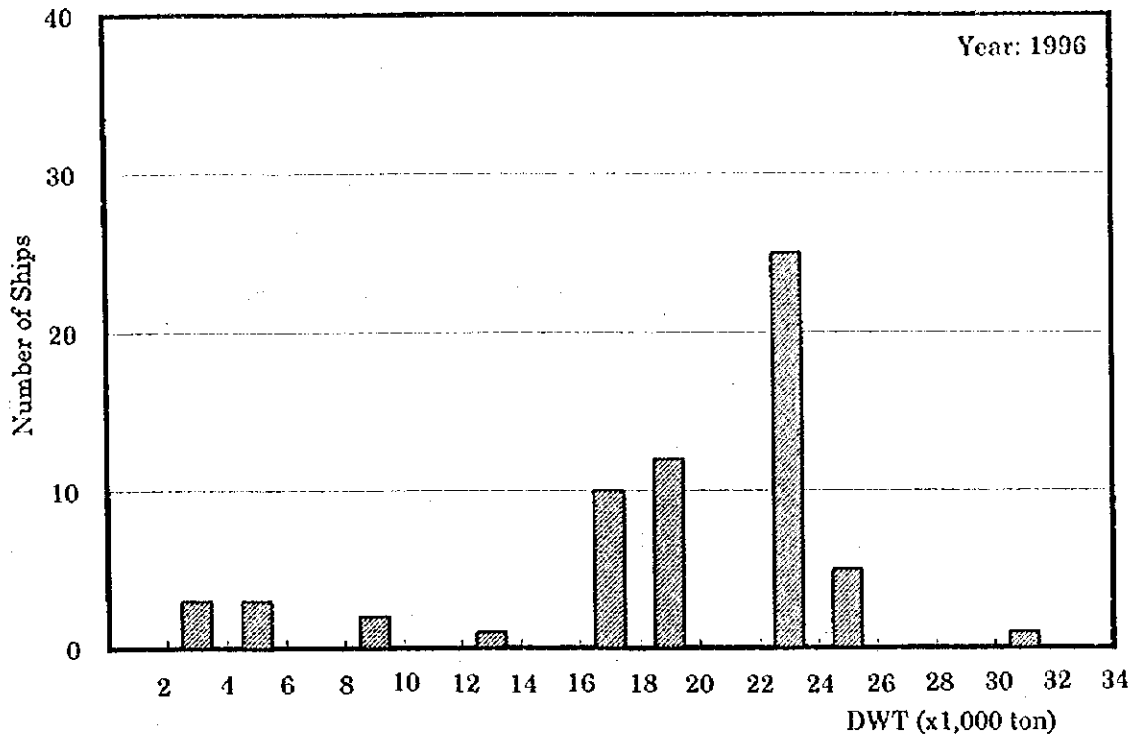


Figure 2.2.2-3 Dead Weight Tonnage Distribution of Calling Tankers

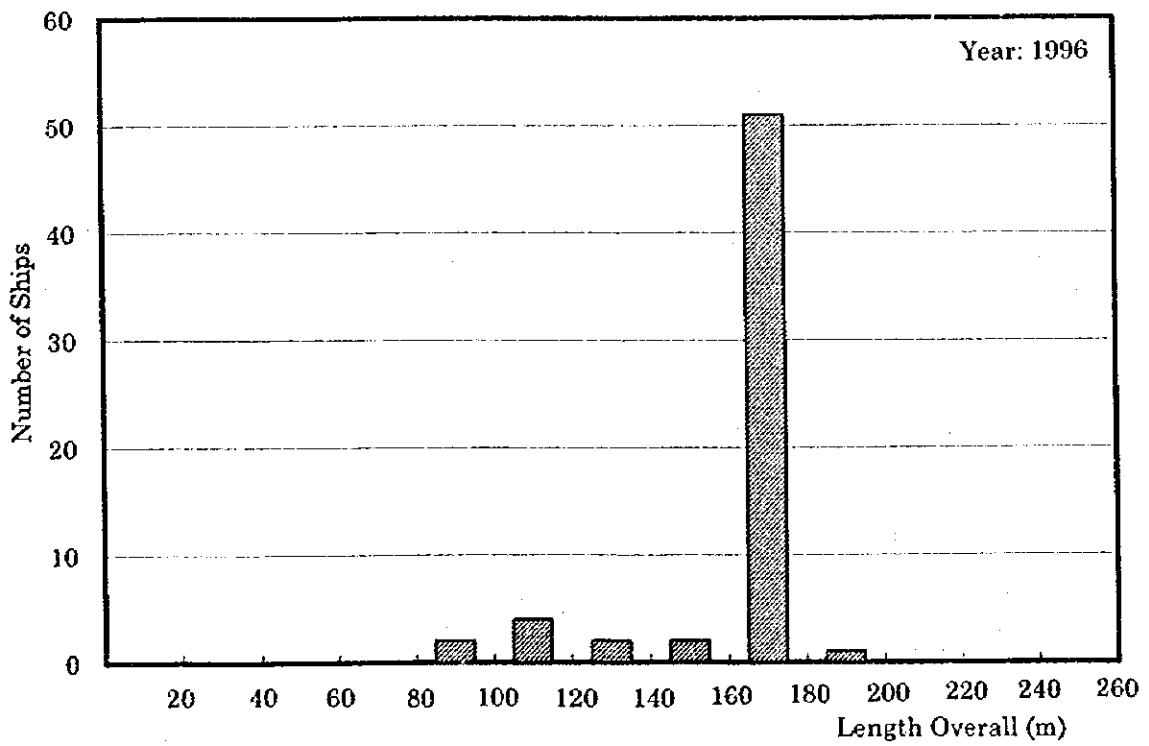


Figure 2.2.2-4 Length Overall Distribution of Calling Tankers

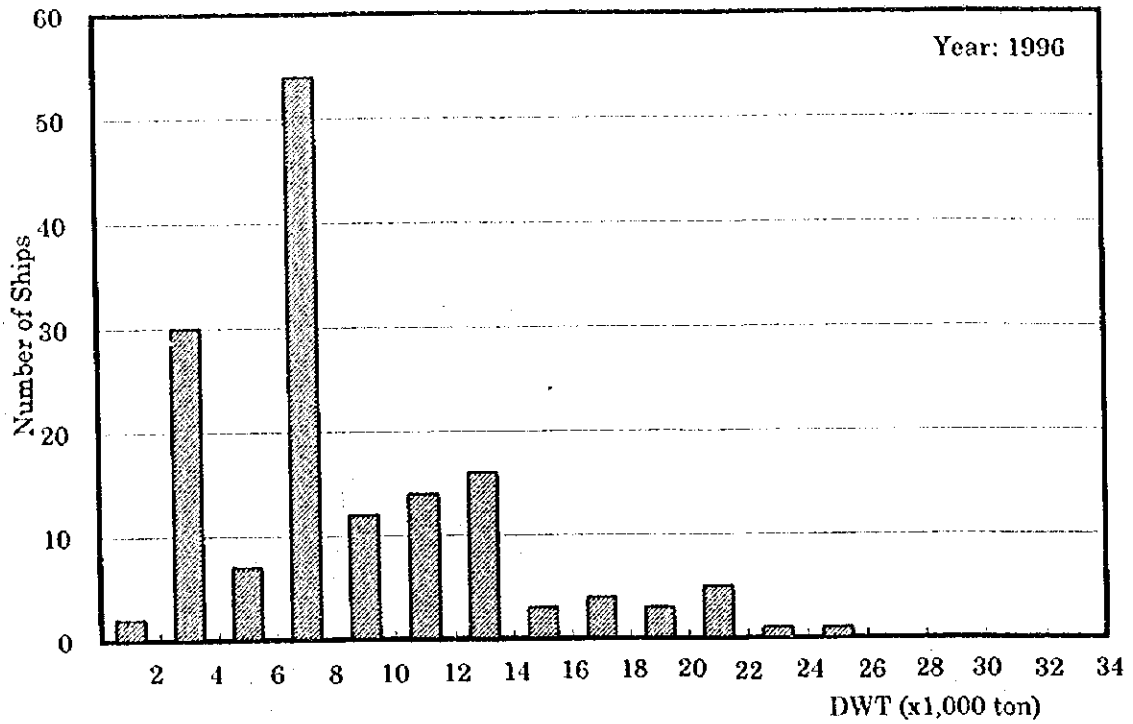


Figure 2.2.2-5 Dead Weight Tonnage Distribution of Calling Container Carriers

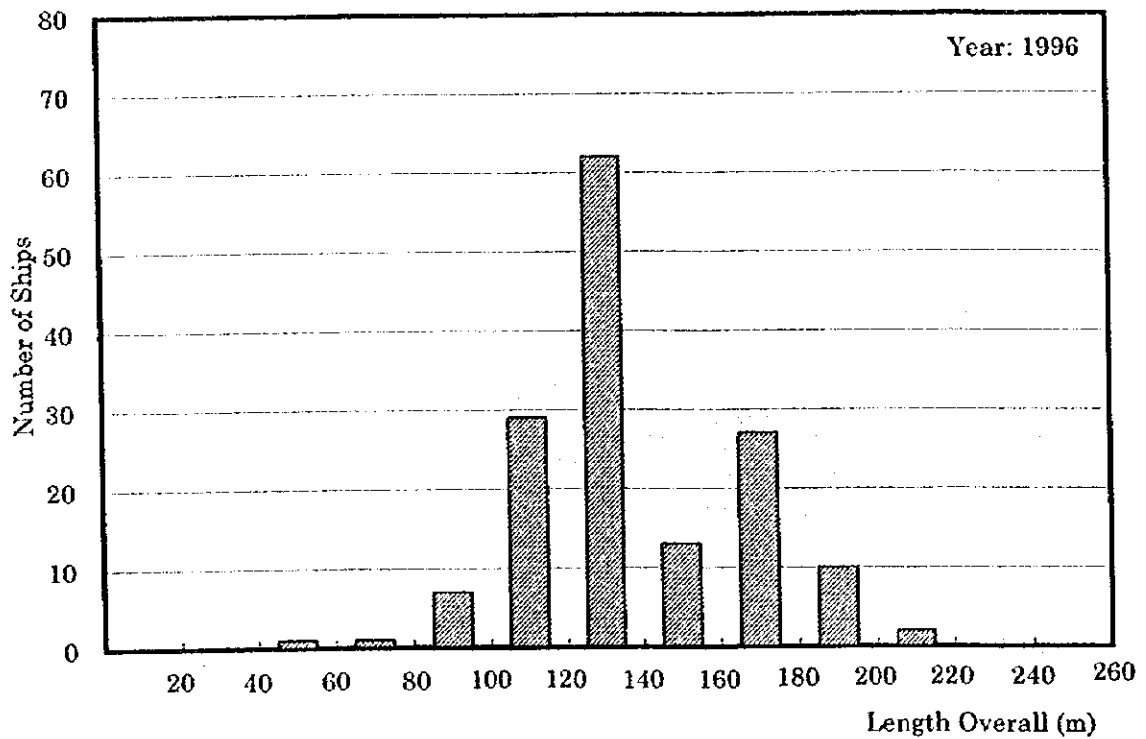


Figure 2.2.2-6 Length Overall Distribution of Calling Container Carriers

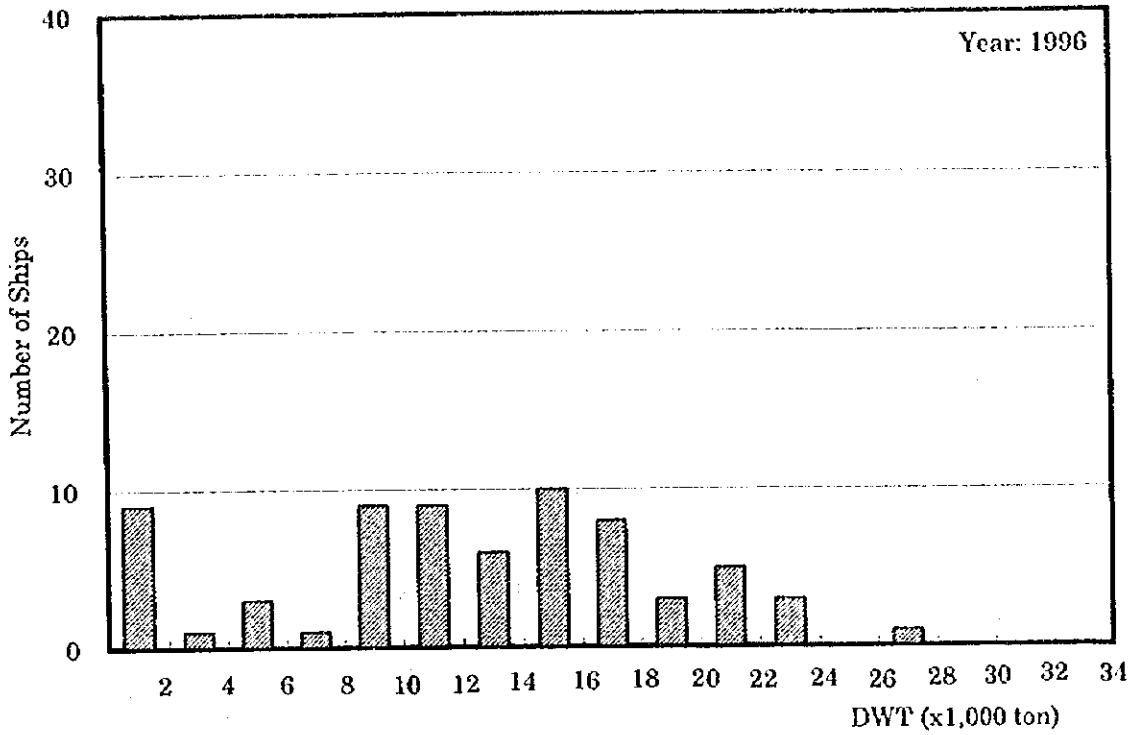


Figure 2.2.2-7 Dead Weight Tonnage Distribution of Calling Bulk Carriers

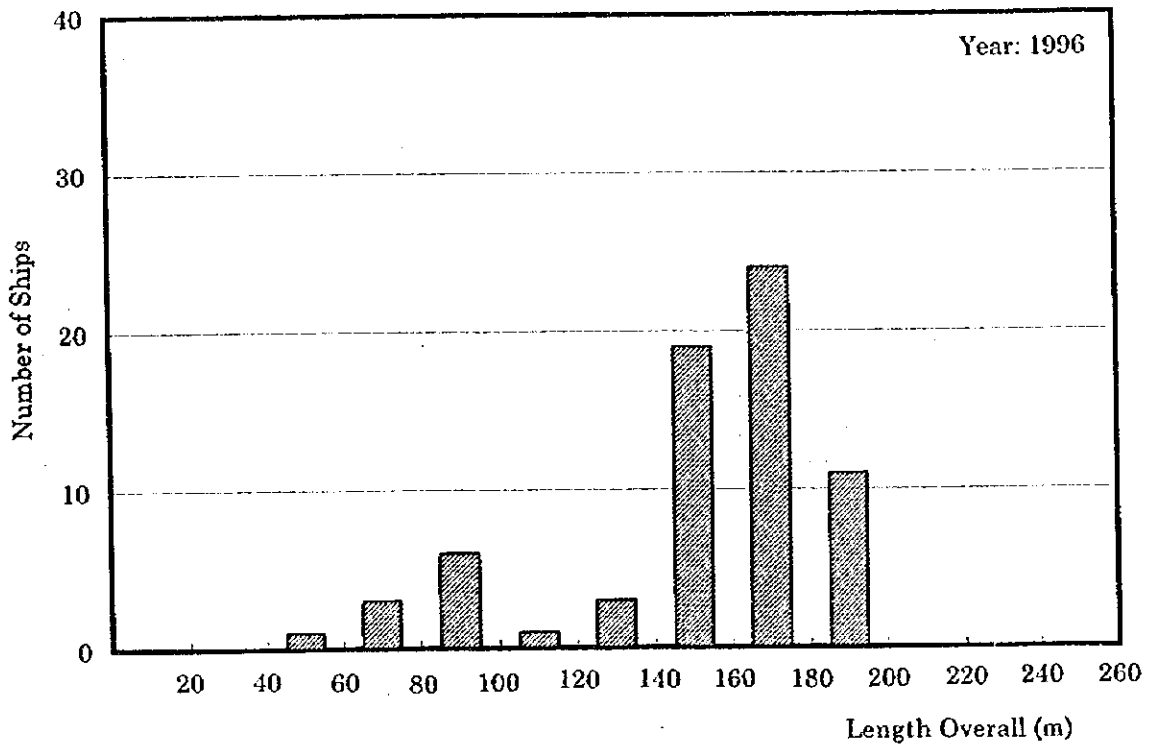


Figure 2.2.2-8 Length Overall Distribution Calling Bulk Carriers

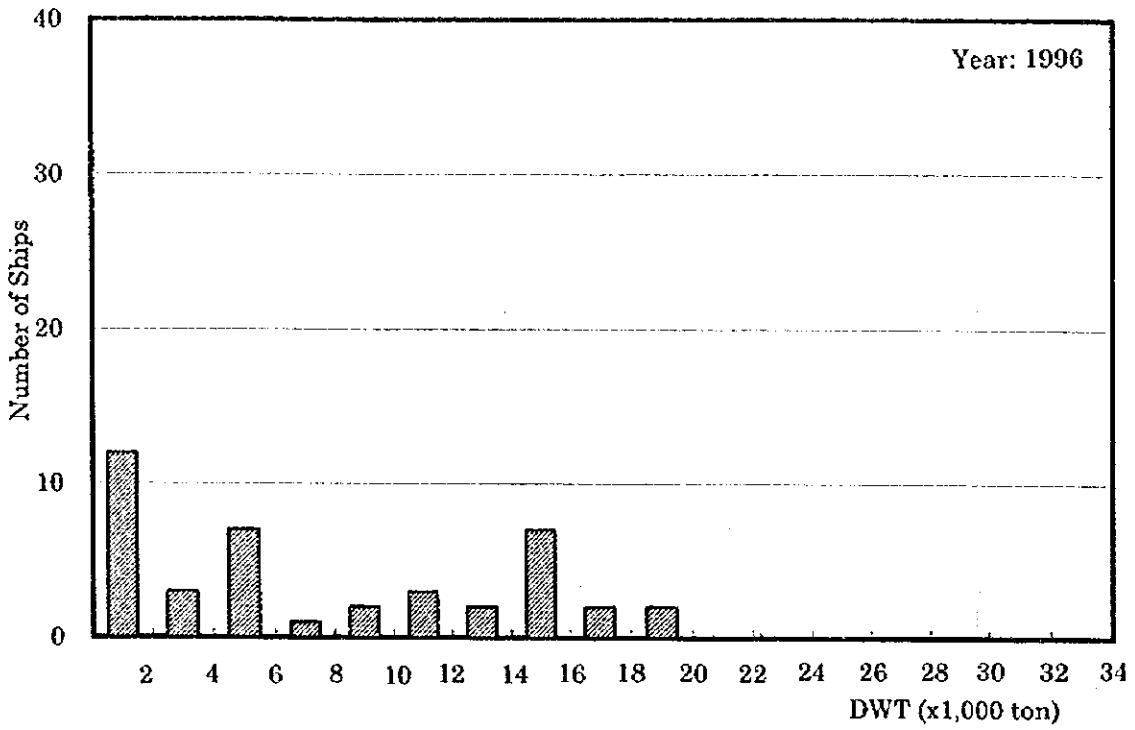


Figure 2.2.2-9 Dead Weight Tonnage Distribution of Calling General Cargo Carriers

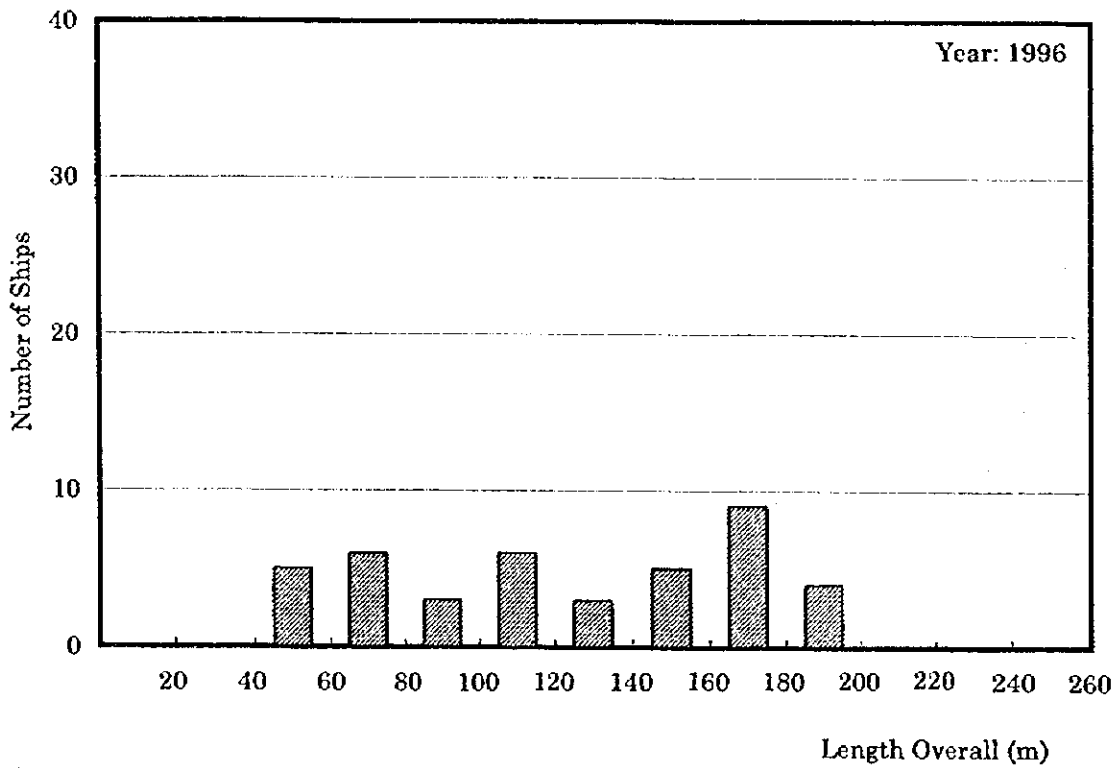


Figure 2.2.2-10 Length Overall Distribution of Calling General Cargo Carriers

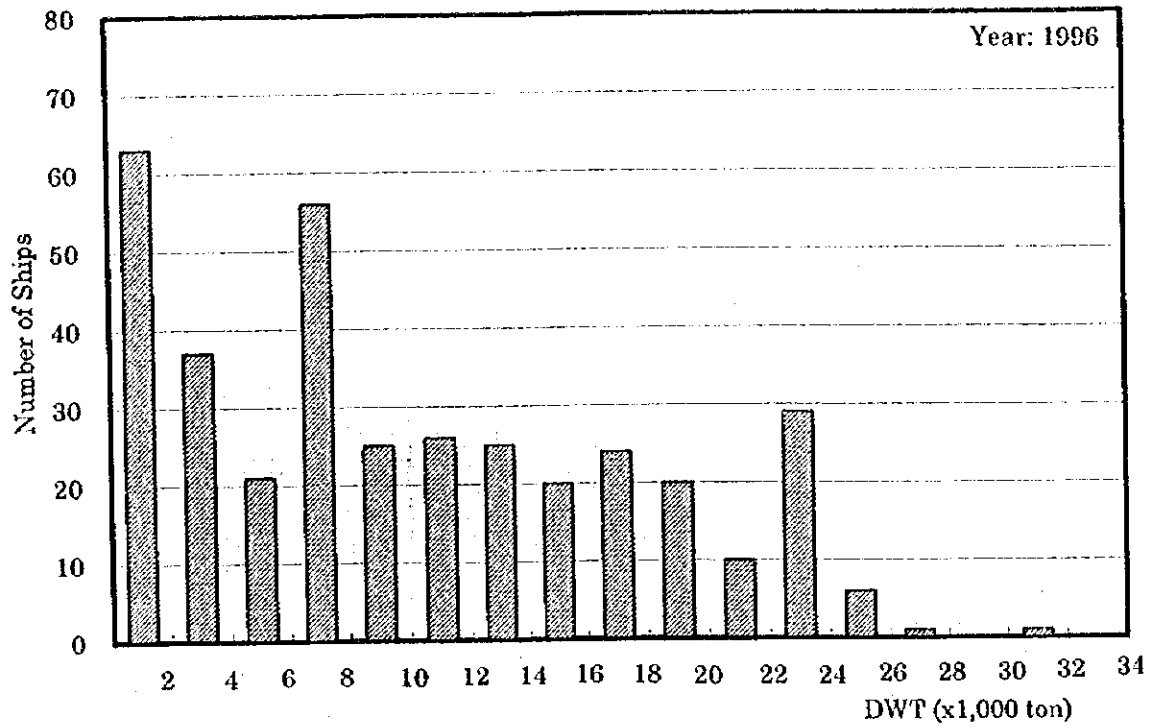


Figure 2.2.2-11 Dead Weight Tonnage Distribution of Total Calling Ships

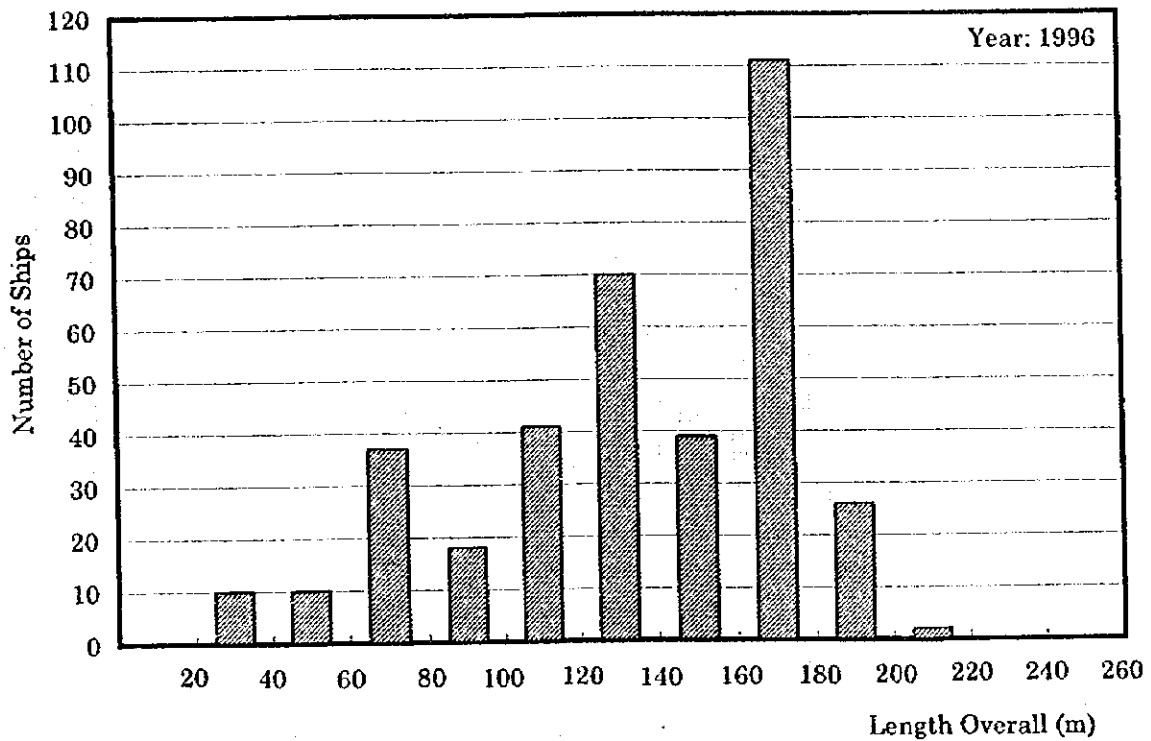


Figure 2.2.2-12 Length Overall Distribution of Total Calling Ships



Table 2.2.2-6 Dead Weight Tonnage of Calling Ships in 1991 and 1996

DWT (ton)	Number of Ships' Call		
	1991	1996	1996-1991
DWT ≥ 32,000	--	-	-
32,000 > DWT ≥ 30,000	-	1	1
30,000 > DWT ≥ 28,000	-	-	-
28,000 > DWT ≥ 26,000	2	1	-1
26,000 > DWT ≥ 24,000	7	6	-1
24,000 > DWT ≥ 22,000	5	29	24
22,000 > DWT ≥ 20,000	2	10	8
20,000 > DWT ≥ 18,000	38	20	-18
18,000 > DWT ≥ 16,000	13	24	11
16,000 > DWT ≥ 14,000	27	20	-7
14,000 > DWT ≥ 12,000	17	25	8
12,000 > DWT ≥ 10,000	23	26	3
10,000 > DWT ≥ 8,000	25	25	0
8,000 > DWT ≥ 6,000	12	56	44
6,000 > DWT ≥ 4,000	21	21	0
4,000 > DWT ≥ 2,000	40	37	-3
2,000 > DWT	259	63	-196
Total	491	364	-127

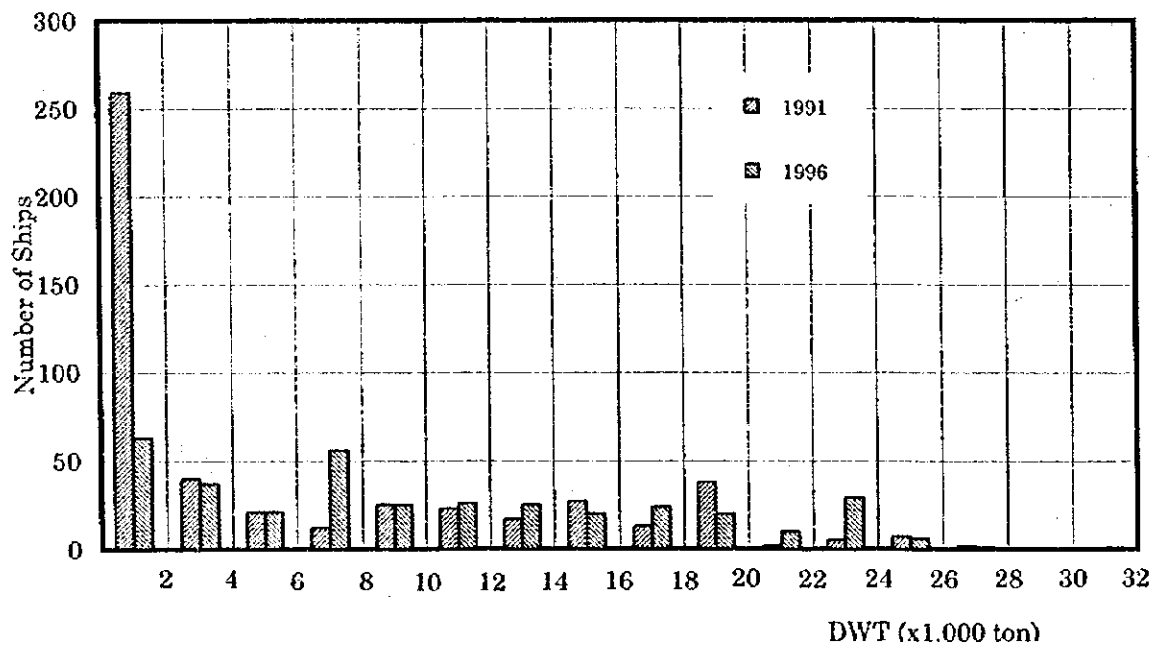


Figure 2.2.2-13 Dead Weight Tonnage Distribution of Calling Ships in 1991 and 1996

Table 2.2.2-7 Arrival Draft of Calling Ships by Ship Type

Year: 1996

Arrival Draft (m)	Tanker	Container	Dry Cargo	Others	Total
11.0>Draft $\geq$ 10.5	6	-	1	-	7
10.5>Draft $\geq$ 10.0	6	-	3	-	9
10.0>Draft $\geq$ 9.5	9	-	19	-	25
9.5>Draft $\geq$ 9.0	8	11	17	-	36
9.0>Draft $\geq$ 8.5	11	12	7	-	30
8.5>Draft $\geq$ 8.0	4	15	8	-	27
8.0>Draft $\geq$ 7.5	8	27	9	-	44
7.5>Draft $\geq$ 7.0	8	49	6	-	63
7.0>Draft $\geq$ 6.5	-	17	8	1	26
6.5>Draft $\geq$ 6.0	-	8	4	-	12
6.0>Draft $\geq$ 5.5	-	5	7	2	14
5.5>Draft $\geq$ 5.0	1	2	3	12	18
5.0>Draft $\geq$ 4.5	1	-	8	5	14
4.5>Draft $\geq$ 4.0	-	2	4	7	13
4.0>Draft $\geq$ 3.5	-	4	2	8	14
3.5>Draft $\geq$ 3.0	-	-	2	3	5
3.0>Draft $\geq$ 2.5	-	-	2	3	5
2.5>Draft $\geq$ 2.0	-	-	2	-	2
Total	62	152	112	41	364

Year: 1996

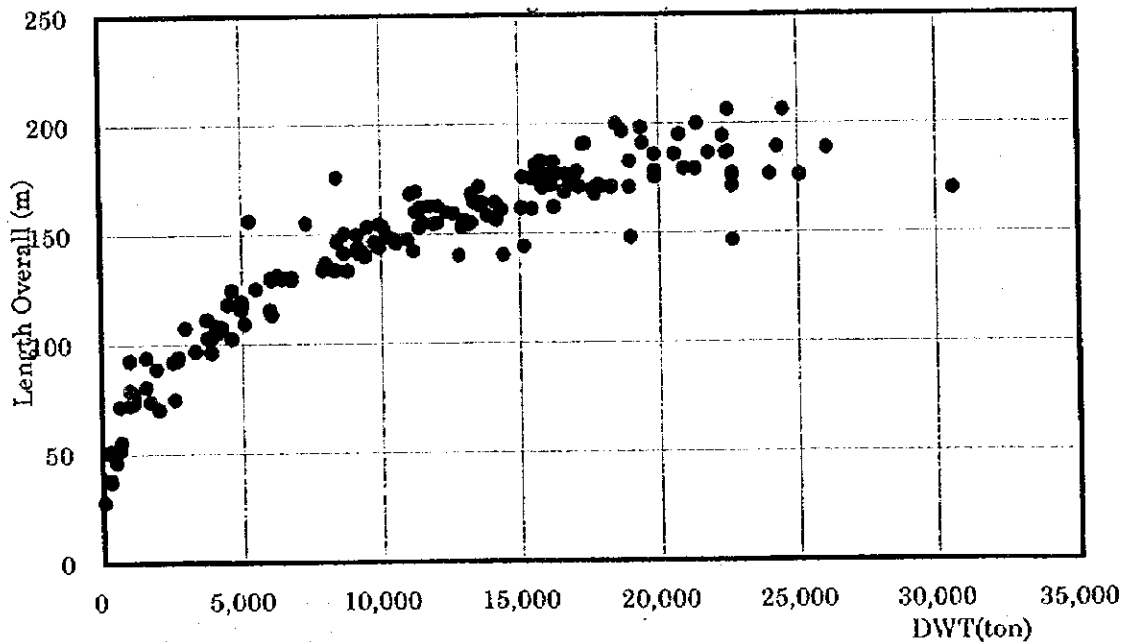


Figure 2.2.2-14 Dead Weight Tonnage Distribution of Calling Ships by Ship Type

Table 2.2.2-8 Accumulated Arrival Draft of Calling Ships

Year: 1996

Arrival Draft (m)	Number of Ships' Call	Accumulated Number	%
Draft $\geq 11.0$	-	364	100.0
11.0 > Draft $\geq 10.5$	7	364	100.0
10.5 > Draft $\geq 10.0$	9	357	98.1
10.0 > Draft $\geq 9.5$	25	348	95.6
9.5 > Draft $\geq 9.0$	36	323	88.7
9.0 > Draft $\geq 8.5$	30	287	78.8
8.5 > Draft $\geq 8.0$	27	257	70.6
8.0 > Draft $\geq 7.5$	44	230	63.2
7.5 > Draft $\geq 7.0$	63	186	51.1
7.0 > Draft $\geq 6.5$	26	123	33.8
6.5 > Draft $\geq 6.0$	12	97	26.6
6.0 > Draft $\geq 5.5$	14	85	23.4
5.5 > Draft $\geq 5.0$	18	71	19.5
5.0 > Draft $\geq 4.5$	14	53	14.6
4.5 > Draft $\geq 4.0$	13	39	10.7
4.0 > Draft $\geq 3.5$	14	26	7.1
3.5 > Draft $\geq 3.0$	5	12	3.3
3.0 > Draft $\geq 2.5$	5	7	1.9
2.5 > Draft $\geq 2.0$	2	2	0.5
2.0 > Draft $\geq 1.5$	-	-	-
1.5 > Draft $\geq 1.0$	-	-	-
1.0 > Draft $\geq 0.5$	-	-	-
0.5 > Draft	-	-	-
Total	364		

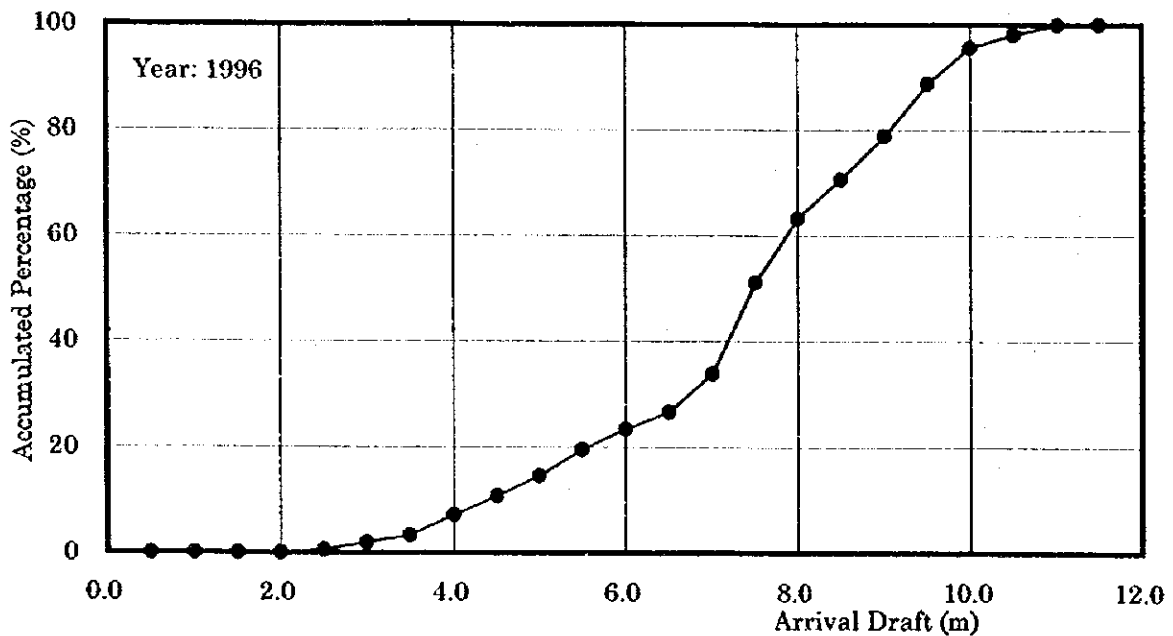


Figure 2.2.2-15 Accumulated Arrival Draft of Calling Ships

Table 2.2.2-9 Average Tide Waiting Time of Arrival Ships from 1988 to 1996

Arrival Ships of Draft Higher than 5m

Year	No. of Arrival Ships (1)	No. of Tide Waiting Ships (2)	% (2)/(1)	Average Tide Waiting Time (hr)
1988	265	186	70.2	9.2
1991	243	28	11.5	6.2
1994	305	91	29.8	8.2
1996	289	202	69.9	15.0

Capital Dredging: from 1989 to 1991

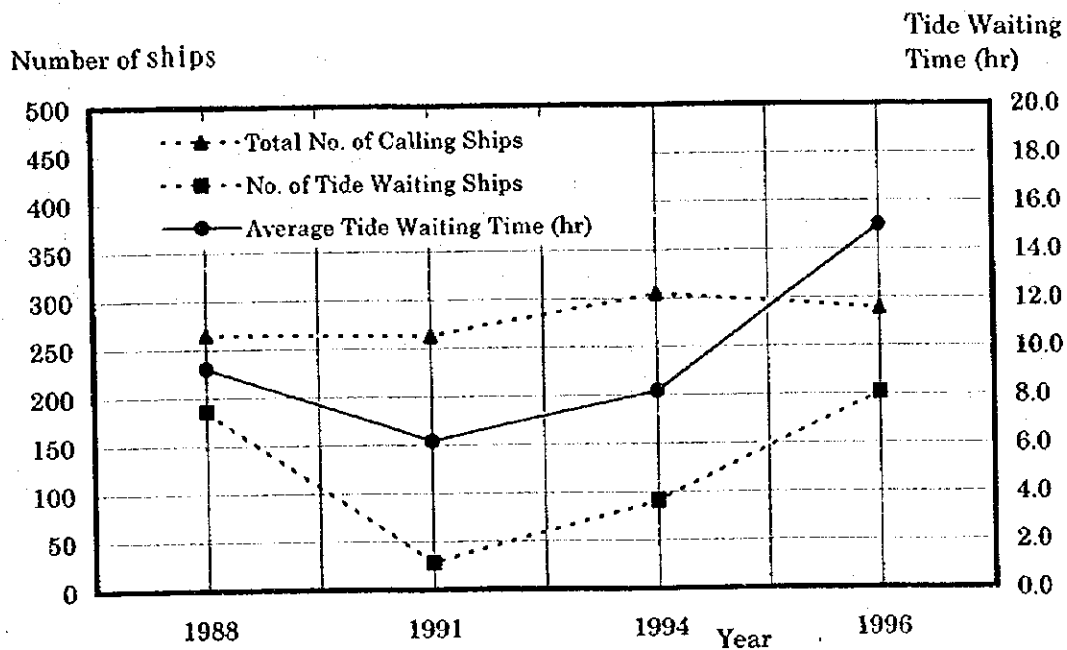


Figure 2.2.2-16 Average Tide Waiting Time of Arrival Ships from 1988 to 1996

**Table 2.2.2-10 Average Tide Waiting Time of Arrival Ships in 1988**

Year: 1988

Type of Ship	No. of Arr. Ship	Tide Waiting		Night Waiting		Other Reasons		Total Waiting	
		No.	Time (hr)	No.	Time (hr)	No.	Time (hr)	No.	Time (hr)
Tanker	53	46	14.8	28	7.2	37	98.8	57	79.7
Container	20	17	5.5	10	5.9	2	12.0	19	9.3
Dry Cargo	152	111	7.7	62	5.9	81	32.0	144	26.5
Others	40	12	7.0	19	7.2	18	10.4	29	14.1
Total	265	186	9.2	119	6.4	138	46.8	249	35.9

Arrival ships of draft deeper than 5 m

**Table 2.2.2-11 Average Tide Waiting Time of Arrival Ships in 1991**

Year: 1991

Type of Ship	No. of Arr. Ship	Tide Waiting		Night Waiting		Other Reasons		Total Waiting	
		No.	Time (hr)	No.	Time (hr)	No.	Time (hr)	No.	Time (hr)
Tanker	61	17	6.7	28	7.2	49	72.0	57	67.3
Container	30	1	5.0	6	7.4	25	38.2	25	39.7
Dry Cargo	136	10	5.4	51	8.0	117	44.0	124	45.0
Others	36	0	0.0	12	0.0	15	0.0	18	0.0
Total	263	28	6.2	97	7.8	206	47.3	224	47.4

Arrival ships of draft deeper than 5 m

**Table 2.2.2-12 Average Tide Waiting Time of Arrival Ships in 1994**

Year: 1994

Type of Ship	No. of Arr. Ship	Tide Waiting		Night Waiting		Other Reasons		Total Waiting	
		No.	Time (hr)	No.	Time (hr)	No.	Time (hr)	No.	Time (hr)
Tanker	56	38	9.0	25	6.3	45	60.0	54	59.2
Container	134	15	7.1	70	5.5	97	11.6	112	14.5
Dry Cargo	106	38	7.8	52	5.7	77	49.7	97	45.5
Others	9	0	0.0	5	5.9	7	8.0	7	12.3
Total	305	91	8.2	152	5.7	226	34.1	270	34.5

Arrival ships of draft deeper than 5 m

**Table 2.2.2-13 Average Tide Waiting Time of Arrival Ships in 1996**

Year: 1996

Type of Ship	No. of Arr. Ship	Tide Waiting		Night Waiting		Other Reasons		Total Waiting	
		No.	Time (hr)	No.	Time (hr)	No.	Time (hr)	No.	Time (hr)
Tanker	60	48	18.8	21	9.8	22	58.6	53	44.5
Container	143	85	5.8	42	6.8	32	19.8	105	13.5
Dry Cargo	85	68	23.9	24	8.8	56	74.6	74	79.4
Others	1	1	3.8	1	8.5	0	0.0	1	12.3
Total	289	202	15.0	88	8.1	110	55.5	233	41.4

Arrival ships of draft deeper than 5 m

(at anchorage only excluding waiting time at berth)

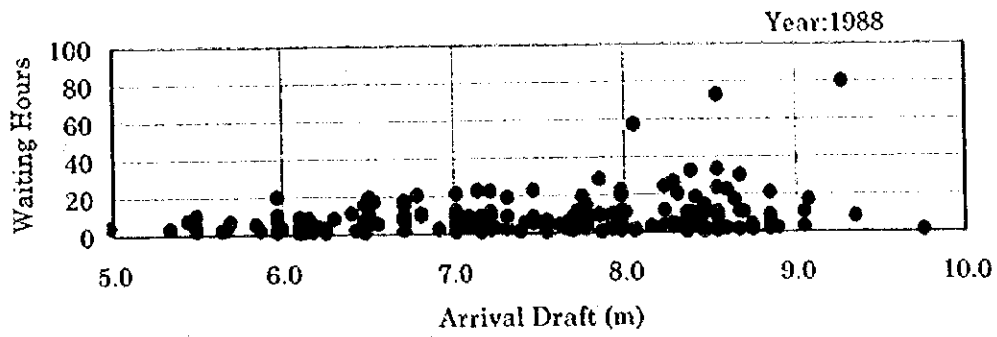


Figure 2.2.2-17 Tide Waiting Time and Arrival Draft Distribution 1988

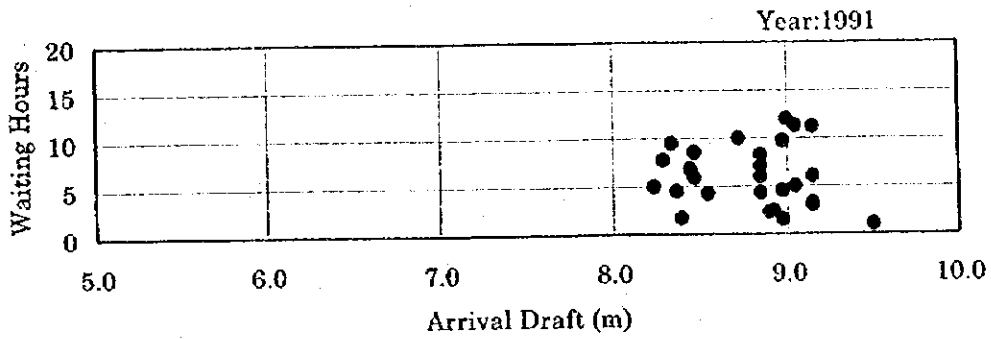


Figure 2.2.2-18 Tide Waiting Time and Arrival Draft Distribution 1991

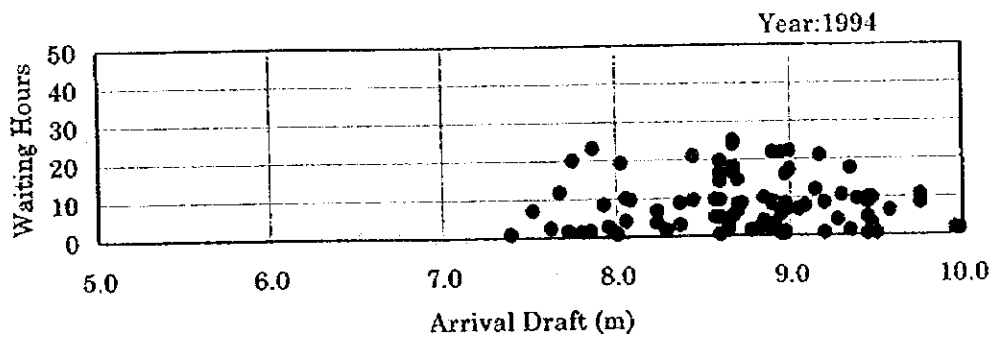


Figure 2.2.2-19 Tide Waiting Time and Arrival Draft Distribution 1994

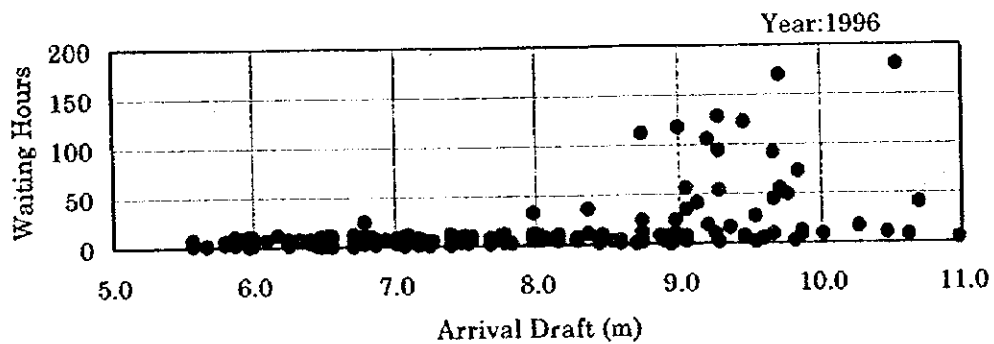


Figure 2.2.2-20 Tide Waiting Time and Arrival Draft Distribution 1996

**Table 2.2.2-14 Arrival Draft of Calling Ships from 1988 to 1996**

Arrival Draft (m)	1988	1991	1994	1996
11.0>Draft $\geq$ 10.5	.	.	.	7
10.5>Draft $\geq$ 10.0	.	.	2	9
10.0>Draft $\geq$ 9.5	2	2	14	25
9.5>Draft $\geq$ 9.0	6	18	36	36
9.0>Draft $\geq$ 8.5	33	34	42	30
8.5>Draft $\geq$ 8.0	34	41	19	27
8.0>Draft $\geq$ 7.5	40	39	30	44
7.5>Draft $\geq$ 7.0	43	33	63	63
7.0>Draft $\geq$ 6.5	25	30	45	26
6.5>Draft $\geq$ 6.0	30	12	29	12
6.0>Draft $\geq$ 5.5	31	23	19	14
5.5>Draft $\geq$ 5.0	21	30	6	18
5.0>Draft $\geq$ 4.5	21	41	17	14
4.5>Draft $\geq$ 4.0	76	77	42	13
4.0>Draft $\geq$ 3.5	40	35	31	14
3.5>Draft $\geq$ 3.0	20	14	9	5
3.0>Draft $\geq$ 2.5	17	26	12	5
2.5>Draft $\geq$ 2.0	7	25	7	2
Total	446	480	423	364

**Table 2.2.2-15 Cargo Handling Time by Ship Type**

Year: 1996

Draft (m)	Average Cargo Handling Time (hr)			
	Tanker	Container	General C.	Bulk
Draft<6.0	-	23	48	90
6.0 $\leq$ Draft<7.0	15	32	48	131
7.0 $\leq$ Draft<8.0	20	33	72	149
8.0 $\leq$ Draft<9.0	21	36	72	149
9.0 $\leq$ Draft<10.0	23	38	90	216
10.0 $\leq$ Draft	25	-	-	250
Total Average	21	34	69	159

### 2.2.3 Cargo Handled

Statistics of cargo handled at Beira Port during the period from 1986 to 1996 are summarized in Table 2.2.3-1 and a trend of fluctuation of cargo handling volume is illustrated in Figure 2.2.3-1. Container traffics through Beira Port including transit containers of the hinterland countries are given in Table 2.2.3-2.

Since the implementation of the BPTS projects such as the construction of the New Container Terminal and relevant cargo handling facilities have become effective, the cargo handling capacity has improved significantly and cargo traffics rose sharply from 1,704 thousand metric tons in 1991 to 2,392 million metric tons in 1992 and to 2,638 thousand metric tons in 1993, including oil products. In the last 5 years, the trend of the total tonnage including oil products has shown a steady increase with slight fluctuation around the level of 2.5 million metric tons. In particular, the transit import and export traffics excluding a drought relief, show a sharp increase after the completion of the BPTS projects. According to the statistics of handling cargo at Beira Port, most of the recently increased cargo is distinctly attributable to the increase of transit cargoes from and to the hinterland countries.

The remarkable features of cargoes handled at Beira Port are summarized as follows:

- (1) Most of the cargo handled at Beira Port is international traffic. The domestic cargo by cabotage accounts for only 2 % of the total cargo.
- (2) Transit cargo is predominant and takes up more than 80 % of the total cargo handled at the Port. Most transit cargo is to and from Zimbabwe.
- (3) More than 50 % of the total cargo consists of oil products

The breakdown of the transit cargoes through Beira Port to the hinterland countries as well as a commodity except oil products are shown in Table 2.2.3-3 and Figure 2.2.3-2.

The main commodities exported from Zimbabwe are tobacco, cotton, coffee, maize and granite. The coal export amounting to 70.3 thousand metric tons was recorded in 1996. Regarding the import products, fertilizers and food products such as maize, rice and soya are predominant. The imported oil products accounted for 919.3 thousand tons in 1996.



Commodity types of the consisting transit cargoes from and to Malawi are almost as same as those from Zimbabwe. Copper produced in Zambia is exported through Beira Port.

The railway traffic statistics of Beira Railway Station by hinterland country with commoditywise except oil products are shown in Table 2.2.3-4. 90 % of the transit cargo to and from the hinterland countries except oil products is transported by railway. National traffic transported by railway was amounted to 71,400 metric tons in 1996, occupying only 6 % of the total traffic of 1,179.3 thousand metric tons handled at Beira Station.

Table 2.2.3-1 Statistics of Cargo Handled at Beira Port

Year	Cargo in 1,000 metric ton										
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
A. Transit											
* Export	101.0	237.0	241.5	274.0	350.3	252.1	209.3	411.6	576.3	365.3	595.0
* Imports excl. POL (Drought Relief incl.)	52.0	81.0	106.6	181.9	192.9	140.6	786.5 (670.0)	746.9 (370.0)	473.8	598.9 (102.7)	645.9 (20.2)
Total excl. POL	153.0	318.0	348.1	455.9	543.2	392.7	995.8	1,158.5	1,050.1	964.2	1,240.9
* POL Imports	585.0	695.0	734.7	837.0	896.0	904.5	945.3	990.3	1,070.9	1,005.3	1,005.2
TOTAL	738.0	1,013.0	1,082.8	1,292.9	1,439.2	1,297.2	1,941.1	2,148.8	2,121.0	1,969.5	2,246.2
B. Mozambique International Trade											
* Export	22.0	18.0	29.4	23.5	21.3	41.9	19.0	25.0	24.7	64.3	57.8
* Imports excl. POL	84.0	131.0	177.8	189.0	155.8	158.3	284.3	284.1	162.2	279.5	162.0
Total excl. POL	107.0	147.0	207.2	212.5	177.1	200.2	303.3	309.1	186.9	348.8	219.9
POL Imports	52.0	63.0	64.6	88.5	54.9	79.4	66.6	86.1	103.7	121.6	84.4
Total	159.0	211.0	271.8	301.0	232.0	279.6	369.9	395.2	290.6	465.4	304.2
C. Mozambique National Trade											
Cabotage	117.0	138.0	161.9	161.1	157.6	127.3	81.3	93.5	53.1	53.3	52.9
A + B + C											
Total	1,014.0	1,362.0	1,516.5	1,755.0	1,828.8	1,704.1	2,392.3	2,637.5	2,464.7	2,488.2	2,603.3
TOTAL, excl. POL	377.0	604.0	717.2	829.5	877.9	720.2	1,380.4	1,561.1	1,290.1	1,361.3	1,513.7

Source: Final Progress Report, Beira Corridor Authority

\* Average weight per TEU calculated at 10 tons.

\* Cabotage: Coastal traffic

Table 2.2.3-2 Statistics of Container Traffic through Beira Port

(Unit: TEU)

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
A. Transit	3,053	6,989	8,163	9,659	9,647	7,627	10,760	21,930	23,180	21,315	24,596
* Export			5,259	6,537	6,364	5,081	8,575	14,871	14,816	14,365	15,649
*Import			2,904	3,122	3,283	2,546	2,185	7,059	8,364	6,950	8,947
B. Moz. Inter. Traffic	1,854	3,093	2,425	2,840	3,306	3,399	3,392	2,387	2,583	2,497	3,357
* Export			228	459	374	400	316	503	896	420	567
*Import			2,197	2,381	2,932	2,999	3,076	1,884	1,714	2,077	2,790
C. Empty Containers	n/a	n/a	3,480	3,629	2,665	2,815	2,311	2,693	2,965	3,434	5,883
D. Moz. National Traffic	...	...	1,211	1,778	1,485	1,263	1,167	298	119	127	39
*Full Container	...	...	871	1,515	1,227	1,114	1,003	247	105	113	33
*Empty Container	...	...	340	263	258	149	164	51	14	14	6
A+B+C+D	4,907	10,072	16,279	17,906	17,103	15,104	17,630	27,308	28,847	27,373	33,875
A+B+D excl. Empties			11,799	14,277	14,438	12,289	15,319	24,615	25,882	23,939	27,992
Containers in Transit TEU's											
Zimbabwe Exports:											
Cotton	...	...	1,365	2,199	1,334	582	500	1,027	778	1,316	1,462
Asbestos	...	...	1,438	1,188	949	433	355	395	...	8	4
Tobacco	...	...	598	1,214	1,862	2,308	6,143	9,448	7,452	5,943	5,819
Coffee	...	...	428	282	769	708	447	194	239	537	296
Tea	...	...	340	478	376	356	165	425	484	416	414
Extracts	...	...	107	302	400	299	237	239	271	193	258
Peanuts	...	...	60	...	17	7	...	...	...	...	...
Miscellaneous	...	...	748	604	347	376	552	1,103	1,376	1,452	1,977
Empties	...	...	2	...	...	...	120	8	208	...	...
Total, Zimbabwe Export	2,118	4,796	5,086	6,267	6,054	6,069	8,519	12,839	10,808	9,865	10,230
Import not Separable on Countries			...	...	...	...	...	5,916	5,796	2,554	1,857
Zimbabwe Imports	902	1,986	2,991	3,006	3,062	2,450	2,391	893	1,695	2,433	3,251
Malawi Export /Import	33	203	34	340	271	2	194	2,058	4,667	6,153	8,688
Tobacco Export	...	...	...	...	...	...	...	1,383	1,701	2,645	3,651
Tea Export	...	...	...	...	...	...	...	147	1,293	1,151	1,282
Coffee Export	...	...	...	...	...	...	...	41	128	72	43
Miscellaneous Export	...	...	...	...	...	...	...	166	479	505	486
Import	...	...	...	...	...	...	...	321	1,066	1,780	3,326
Botswana Export /Import	...	4	5	30	60	72	4	5	59	18	1
Zambia Export /Import	...	...	147	16	200	34	90	315	706	287	569
TOTAL TRANSIT	3,053	6,989	8,263	9,659	9,647	7,627	11,198	22,026	23,731	21,310	24,596

Source: Final Progress Report, Beira Corridor Authority

Table 2.2.3-3 Statistics of Transit Cargo through Beira Port

(Cargo in 1,000 metric ton)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
<b>Export</b>									
1. Zimbabwe	125.2	145.4	233.0	199.8	169.2	334.8	480.7	283.0	451.8
Asbestos	38.6	31.8	25.5	14.1	6.3	6.5	0.0	0.0	0.0
Citrus	---	---	---	---	---	---	---	---	2.2
Coal	---	---	---	---	---	---	---	---	70.3
Coffee	7.2	5.3	14.0	11.9	8.4	2.9	3.4	9.1	5.4
Cotton	14.8	26.4	14.7	5.4	4.3	11.3	9.3	16.2	18.3
Extractos	4.6	5.5	5.4	4.4	4.2	4.1	5.2	3.5	5.4
Feeding stuff	15.3	---	1.5	20.4	---	---	---	---	---
Granite	---	---	---	---	---	36.5	52.8	68.9	80.0
Graphite	---	---	---	---	---	---	---	1.5	0.1
Maize	3.9	17.9	107.3	72.8	---	84.1	261.0	4.5	132.6
Sawn wood	---	---	---	---	---	42.3	23.5	16.2	6.1
Steel	3.3	18.5	16.0	4.2	15.5	14.5	0.2	0.7	5.9
Tea	3.6	4.7	3.2	3.9	2.0	4.7	5.7	4.4	4.6
Tobacco	7.7	15.4	18.5	25.6	63.4	105.3	78.5	62.3	66.6
Vermiculite	---	---	---	---	---	---	---	11.9	10.2
Wheat	---	---	---	---	---	---	---	42.0	19.4
Wood, logs	---	---	---	---	---	---	---	9.3	0.0
Other Products	26.2	19.9	26.9	37.1	65.1	22.6	41.1	32.5	24.7
2. Malawi	33.6	27.6	40.1	21.5	10.9	18.6	49.4	57.3	98.0
Coffee	---	---	---	---	---	0.7	2.0	1.3	0.7
Tea	---	---	---	---	---	1.6	13.6	12.9	14.8
Tobacco	---	---	---	---	---	14.5	18.2	23.1	33.1
Cotton	---	---	---	---	---	---	---	1.8	1.1
Sugar and other	---	---	---	---	---	1.8	15.6	18.2	48.3
3. Zambia	82.7	101.0	76.9	30.9	29.1	56.5	46.3	25.0	45.2
Copper and other	82.7	101.0	76.9	30.9	29.1	56.5	46.3	25.0	45.2
4 Others	---	---	---	---	---	1.7	---	---	---
<b>Total Exports</b>	<b>241.5</b>	<b>274.0</b>	<b>350.0</b>	<b>252.2</b>	<b>209.2</b>	<b>411.6</b>	<b>576.4</b>	<b>365.3</b>	
<b>Imports excl. POL</b>	<b>106.6</b>	<b>181.9</b>	<b>192.9</b>	<b>140.4</b>	<b>786.5</b>	<b>746.9</b>	<b>473.8</b>	<b>598.8</b>	<b>645.9</b>
Import cont.-not separable	---	---	---	---	---	90.0	85.0	0.0	0.0
0. Drought Relief	---	---	---	---	670.0	370.0	0.0	102.7	20.2
1. Zimbabwe	92.7	98.0	130.6	110.3	103.0	226.2	218.2	443.0	479.5
Fertilizer	---	---	---	---	---	85.6	108.1	52.5	99.7
Maize	---	---	---	---	---	---	---	15.2	58.4
Rice	---	---	---	---	---	24.3	14.4	28.3	17.6
Soya	---	---	---	---	---	0.0	10.1	47.6	0.0
Steel	---	---	---	---	---	---	---	8.5	0.0
Wheat	---	---	---	---	---	52.6	54.8	225.4	242.7
Other Products	---	---	---	---	---	63.7	30.8	65.5	61.0
2. Malawi	0.1	6.4	9.1	5.5	13.0	29.7	91.1	46.5	130.9
Fertilizer	---	---	---	---	---	22.8	8.5	19.3	48.1
Maize	---	---	---	---	---	0.0	44.4	3.8	16.3
Sugar	---	---	---	---	---	0.0	12.0	0.0	0.0
Wheat	---	---	---	---	---	---	---	---	22.2
Other Products	---	---	---	---	---	6.9	26.2	23.4	44.3
3. Zambia	12.0	77.1	47.3	18.2	0.1	28.9	78.1	6.0	15.3
Fertilizer	---	---	---	---	---	27.5	57.5	0.0	0.0
Meize	---	---	---	---	---	---	---	---	7.8
Rice	---	---	---	---	---	0.0	2.1	1.0	0.5
Wheat	---	---	---	---	---	0.0	10.5	2.7	0.0
Other Products	---	---	---	---	---	1.4	8.0	2.3	7.0
4. Botswana	1.8	0.4	5.9	6.4	0.4	1.7	1.5	0.7	0.0
<b>POL Imports</b>									
1. Zimbabwe	734.7	837.0	893.0	904.5	945.3	990.3	1,070.9	986.4	919.3
2. Malawi	---	---	3.0	---	---	---	---	18.9	86.0
<b>Total Imports</b>	<b>841.3</b>	<b>1,018.9</b>	<b>1,088.9</b>	<b>1,044.9</b>	<b>1,731.8</b>	<b>1,737.2</b>	<b>1,544.7</b>	<b>1,604.1</b>	<b>1,651.2</b>

Source: Final Progress Report, Beira Corridor Authority

Table 2.2.3-4 Statistics of Railway Traffic at Beira Station

(Cargo in 1,000 metric ton, net)

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Transit Traffic "Up"											
Salt	---	---	---	8.2	---	---	---	---	---	---	---
Maize	---	---	---	---	---	---	327.8	201.0	0.9	16.5	68.8
Mapira	---	---	---	---	---	---	---	---	---	16.7	---
Beans	---	---	---	---	---	---	---	---	---	62.8	0.4
Rice	---	---	---	2.2	10.4	---	8.7	16.5	21.8	22.3	16.8
Wheat	---	---	---	---	---	---	26.7	56.0	61.0	231.3	157.4
Tallow	---	---	5.7	4.3	5.2	6.6	6.8	4.4	2.5	0.0	0.0
Wood Pulp	---	---	2.9	2.6	0.5	2.0	0.8	---	---	---	---
Fruit Pulp	---	---	---	---	---	---	---	---	---	2.1	0.1
Asphalt (in drums)	---	---	16.9	10.6	22.3	15.4	---	5.5	---	---	---
Fuel (in wagons)	---	---	1.4	2.3	0.8	12.1	3.0	7.7	10.2	12.5	2.3
Steel	---	---	7.1	7.0	2.6	1.3	3.5	1.2	0.2	8.6	0.3
Sodium	---	---	12.3	8.5	9.7	6.4	1.1	3.4	---	---	0.0
Fertilizer	---	---	13.5	55.9	50.8	54.0	21.4	88.9	126.0	56.4	93.2
Containers	---	---	36.7	39.4	48.4	44.2	38.3	49.3	48.7	50.9	52.5
Cotton	---	---	---	---	---	---	9.8	---	1.1	14.0	4.0
Sugar	---	---	---	---	---	---	---	11.0	5.0	0.0	2.6
Soya	---	---	---	---	---	---	---	---	7.6	0.0	0.0
Vehicles	---	---	---	---	---	---	---	---	---	0.3	0.0
Other Products	---	---	13.5	36.5	47.7	31.0	69.1	39.7	12.2	7.9	56.0
Total "Up"	54.6	95.0	110.0	177.5	198.4	173.0	517.0	484.8	297.2	492.3	459.4
Transit Traffic "Down"											
Maize	---	---	28.6	43.5	172.9	114.2	0.6	99.6	190.0	19.9	132.0
Sugar	---	---	29.5	23.3	32.8	17.9	10.3	0.3	1.1	2.9	8.8
Clinker	---	---	---	---	---	---	---	---	---	35.1	25.2
Cotton	---	---	13.7	20.8	9.8	2.2	0.9	4.1	3.3	10.3	19.3
Coal for CFM- C	---	---	---	16.2	20.9	19.5	11.5	2.6	4.3	5.4	73.8
Wattle	---	---	5.0	5.0	1.7	5.0	4.7	3.8	3.3	4.1	5.5
Wheat	---	---	---	---	---	---	---	---	---	42.6	83.8
Stones	---	---	20.8	13.6	6.7	111.0	3.9	44.9	4.9	0.4	6.8
Steel	---	---	0.2	18.3	19.5	---	20.5	12.0	0.1	0.0	15.0
Copper	---	---	78.2	86.9	34.6	8.7	3.2	11.1	4.1	10.6	26.6
Asbestos	---	---	28.6	30.0	35.2	5.8	7.3	6.1	1.8	0.1	0.1
Wood, Logs	---	---	13.7	---	---	---	---	29.8	25.7	14.8	0.0
Sawn Wood	---	---	---	---	---	---	---	---	---	3.1	5.0
Containers	---	---	34.7	42.9	56.0	59.4	90.8	153.5	115.7	101.0	129.2
Granite	---	---	30.5	18.5	63.1	56.3	78.8	57.6	36.5	32.7	86.9
Other Products	---	---	---	---	---	---	---	59.8	52.0	79.8	30.5
Total "Down"	2,315.0	302.0	283.5	319.0	452.2	300.0	232.5	485.2	442.8	362.8	648.5
Inter. Traffic, Total	---	---	393.5	496.5	650.6	473.0	749.5	970.0	740.0	855.1	1,107.9
National Traffic	84.9	83.5	92.8	153.4	199.5	226.1	97.4	59.4	53.4	119.1	71.4
Grand Total	317.0	480.5	486.3	649.9	850.1	699.1	846.9	1,029.4	793.4	974.2	1,179.3

Source: Final Progress Report, Beira Corridor Authority

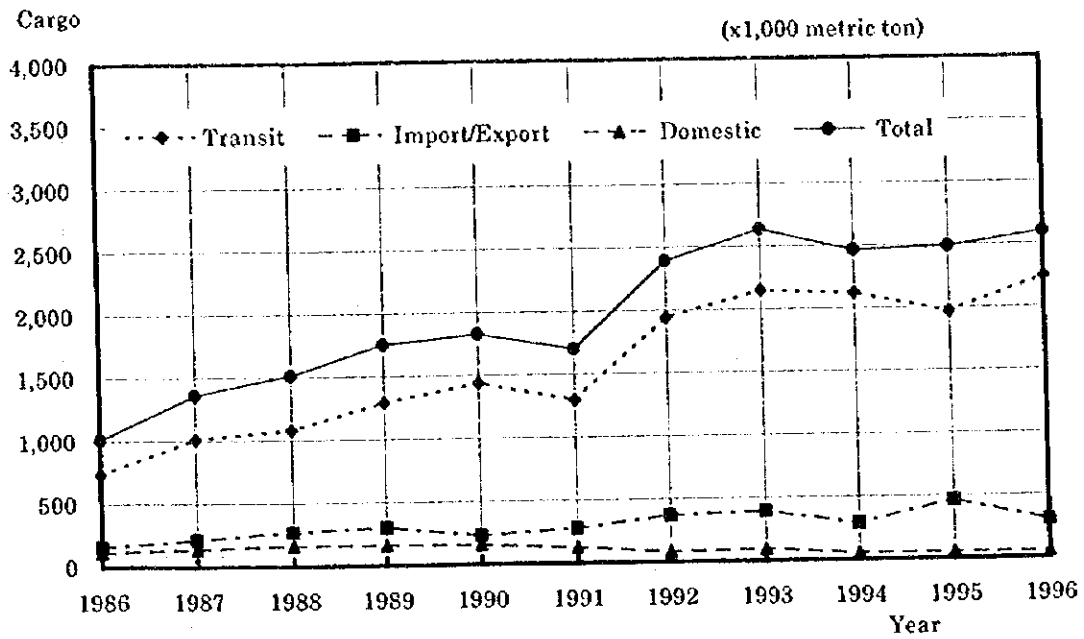


Figure 2.2.3-1 Cargo Handled at Beira Port

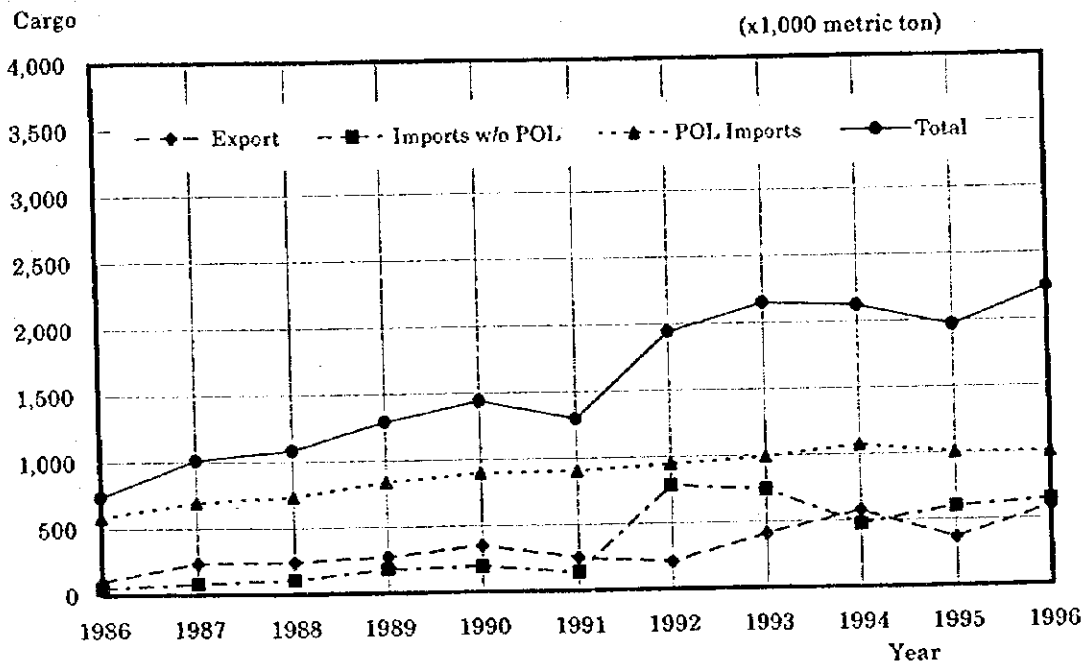


Figure 2.2.3-2 Transit Cargo through Beira Port

## **2.2.4 Cargo Handling Operations**

### **(1) Container Terminal**

Containers are loaded and unloaded by gantry cranes alongside Quays 2 to 5 and are moved to the container yard by tugmaster or chassis. For transferring containers to railway wagons, the rail mounted transfer crane located at the railway terminal in the container yard is used. In the container yard and the container freight warehouse, containers are handled by forklifts of adequate lifting capacity. The container yard has a sufficient area to stack empty and laden containers.

### **(2) General Cargo Terminal**

Electric cranes alongside the quay or mobile cranes are utilized for loading and unloading cargoes. Bulk cargoes transported alongside the quays by railway wagons are directly loaded onto the ships by shore-side cranes.

### **(3) Oil Terminal**

Loading and unloading of petroleum products are shifted mostly from Quay 11 to Quay 12 at the New Container Terminal. Petroleum products such as fuel, diesel, jet oil and petrol are discharged from a tanker berthing alongside the quay at the New Oil Terminal and transferred to the tank farm through pipelines corresponding to each oil product.

## 2.2.5 Operation and Management

Owing to the Administrative Reform of the Government of Mozambique since January 1<sup>st</sup>, 1989, the administrative function of Mozambican ports and railways was separated from MTC (Ministry of Transport and Communications) and CFM (Empresa Nacional de Portos e Caminhos de Ferro de Mozambique E.E.) as a state enterprise was established. Since then, fitting to the movement to establish new public company on another division, the law to establish new public company was decided at the Council of Ministers on September 20<sup>th</sup>, 1994 and new CFM (Empresa de Portos e Caminhos de Ferro de Mozambique E.P.) was established. The present Organization Chart of MTC and CFM are shown in Figures 2.2.5-1 and 2.2.5-2.

On January 1<sup>st</sup>, 1995, CFM was established as a public company, as a collective person under the public law, with its own legal status and administrative and patrimonial autonomy. The document published in the official gazette, the Boletim de Republica, First series, No 36, of September 13<sup>th</sup>, 1994, stresses the important role of CFM in developing the national and regional economies, in raising money, both in local and foreign currencies, in the railway transport of people and goods, and in the handling of cargo.

"An important vehicle in the consolidation of national unity", CFM's performance structures society, since it is through its services that "the circulation of citizens and the transport of goods" is facilitated. This restructuring aims essentially at achieving "a better administrative and management capacity, which is the condition for dealing with a highly competitive market and adjusting to the demands of the users of Mozambican ports and railways".

The CFM management bodies are the Administration Council (CA) as the Board of Management and the Fiscal Council. The CA consists of seven members, one of who is the chairman. The chairman of the CA is appointed by the Council of Ministers, while the others are appointed by the Ministry of Transport and Communications. One is proposed by the Finance Ministry, one is an elected representative of the workforce, and the other four are proposed to the Transport Ministry by the chairman of the CA.



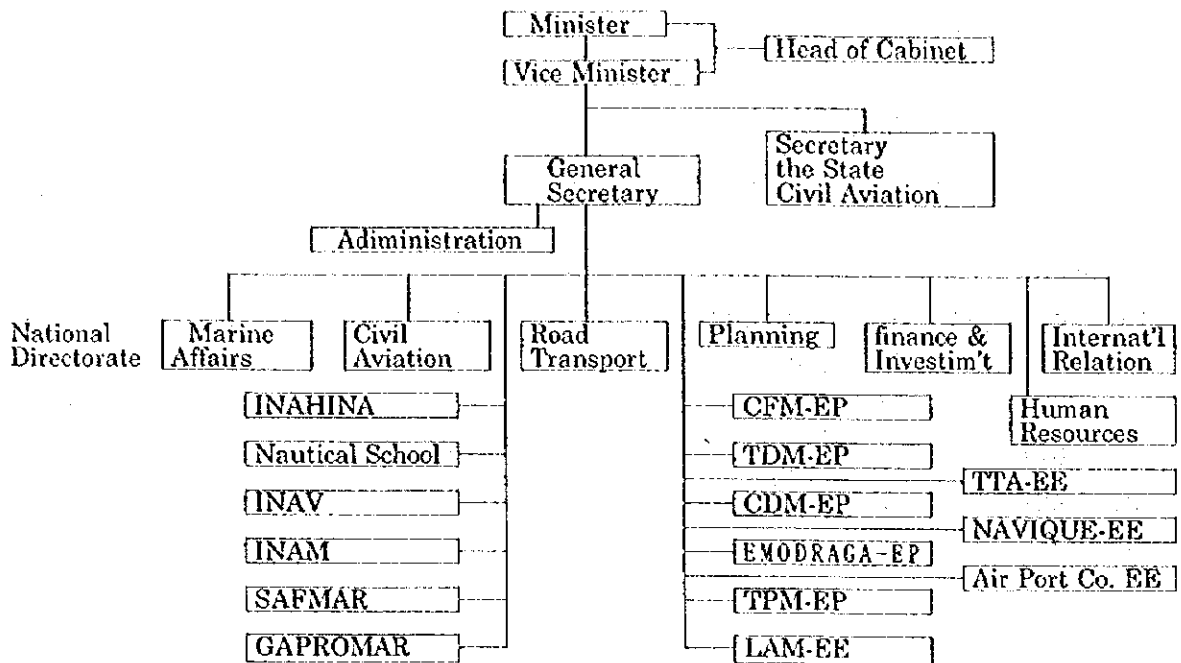


Figure 2.2.5-1 Organization Chart of Ministry of Transport and Communications

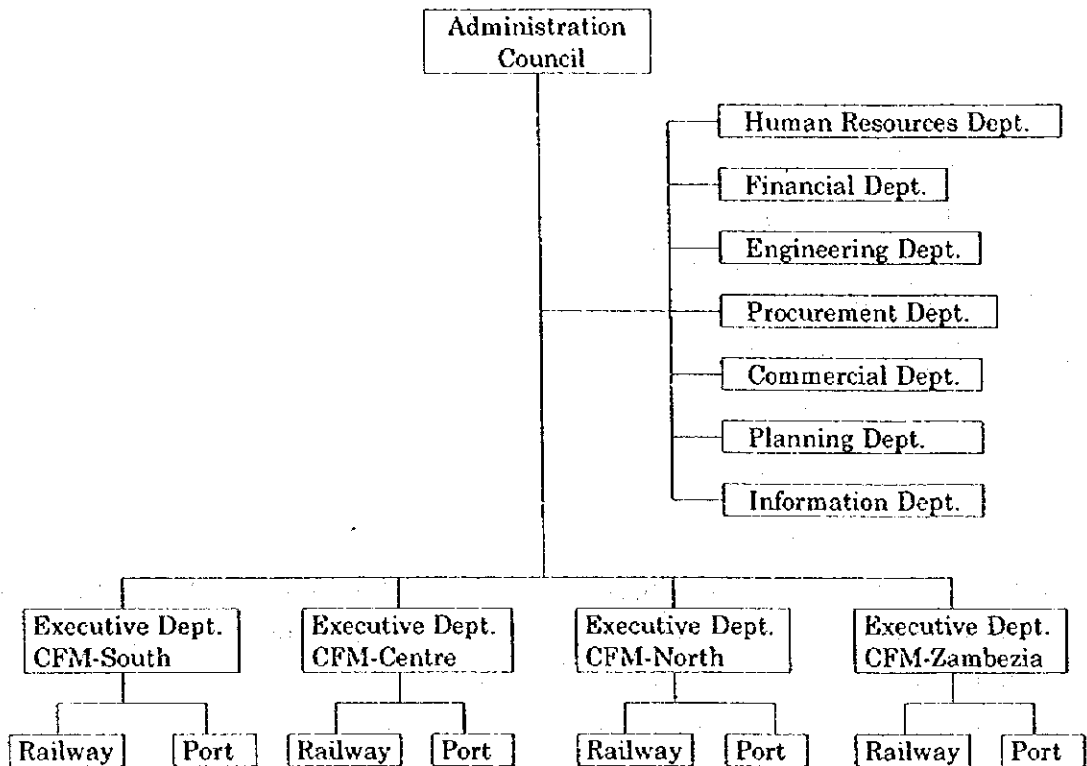


Figure 2.2.5-2 Organization Chart of CFM

The CA draws up CFM management policies, discusses and votes on plans of activity, as well as the balance sheets and accounts of the previous year, which it then submits to higher appreciation; it also discusses and votes on norms concerning staff and their status.

Coordinating the entire activity of the company, giving top level guidance to its services, and managing everything concerned with it are also tasks of the CA. It is part of the CA's sphere of competence to appoint and dismiss Executive Directors and their assistants, to decide on opening or closing commercial offices abroad, as well as appointing and dismissing commercial representatives.

One of the most important aspect is the Contract-Programme, agreed for a minimum of three years between the government and CFM. The Contract-Program defines: the strategic guidelines for the company; the overall goals of the tariffs charged for the company's services ; the company's main social, economic and financial indicators, such as the wages fund, and investments and financial requirements ; and subsidies to be granted from the state budget. The administrative function of transportation on the ports and railways of Beira Port is under CFM-C, one of the four executive departments under the CA. The organization chart of CFM-C is shown in Figure 2.2.5-3.

Table 2.2.5-1 shows the Change of Profit and Loss (P/L), such as Operational Revenue, Direct Cost (Salaries, Wages, Other Expenses) and Fixed Cost (=Depreciation Expense + Financial Interest etc.) in all CFM, CFM-C and Port section (Beira Port) of CFM-C during 1992-1996. The allocation of Expenses from CFM to EMO DRAGA during 1992-1996 is shown in Table 2.2.5-1. As shown the changeable Exchange Rate (meticals for US\$), the worth of local currency has fallen down and expenses have increased for 6 years. However, as the transit share of port cargo in Mozambique is more than 70 %, operational revenue accounting for most of the foreign currency generated, so that Marginal Profit (Operational Revenue - Direct Cost) have always been positive during 6 years and the financial management of CFM can be easy to be established against inflation. The Operational Loss in 1994 was caused by the rehabilitation after the War whose costs amounted to US\$ 2.5 billion. Only in CFM, the war that devastated the country until 1922 destroyed infrastructures and movable materials equivalent to US\$ 2.5 billion and contributed to the high debt of Mozambique and making the company unprofitable. As shown in Figure 2.2.5-5,

the fixed cost is increased after 1993 and the administration in the finance of every sector become profitable after 1995. As a result, the rate of Marginal Profit rose to 67.7 % in the Port Section of CFM-C at Beira Port.

Organization Chart of EMODRAGA, the public company as same as CFM, is shown in Figure 2.2.5-4. The Board of Management of EMODRAGA consists of five members, one of whom is the chairman. The chairman of the Board is appointed by the Council of Ministers, while the others are appointed by MTC. One is proposed by the Finance Ministry, one is an elected representative of the workforce, and the other two are proposed to MTC by the chairman of the Board.

The personnel by department of EMODRAGA in 1997 is shown in Table.2.2.5-2. The total personnel is 213 employees consisting of 109 persons in head office in Beira and 104 persons in branch office in Maputo. 109 employees of head office consist of 1 as managing director (the chairman of the Board), 35 of Production Division, 40 of Maintenance Division and 23 of Administration Division. 104 employees of branch office consist of 1 director (the member of the Board), 60 of Dredging department, 27 of Naval Fleet department and 16 of Accounting and Finance department.

As the main task of EMODRAGA is to dredge the Access Channel, most of the total revenue depends on the expenditure of CFM. The agreement between the revenue of EMODRAGA and the expenditure of CFM in 1997 is shown in Table.2.2.5-3.

According to the Income Statement of EMODRAGA in 1992-1996 as shown in Table.2.2.5-4, income from CFM Agreement has increased from US\$ 913,254 (64.3 %) in 1992 to US\$ 2,175,988 (92.6 %) in 1996. The detail of the revenue and the expenditure of EMODRAGA in 1992-1996 is shown in Table.2.2.5-5. The Balance Sheet of all EMODRAGA as well as Beira Portion of EMODRAGA is shown in Table.2.2.5-6

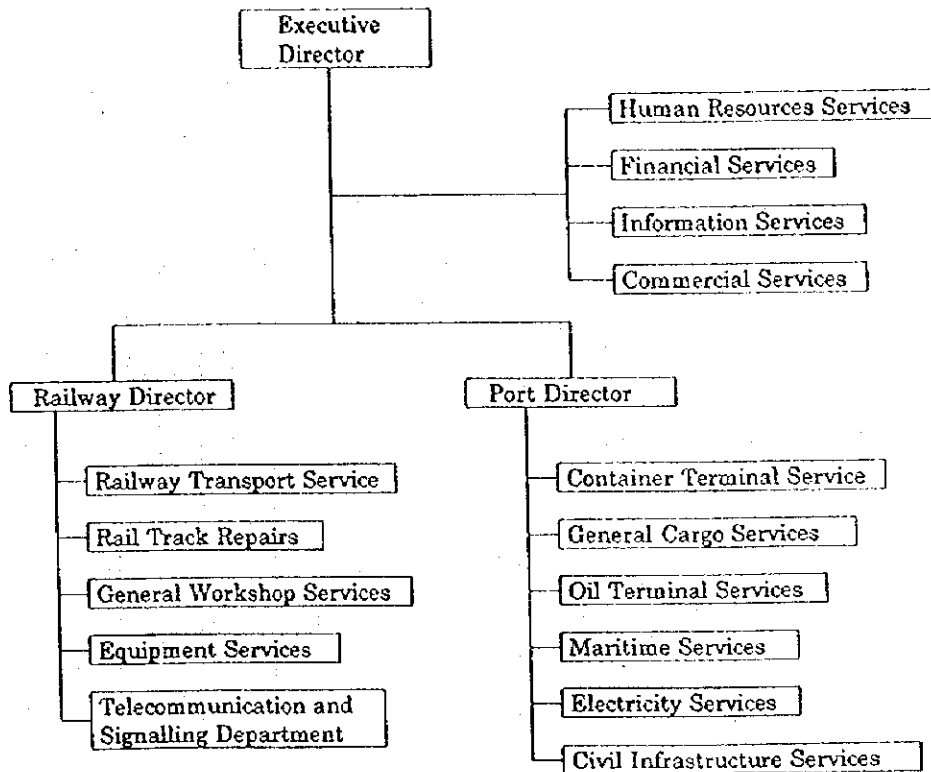


Figure 2.2.5-3 Organization Chart of CFM-C

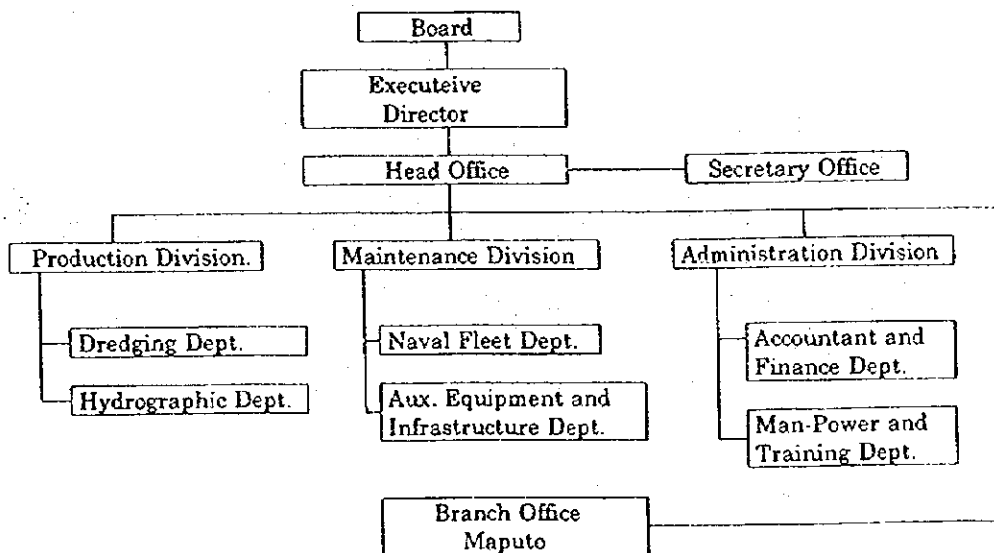


Figure 2.2.5-4 Organization Chart of EMODRAGA

Table 2.2.5-1 The Change of P/L (Operation Revenue, Expense, Profit) in CFM, CFM-C and Port Section of CFM-C during 1992-1996

	1992			1993			1994			1995			1996		
	ALL-CFM	CFM-C	PORT	ALL-CFM	CFM-C	PORT	ALL-CFM	CFM-C	PORT	ALL-CFM	CFM-C	PORT	ALL-CFM	CFM-C	PORT
(unit : billion metricals)															
(Cargo Volume of Beira Port; 1000 tons)			2,392.3			2,637.5			2,613.8			2,488.2			2,603.3
(A) Operational Revenue	213.9	110.8	76.7	295.4	161.9	94.3	467.4	220.9	110.0	950.7	293.8	205.9	1195.2	455.6	282.0
6.2 Salaries, Wages	41.0	15.3	6.1	71.1	30.4	12.2	109.9	42.6	17.0	161.8	75.0	30.0	173.5	80.4	32.2
6.8 Other expenses	63.9	28.7	8.1	125.6	60.6	18.1	221.1	88.2	19.5	309.6	127.2	25.9	355.2	148.1	58.8
(B) Total Direct Cost	104.9	44.0	14.2	196.7	91.0	30.3	331	130.8	36.5	471.4	202.2	55.9	528.7	228.5	91.0
(A-B) Marginal Profit	109.0	66.9	62.5	98.7	71.0	64.0	136.4	90.1	73.5	479.3	91.6	150.0	666.5	227.1	191.0
(C) Depreciation Expense	14.2	2.9	2.2	102.4	63.5	49.9	200.5	100.6	79.7	414.4	100.6	70.0	438.5	100.5	70.0
(D=A-B-C) Operational Profit	94.8	63.9	60.3	-3.7	7.5	14.1	-64.1	-10.5	-6.2	64.9	-9.0	80.0	227.9	126.5	121.0
E) Financial Revenue	5.7	2.7	2.1	34.2	8.2	6.4	10.5	4.1	2.2	53.9	34.5	24.0	61.9	34.5	24.0
F) Financial Expense	1.1	0.3	0.2	12.6	3.3	2.6	6.15	3.7	2.9	21.6	2.0	1.4	112.3	2.0	1.4
(G=D+E-F) Continuing Profit	99.4	66.3	62.2	17.9	12.4	17.9	-59.8	-10.1	-5.9	97.2	23.6	0.0	177.4	159.0	143.6
Exchange Rate (Metical for US\$)	2,432.4			3,722.70			5,918.10			10,785.0			11,230.0		
The Number of Regular Employee				18,159			18,738	6,914		18,500	5,435	2,170	18,000	5,580	1,977
The Number of Total Employee				23,700			31,348	11,759		28,500	11,650	4,651	27,000	11,423	4,047
Note : PORT= Port Section of CFM-C															
	1992			1993			1994			1995			1996		
CFM	ALL-CFM	CFM-C	Rate	ALL-CFM	CFM-C	Rate	ALL-CFM	CFM-C	Rate	ALL-CFM	CFM-C	Rate	ALL-CFM	CFM-C	Rate
(H) Expenses from CFM to EMODRAGA	2.2	0.892	0.0628	4.5			8.0			15.2	3.606	0.0645	24.4	7.352	0.0808
All-EMODR	Beira	(H/B)		All-EMODR	Beira	(H/B)	All-EMODR	Beira	(H/B)	All-EMODR	Beira	(H/B)	All-EMODR	Beira	(H/B)

Table 2.2.5-2 Personnel of EMODRAGA in 1997

(unit : person)

Organization of EMODRAGA E.P.		Numbers
	Dredging Dept.	26
	Hidographic Dept.	8
	Production Division[+Head 1]	35
	Naval Fleet Dept.	39
	Auxiliary Equipment & Infrastructure	0
	Maintenance Division[+Head 1]	40
	Accounting and Finance Dept.	8
	Man-Power, Training Dept.	14
	Administration Division[+Head 1]	23
	Head Office on Beira Port [+ Managing Director 1]	109
	Dredging Dept.	60
	Naval Fleet Dept.	27
	Accounting and Finance Dept.	16
	Branch Office on Maputo Port [+Director 1]	104
	<b>Total of EMODRAGA</b>	<b>213</b>

Table 2.2.5-3 Agreement between EMODRAGA & CFM in 1997

	Timing on Payment	CFM(Total)	CFM-S	CFM-C
1	Monthly Payment	43,000US\$	23,000US\$	20,000US\$
	(Direct Cost as fuel , dry dock)			
2	3 month Payment	165,000US\$	90,000US\$	75,000US\$
	(Material & Spare Parts)			
3	Fuel & Lubricating Oil	All pay	All pay	All pay
4	Dock	All pay	All pay	All pay

Table 2.2.5-4 Income Statement of EMODRAGA for 5 Years

(unit : US\$)

Accounts	Fiscal Year(from JAN, till DEC.)				
	1992	1993	1994	1995	1996
72. Income from CFM Agreement	913,254	1,196,174	1,346,095	1,406,892	2,175,988
721. Local Currency	776,320	989,188	736,075	618,999	1,656,609
7211 Monthly	538,563	510,919	424,798	420,955	487,979
7212 Dock Charges of Floating Units	28,840	98,857	70,598	36,755	609,595
7213 Fuel & Lubricating Oil	199,034	326,638	235,938	155,628	545,219
7214 Port Charges	9,383	6,422	4,741	5,221	13,817
7215 Various	501	46,351	0	440	0
722. Foreign Currency	136,934	206,986	610,020	787,894	519,379
7221 Import Fund	0	89,040	459,752	359,010	519,379
7222 Investment Fund	136,934	117,946	150,268	428,884	0
78. Other Revenue (Rent and Hire)	506,486	127,194	158,082	94,963	173,174
7811 Rent and Hire of Buildings	21,018	37,033	32,062	24,849	122,351
7812 Rent and Hire of Equipment	82,992	54,703	40,087	54,304	24,167
7813 Various	402,476	35,459	85,934	15,810	26,656
7. Total Revenues	1,419,740	1,323,368	1,504,178	1,501,855	2,349,162
Foreign Exchange Rate(metical/US\$)	2,432.40	3,722.70	5,918.10	10,785.00	11,230.00

(unit : meticals)

Table 2.2.5-5 Income Statement of EMODRAGA

Accounts	Fiscal Year(from JAN, till DEC.)				
	1992	1993	1994	1995	1996
72. INCOME from CFM Agreement	2,221,400,226	4,452,997,573	7,966,325,426	15,173,335,451	24,436,345,837
78. Other Revenue (Rent and Hire)	1,231,976,487	473,505,396	935,547,774	1,024,170,569	1,944,743,058
7. Total Revenues	3,453,376,713	4,926,502,969	8,901,873,200	16,197,506,020	26,381,088,895
621. Wages, Salaries	563,955,561	748,091,064	1,037,056,582	1,476,549,279	2,592,313,076
631. Water	5,821,146	5,634,068	14,875,647	16,427,689	23,526,277
632. Electricity	64,224,002	98,963,334	139,690,534	149,771,485	261,900,568
633(1) Fuel & Oil - CFM	371,384,695	997,562,300	1,459,586,167	1,740,768,077	5,671,678,144
633(2) Fuel & Oil - EMODRAGA	57,226,504	49,456,485	394,020,682	193,884,203	40,967,130
634. Tools & Utensils	26,629,838	24,165,258	23,699,712	44,664,476	90,120,327
635. Material & Spare Parts for Repair	292,223,423	681,928,567	520,432,196	3,741,625,042	2,389,595,943
636. Stationary	72,557,769	94,033,493	147,634,647	177,399,711	327,494,132
637. Material For Cleanliness & Security	44,542,032	42,006,070	89,513,905	131,721,211	132,452,553
638. Meal Supply for Floating Units, etc.	102,423,573	197,578,379	221,153,766	324,785,850	487,740,500
639. Other Purchase	185,840,753	18,042,443	103,128,008	188,085,133	205,669,071
641. Repaires and Transportation	742,636,743	685,951,666	1,514,684,485	4,119,245,693	1,395,778,238
643. Communication	86,939,388	106,761,852	132,445,573	178,361,076	316,311,417
647. Traveling, Accommodation and Allow	64,460,867	37,436,520	69,801,050	96,577,340	355,560,092
648. Announcement & Propaganda	2,503,354	2,207,884	7,895,500	7,962,368	22,983,900
649. Other Services	55,623,085	35,584,133	93,273,822	130,375,219	366,900,052
651. Financial Expenses	469,815	1,088,647	5,317,997	4,518,334	12,993,723
663. Import Duty	153,820,707.0	210,580,451.0	625,647,938.0	332,691,038	569,488,695
667. Other Taxes	21,672,861	38,884,724	145,583,632	136,182,655	218,587,724
671. Depreciation Cost		2,208,689,716	3,425,233,477	4,580,062,285	3,242,260,530
681. Rent & Hire	32,914,737	43,514,541	62,189,028	155,674,098	87,903,720
682. Insurance	43,210,024	71,740,407	114,170,614	96,965,733	115,151,364
684. Public Relations, Meal & Medicine	66,909,503	86,507,163	145,600,762	179,579,761	231,979,314
685. Miscellaneous	40,398,330	25,259,443	97,025,116	133,381,909	227,153,937
6. Total Expenditure	3,098,398,740	6,511,699,108	10,539,660,840	18,337,259,665	19,386,505,427
BALANCE(Revenue - Expenditure)	354,977,973	-1,585,196,139	-1,637,787,640	-2,139,753,645	6,994,583,468
Foreign Exchange Rate (metical/US\$)	2,432.40	3,722.70	5,913.10	10,785.00	11,230.00





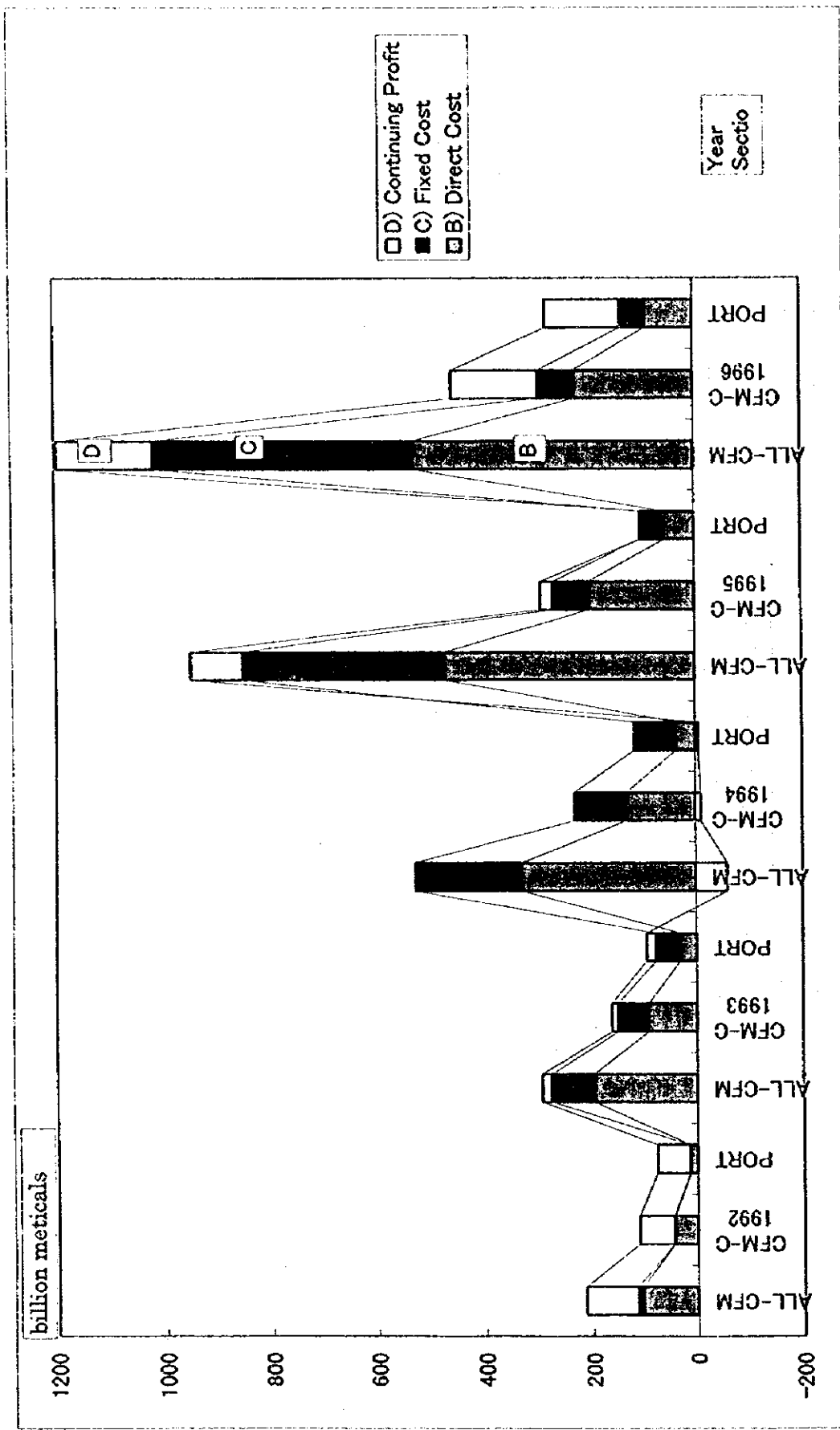


Figure 2.2.5-5 The Change of P/L in CFM, CFM-C and Port Section of CFM-C during 1992-1996

## 2.2.6 Problems and Constraints

The current situation and problems at Beira Port are outlined below.

### (1) Port Activities

Beira Port has been playing an important role in sea transportation not only for Mozambique but also for such land locked countries such as Zimbabwe, Malawi, Zambia, etc. Volume of port cargoes handled in Beira Port has increased by 5 % in 1996 from 1995 and the cargoes to/from the land locked countries show steady increase. The cargo handling capacity of the port is estimated at around 5 million freight ton with the existing port facilities as compared with 4 million freight ton handled in 1996. Maersk feeder vessels will start calling to Beira Port in 1997. The onshore port facilities and road/railway connection are in a comparatively better condition. To cope with an increasing traffic demand, improvement and repair of cargo handling equipment and railway facilities are being planned.

The rail and road connection to the land locked countries were seriously damaged by a heavy flood in Pungue valley in early 1997 and rehabilitation works are planned and implemented.

### (2) Siltation in the Access Channel

The major bottleneck of Beira Port has long been recognized as its shallow approach channel which is under serious siltation all the time. The existing channel to Beira Port was deepened to -8.0 m below CDL from the previous depth of -6.0 m below CDL under the contract PA-1 during the period from March, 1989 to August, 1990. Since then, no substantial maintenance dredging works have been carried out. The contract of maintenance dredging works was signed between CFM and EMODRAGA in 1996 and the works are expected to commence in 1997 when financial inputs from the Government have been arranged.

### (3) Present Condition of Channel Navigation

The existing channel has been silted to the depth of 4.8 m below CDL and the maximum draft of ship calling the port is limited to 10.3 m at present. This draft limitation leads to an eventual uneconomical arrangement of ship operators to use either a smaller ship with full cargoes or a large ship with part cargoes for shallower draft. According to interviews with major shipping agents in Beira, most of large ships have to wait for the high tide or are scheduled to arrive just before high tide to avoid otherwise unnecessary waiting time.

Night navigation is prohibited for ships larger than Loa 150 m and thus all the large ships have to navigate at daytime high tide on entering and leaving the port resulting in long waiting time.

With a very large tidal range of more than 6.0 m, the port narrowly receive ships without any major maintenance dredging work. However, if the channel is further silted, most of the shipping companies operating large vessels will divert them to other ports through consideration of transport economy and safety.

#### **(4) Dredging Fleet**

The existing dredging fleet of EMODRAGA are obsolescent and far below the capacity required to maintain the channel to the original design depth. Only one grab dredger is available in Beira Port. The trailing suction hopper dredger "Rovuma" mainly working in Maputo is difficult to mobilize to Beira due to her deteriorated condition and insufficient dredging capacity to be shared with the other ports. Necessity of maintenance dredging works has long been recognized but neither the contract dredging work nor the purchase of a dredger has been undertaken due to financial constraints.

#### **(5) Future Prospects**

After the recent stabilization of social security coupled with the restructuring of CFM, Beira Port is recovering the past prosperous economic activities with sharply increasing port cargoes in recent years. Cargoes to/from the land locked countries show remarkable increase and various facilities to handle them are planned in the port area. According to the cargo forecast conducted by SATCC, the volume of port cargo is expected to increase from 2.5 million ton in 1995 to 4.9 million ton in 2017. Thus, the existing silted channel has become an increasingly destructive constraint for a sound growth of Beira Port.

#### **(6) Marine Accidents**

Though navigation in the existing channel is somewhat tricky especially in periods of strong tidal current and inclement weather, no major marine accidents have been recorded except for the following.

Type of accident	Agrounding, towed back by two tug boats after 8 hours
Location	Southern channel slope at Macuti corner
Time	March 21 <sup>st</sup> , 1996, 3 hours after High Tide
Ship	Bulk Carrier; Al Qawiyu, 15,780 GRT, Loa 187 m

In the recent Beira Port Advisory Committee chaired by CFM and attended by about 40 port users, the maintenance dredging work was one of the major topics discussed and requested for urgent implementation.

**(7) On-board Inspection of the Channel**

The study team made an inspection of the channel on-board Tanker "Karibu" which is the current largest vessel calling the port on March 20<sup>th</sup>, 1997. Necessity of accurate time scheduling of channel navigation negotiating a high tide, tricky maneuvering at the bend due to insufficient depth and width of the channel and dense mud flow whirling up by propeller flow were noticed.

## **2.3 Dredging Activities**

### **2.3.1 Present Organization**

In 1980, EMODRAGA was established as an independent dredging service organization which was controlled directly by the Ministry of Transport and Communications.

In 1987, EMODRAGA's head office moved from Maputo to Beira where an administration office, workshops and spacious warehouses were already located.

To improve the efficiency of dredging services, EMODRAGA received technical and financial assistance from the Netherlands following an agreement signed by both Governments, Mozambique and Netherlands, in 1982.

In May 1989, the Government of Mozambique transferred the ownership and management responsibilities of the port and railway division to "Portos Ecaminhos De Ferro De Mozambique EP (CFM)" State Enterprise.

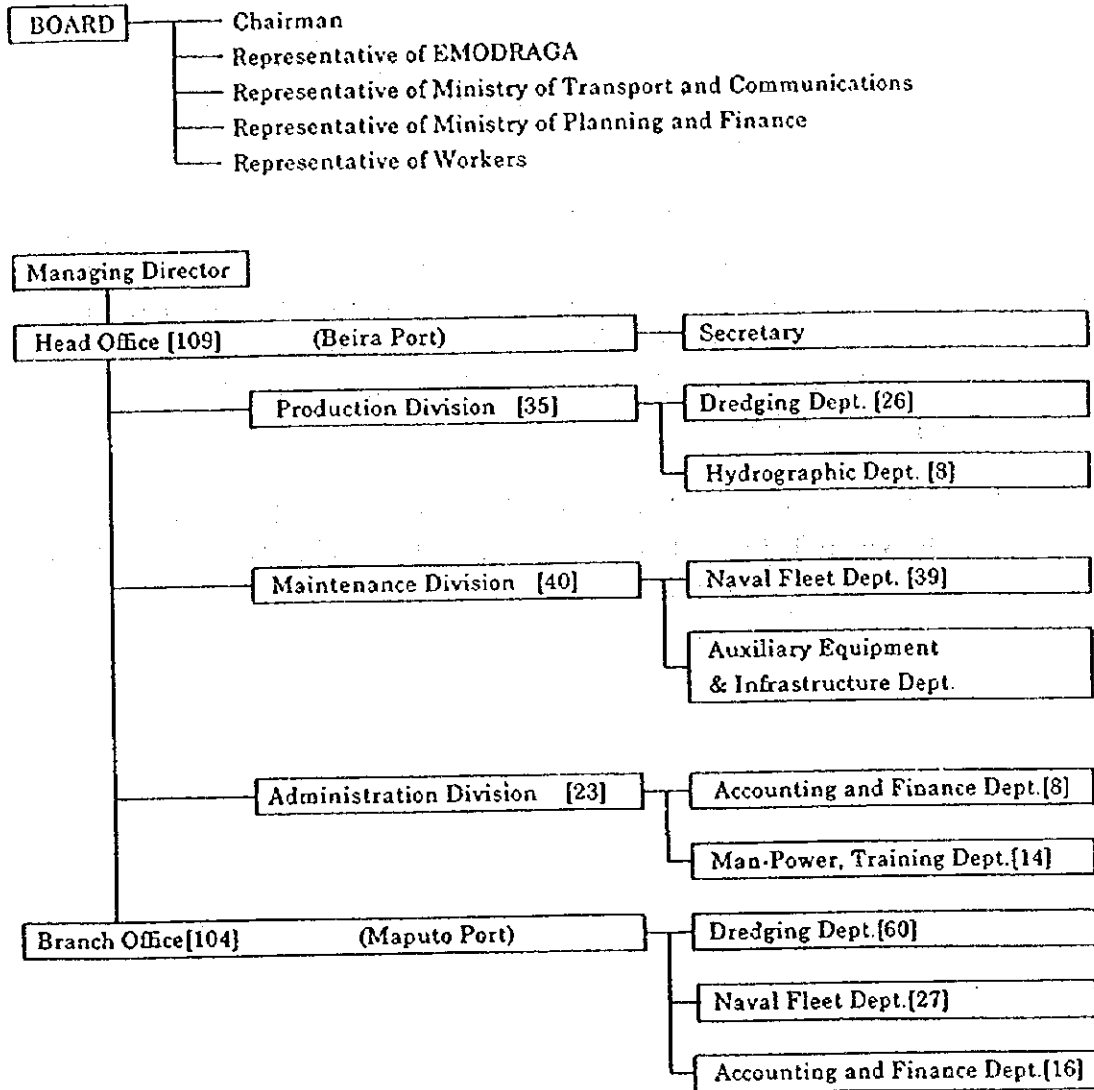
CFM was organized with four regional Executive Directorates, CFM-S, CFM-C, CFM-Z and CFM-N.

CFM is fully responsible for management and operation of all ports in Mozambique and the Executive Directorate of CFM-C is in charge of administration of Beira Port.

The existing organization chart of EMODRAGA is shown in Figure 2.3.1-1 and the outline of the activities of each division are as follows;

- (1) Production Division of 35 members is in charge of planning and control of dredging works.
- (2) Maintenance Division is in charge of repairs and maintenance of dredging fleet with 40 members.
- (3) Administration Division of 23 members is responsible for all matters related to accounting and administrative works.
- (4) Branch Office in Maputo Port consists of Dredging Department, Naval Fleet Department and Accounting and Finance Department with 104 members.

Present Organization Chart of EMODRAGA is as follows as of March, 1997;



Number of Members are shown in [ ]

Figure 2.3.1-1 Organization Chart of EMODRAGA E.P.

### 2.3.2 Expenses and Assets of EMODRAGA

The revenue and expenses of EMODRAGA in 1996 are shown in Table 2.3.2-1. The revenue consists of income based on the agreement with CFM (93 %) and other revenues. Other revenues are rent and hire of buildings and equipment belonging to EMODRAGA.

Total expenditure is 73 % of the total revenue, fuel and oil are 22 %, repairs are 5 %, material and spare parts are 9 % of the total revenue.

The content of agreement between EMODRAGA and CFM in 1997 is shown in Table 2.3.2-2. The fixed amount for the direct cost such as fuel and dry dock will be paid every month by CFM. The fixed amount for the expenses on material and spare parts will be paid every 3 months by CFM. In case of purchase for fuel and lubricating oil in much volume or docking for over-haul, all expenses will be paid by CFM.

Situation of fixed assets of all EMODRAGA and EMODRAGA of Beira at the end of 1996 is shown in Table 2.3.2-3. Fixed assets of EMODRAGA at Beira is 53.2 % of all EMODRAGA's total assets.

**Table 2.3.2-1 Revenue and Expenditure of EMODRAGA in 1996**

(unit : US\$)

Accounts	in 1996	Rate(%)
Revenue	2,349,162	100.0%
Income from CFM Agreement	2,176,988	93.0%
Other revenue from Rent etc.	173,174	7.0%
Wages, Salaries	230,839	13.4%
Meal Supply for Floating Units	212,787	12.3%
Fuel & Lubricating Oil	508,695	29.5%
Repaires & Transportation	124,290	7.2%
Material & Spare Parts	212,787	12.3%
Insurance	10,254	0.6%
Depreciation	288,714	16.7%
Other Expenditure	137,948	8.0%
Expenditure	1,726,314	100.0%
Revenue - Expenditure	622,848	27.0%

**Table.2.3.2-2 Agreement between EMODRAGA and CFM in 1997**

Timing on Payment	CFM
Monthly Payment	43,000US\$
(Direct Cost as Fuel, Dry Dock)	
3 month Payment	165,000US\$
(Material & Spare Parts)	
Fuel & Lubricating Oil	All pay
Dock	All pay

**Table.2.3.2-3 Fixed Assets in All EMODRAGA  
or in EMODRAGA-Beira at the End of 1996**  
(unit: US\$)

Fixed Assets	Fixed Assets in All EMODRAGA			Fixed Assets in EMODRAGA-Beira		
	(1)Buying Cost	(2)Accumulated Depreciation	(1)-(2)Present Book Value	(3)Buying Cost	(4)Accumulated Depreciation	(3)-(4) Present Book Value
Buildings & Ships etc.	1,225,482	977,231	248,251	185,263	103,363	81,900
Plant & Equipment	4,212,346	3,580,649	631,697	2,536,019	1,969,043	566,977
Other Fixed Assets	204,917	118,733	86,184	104,242	78,057	26,185
Heavy Repaire	1,624,079	1,264,617	359,461	556,707	526,060	30,647
Intangible Assets	2,051	1,203	848	400	400	0
Fixed Assets Total	7,268,875	5,942,433	1,326,442	3,382,632	2,676,923	705,709



Table 2.3.2-4 Annual Operation Cost and Annual Crew Arrangement for Rovuma of EMODRAGA for 8 Years

	Fiscal Year (from JAN. to DEC.)							
	1989	1990	1991	1992	1993	1994	1995	1996
(unit : US\$)								
Accounts etc. / year								
(A) Dredging Volume per year (m <sup>3</sup> )	2,069,411	1,753,431	2,082,267	0	1,136,770	582,254	661,382	1,857,009
(B) Revenue of Rovuma	485,330	898,098	615,344	668,610	740,298	1,623,280	854,473	1,165,862
Income from CFM Agreement	435,212	647,027	584,588	606,789	661,561	1,468,155	610,401	961,131
Other Revenue	50,118	251,071	30,756	61,821	78,737	155,125	244,072	204,731
(1) Operation Cost of Rovuma	986,862	621,295	473,221	631,054	491,910	636,609	683,822	727,490
Wages, Salaries	56,920	55,202	40,058	56,770	40,828	39,318	23,398	32,379
Meal Supply for Floating Unit	29,689	52,147	31,932	31,654	23,890	32,731	27,349	35,441
Fuel and Lubricating Oil	79,575	124,221	110,894	94,799	71,402	84,408	89,931	265,225
Maintenance, Repair, Annual Docking	684,010	275,097	217,186	374,404	289,268	428,061	496,210	350,343
Insurance	19,249	19,249	19,249	19,249	19,249	19,249	19,249	10,249
Overheads etc. Other Cost	117,419	95,379	53,902	54,178	47,273	32,842	27,685	33,853
(2) Depreciation Cost of Rovuma	767,833	767,833	767,833	767,833	767,833	767,833	767,833	767,833
(C)=(1)+(2) Total Cost	1,754,695	1,389,128	1,241,054	1,398,887	1,259,743	1,404,442	1,451,655	1,495,323
Foreign Exchange Rate (metical/US\$)	811.60	1,027.90	1,827.20	2,432.40	3,722.70	5,918.10	10,785.00	11,230.00
(B/A) Revenue /Dredging Volume (m <sup>3</sup> )	0.23	0.51	0.30		0.65	2.79	1.29	0.63
(C/A) Total Cost/Dredging Volume (m <sup>3</sup> )	0.85	0.79	0.60		1.11	2.41	2.19	0.81
(unit : Numbers of person)								
Total crew	36	36	35	35	35	35	35	35
Captain								
Chief Engineer	2	2	1	1	1	1	1	1
Dredge Master	2	2	2	2	2	2	2	2
1st Engineer	1	1	1	1	1	1	1	1
1st Mate								
2nd Engineer	1	1	1	1	1	1	1	1
Dredge Operator	2	2	2	2	2	2	2	2
Electrician	2	2	2	2	2	2	2	2
Deck Crew	8	8	8	8	8	8	8	8
Greaser	6	6	6	6	6	6	6	6
Others (cook,etc)	12	12	12	12	12	12	12	12

Source : EMODRAGA

### 2.3.3 Past Dredging Works

The past dredging works executed at Beira Port are summarized in Table 2.3.3-1.

**Table 2.3.3-1 Soil Volume Dredged at Beira Port**  
(measured hopper volume in m<sup>3</sup>)

	Rovuma	Site	Herz	Site	Sofala	Site	Lurio	Total
1983	564,563				22,400			586,963
	242,769	B10			22,400	Chiveve		
	83,205	Q1-10						
	11,865	Q6-10						
	226,724	B9-11						
1984					98,700			98,700
					98,700	Chiveve		
1985	1,229,170				42,800			1,858,933
	1,187,270	B9-11			42,800	Chiveve		
	41,900	B3-6						
1986	444,500				24,060			468,560
	340,560	B9-10			24,060	Chiveve		
	103,940	EEStock						
1987	240,925				99,130			340,355
	5,439	Renab			84,330	Chiveve		
	7,7953	B1-3			5,600	Q8-9		
	7,707	B3-5a			9,200	Q5-6		
	61,622	B6-8						
	88,204	B9-13						
1988	73,520		5,685		127,350			206,555
					120,900	Chiveve		
					650	Q9		
	73,520	B5a-8	5,685	B5a-8	1,300	Q5-6		
1989	34,152				117,575			151,727
	34,152	B1/3			53,525	Chiveve		
					28,250	Q11		
					8,675	Q9		
					9,100	Q5-6		
					18,025	Praya N		
1990					144,170			144,170
					108,795	Chiveve		
					3,250	Q11		
					3,250	Q8		
					7,250	Q6-7		
					6,700	Q2-5		
					14,375	B5/8		
					240	B1/3/5		
<b>Total</b>	<b>2,022,267</b>		<b>5,685</b>		<b>676,185</b>			<b>3,268,700</b>

Source; EMODRAGA Dredging Report, "BNo, QNo" denote Buoy and Quay No.  
(refer Figure 2.1.1-1 for Quay No and Figure 2.1.5-1 for Buoy No)

The above table shows that the channel was dredged at an average annual rate of 0.33 million m<sup>3</sup> by the trailing suction hopper dredger "Rovuma" for the period from 1983 to 1988 and the quay front areas and the fishery port at 0.8 million m<sup>3</sup> by the backhoe dredger "Sofala" for 8 years from 1983 to 1990.

Extensive capital dredging work was carried out by Breenjenbout - Voskalis and EMODRAGA for 19 months from March 1989.

The work was carried out to deepen the Access Channel of 28 km long to the depth of CDL-8.0 m including the turning basin and the dredging production was approximately 10,000,000 m<sup>3</sup>.

From this experience, EMODRAGA has obtained the characteristics of dredged soil as follows;

Composition:	Fine Clay with Silt	10 %
	Silt with Fine Sand	50 %
	Coarse Sand	40 %
Specific Gravity:	Mud, Fluid	1.73 ton/m <sup>3</sup>
	Sand, Wet	1.92
	Sand, Wet Packed	2.08
	Clay, Compacted	1.75
	Clay, Wet Excavated	1.83
	Average Density of Materials	1.8

Other records such as work time, principal particulars of operated dredgers and other supporting vessels are shown in Table 2.3.3-3.

The annual siltation rate had been estimated in the order of 3.5 - 6.0 million m<sup>3</sup> in the past studies. The above figures on the maintenance dredging are far below the estimated volume of soil silted in the channel causing serious shoaling of the channel. As shown in Table 2.3.3-2, the maintenance dredging during this period was concentrated in 1991 and 1993 and in the area of frontage of the berths accounting for about 65 %; thus, suggesting a greater need in the inner section and more siltation in the outer section of the channel. The past dredging works done in Maputo Port are summarized in Table 2.3.3-4.

#### 1) Chiveve Dock

Past maintenance dredging records in Chiveve Dock for the period from 1964 to 1976 is summarized in the report "Rehabilitation of Beira Fishing Harbor, 1992". For Chiveve Dock, the mean annual volume of soil dredged in 1964 - 1976

is 80,000 m<sup>3</sup>, 45,000 m<sup>3</sup> in 1979 - 1981 and 60,000 m<sup>3</sup> in 1991. These figures represent a very high siltation rate of about 1.6 m/y over the 45,000 m<sup>2</sup> area of Chiveve Dock. This sedimentation is consisted of fine material and mostly caused by the ebb flow.

## 2) River Pungue Berth

The above report also gives the past maintenance dredging records in 1,200 m long River Pungue Berths. The mean annual volume of soil dredged during the period 1964 - 1976 is 20,000 m<sup>3</sup> in the berth area and 120,000 m<sup>3</sup> in the berth and channel area up to buoy No. 13.

**Table 2.3.3-2 Soil Volume Dredged at Beira Port  
after Capital Dredging in 1989 - 90**

(measured hopper volume in m<sup>3</sup>)

	E1	E2	E5	E7	E8	E9	E10	E11	Total	Quay
1990	650	0							650	
1991	90,317	424,238	27,350			125,866			667,771	5,230
1992	8,850	58,154	450		49,899				117,353	
1993	608,166	17,257		126,766	<.....	327,885	.....	...>	1,080,074	16,900
1994	14,200	0							14,200	0
1995	35,230	2,100							37,330	26,351
1996	37,080	250							37,330	21,170
Total	794,493	501,999	27,800	126,766	49,889	453,751			1,954,708	
%	40.6	25.7	1.4	6.5	2.6	23.2			100.0	

Source: EMODRAGA Dredging Report, "E" denotes section of the channel  
(see Figure 5.2.2-1).

**Table 2.3.3-4 Soil Volume Dredged at Maputo Port**

(measured hopper volume in m<sup>3</sup>)

	Rovuma	Herz	Tembe	Total
1983	0	32,400	13,350	255,750
1984	0	0	20,250	20,250
1985	0	0	26,700	26,700
1986	0	55,180	5,700	60,880
1987	1,287,707	0	87,300	1,375,007
1988	1,432,779	0	71,300	1,504,079
1989	2,128,859	0	24,650	2,153,509
1990	1,753,432	0	0	1,753,432
1991	0	0	0	0
1992	0	0	0	0
1993	804,024	0	27,473	831,497
1994	582,254	0	0	582,254
1995	643,569	0	18,413	661,982
1996	0	0	0	0
Total	8,632,624	87,580	295,136	9,225,340

Source: EMODRAGA Dredging Report.

**Table 2.3.3-3 Past Records of Dredging Works at Beira Port**

Contract	P.A.1 (Capital Dredging Works)	
Client	B.C.A.-MTC	
Contractor	Breenjenbout - Boskalis/EMODRAGA	
Supervisor Eng.	DHV-Holland	
Duration of works	March/1989 to September/1990 (19 months)	
Dredging Area	Access channel, turning basins - from Beira Port to 34km of shore access channel.	
Dumping areas used	D2, D3, D4	
Dredging profile	Length: 33,408 m Breadth min.: 135 m Depth: -8 m (CD) Slopes: 1:10	
Dredging production	10,000,000 m <sup>3</sup>	
Weekly production	120,000 m <sup>3</sup>	
Characteristics of dredged materials	Silt, fine sand, coarse sand, clay and hard clay	
Work Time		
Working hours per day	24 hrs/day	
Working days per week	7 days/week	
Working weeks per year	45 weeks/year	
Dredging cycle time	From 1.5 to 6.5 hrs	
Dredgers	No. 1	No. 2
Ship's name	Cornelis Zanen	Johanna Jacoba
Builder	IHC	IHC
Built year	1982	1977
Principal dimenstions	128x23x10.0m	104x17.50x6.95
Hopper capacity	8,000m <sup>3</sup>	3,250 m <sup>3</sup>
Ship's speed fully loaded	15.5 knts	12.8 knts
Main propulsion engine	6,900 HPx2	2,350 HPx2
Dredge pump engine	3,100 HPx2	1,960 HPx2
Type of drag head	California/IHC- Silt	California/IHC- Silt
Total Installed power	15,025 HP	
Other equipment involved		
Cornelis Zanen	13 months	
T.S.H.D.-"Johanna Jacoba"	8 months	
Tug boat "Sea Eagle II" (Plow)	4 months	
Tug boat "Bison-1"	3 months	
Survey boat "Margo"	21 months	
General Service Launch "Drakensteyn"	13 months	
General Service Launch "Hendrikje"	9 months	
Backhoe dredger "Sofala"	2 months	
Survey boat "Tiky II"	6 months	
Tug boat "Chire"	2 months	

## 2.4 Present Condition of Other Ports

Mozambique has three major international sea ports servicing the Southern African region and many regional ports located along the coastline. The major ports and some of the regional ports are controlled and operated by CFM. A description of Maputo and Nacala ports is briefly presented as follows.

- International Ports:	Maputo Beira Nacala
- Regional Ports:	Mocimboa de Prais Pemba Angoche Pebane Quelimane Chinde Inahambane Xai Xai

### 2.4.1 Maputo Port

Maputo Port provides a variety of services for all type of cargo as the gate way of the Maputo Corridor connecting South Africa, Zimbabwe, Swaziland, Botswana, Zambia and Zaire with railway and road connection. The port is situated in the southern part of Mozambique at latitude 25°58.5' S and longitude 32°34.2' E. Maputo Port consists of Maputo Quay and Matola Port Complex with a total length of 37,740 m. Matola Port located further upstream of Maputo Quay for handling coal and petroleum products as well as ammonia. At the south end of the port, a dry dock is provided for ship repair.

The approach to the port comprises the Northern Channel which is dredged and is 100 m wide. This channel is available at any time of the year offering a minimum depth 8 m to 10 m during high tide. Pilotage is compulsory to enter the port.

The length of the 21 berths installed in both Maputo and Matola Ports is 3,470 m and the depth alongside these quays is around 9.5 m. The general layout of the following quays is shown in Figure 2.4.1-1.

**(1) General Cargo Berth**

Quay	440 m in length	
	up to 40,000 DWT	
Handling capacity:	4,000,000 tons/year	
Covered warehouses:	23 units (total area 53,000 m <sup>2</sup> )	
Warehouse:	53,450 m <sup>2</sup>	
Handling equipment:	Heavy lift 60/80 tons	1 unit
	Jib crane 3 - 5 tons	1 unit

**(2) Sugar Terminal**

Intake capacity	2,000 tons/day	
Storage capacity	40,000 tons	
Handling equipment:	Conveyor system	150 m

**(3) Container Terminal**

Quay:	300 m in length	
Handling capacity:	42,000 TEUs/year	
Container Yard:	1,000 TEUs	
Handling equipment:	Gantry crane	2 units
	Forklift 20 tons	9 units
	Top lift spreader	5 units

**(4) Steel Terminal**

Quay	165 m and 175 m in length	
	12 m draft at maximum	
Handling capacity:	900,000 tons/year	
Stock pile facility:	150,000 tons (total area 50,000 m <sup>2</sup> )	
Handling equipment:	Jib crane 20 tons	4 units
	Forklift 20 tons	4 units

**(5) Citrus Terminal**

Quay	270 m in length	
Handling capacity:	10,000,000 cartons/year	
	(500,000 tons/year)	
Storage shed:	10,000,000 cartons	
Handling equipment:	Wharf crane	7 units
	Forklift 2.5 tons	46 units



## (6) Matola Bulk Coal Berth

Quay	210 m in length up to 40,000 DWT
Handling capacity:	1,500,000 tons/year
Stock pile facility:	300,000 tons (total area 66,456 m <sup>2</sup> )
	Warehouse: 53,450 m <sup>2</sup>
Handling equipment:	Tipplers Stackers/reclaimers Shiploaders Conveyor system

## (7) New Matola and Oil Jetties

A new oil terminal commenced its service in August, 1996. Currently, a cereal storing facility are underway to provide 80,000 ton storage space and 400,000 tons handling capacity of cereals per annum.

### 2.4.2 Nacala Port

Nacala port is located in the northern part of the country, at latitude 14°27' S and longitude 40°40' E and is controlled by CFM-N. The port provides the gate way for domestic traffic as well as the Nacala Corridor connecting to Malawi by railway and road extending a distance of 615 km. The railway line linking Nacala Port to Cuamba has an extension of 533 km where a total rehabilitation and a spot rehabilitation of 77 km are continuously being carried out. This is one of the best natural deep-water harbors in Africa with no siltation problem in the port basin and the navigation channel. Sailing conditions and pilotage are as follows:

- Natural deep-water harbor
- Sheltered from the ocean
- No dredging of the channel needed
- Allows ship berthing without size limitation

The length of the 5 quays is 990 m of approximately 10.0 m water depth which is enough for large vessels to berth. The general layout of the port facilities and quays is shown in Figure 2.4.2-1. The port facility and equipment are as follows.

### **(1) General Cargo Terminal**

Handling capacity:	2,000,000 tons/year
Covered warehouses:	8 units (total area 21,000 m <sup>2</sup> )

### **(2) Container Terminal**

Quay:	327 m in length
	15 m in depth
Handling capacity:	30,000 TEUs/year
Stocking capacity:	1,750 TEUs
Container Yard:	60,000 m <sup>2</sup>
Handling equipment:	Transfer Crane 1 unit
	Jib Crane 1 unit
	Forklift 42 tons 2 units
	Forklift 32 tons 2 units

### **(3) P.O.L. Terminal**

Oil storage capacity:	18,000 tons
Palm oil storage capacity:	2,400 tons

### **(4) Port Equipment**

Rail-mounted transfer crane:	1 unit
Jib crane:	1 unit
Electric Crane	5 to 20 tons 11 units
Forklift	25 to 45 tons 5 units
Tractor for shunting	1.5 to 3.5 tons 10 units
	25 to 75 tons 3 units

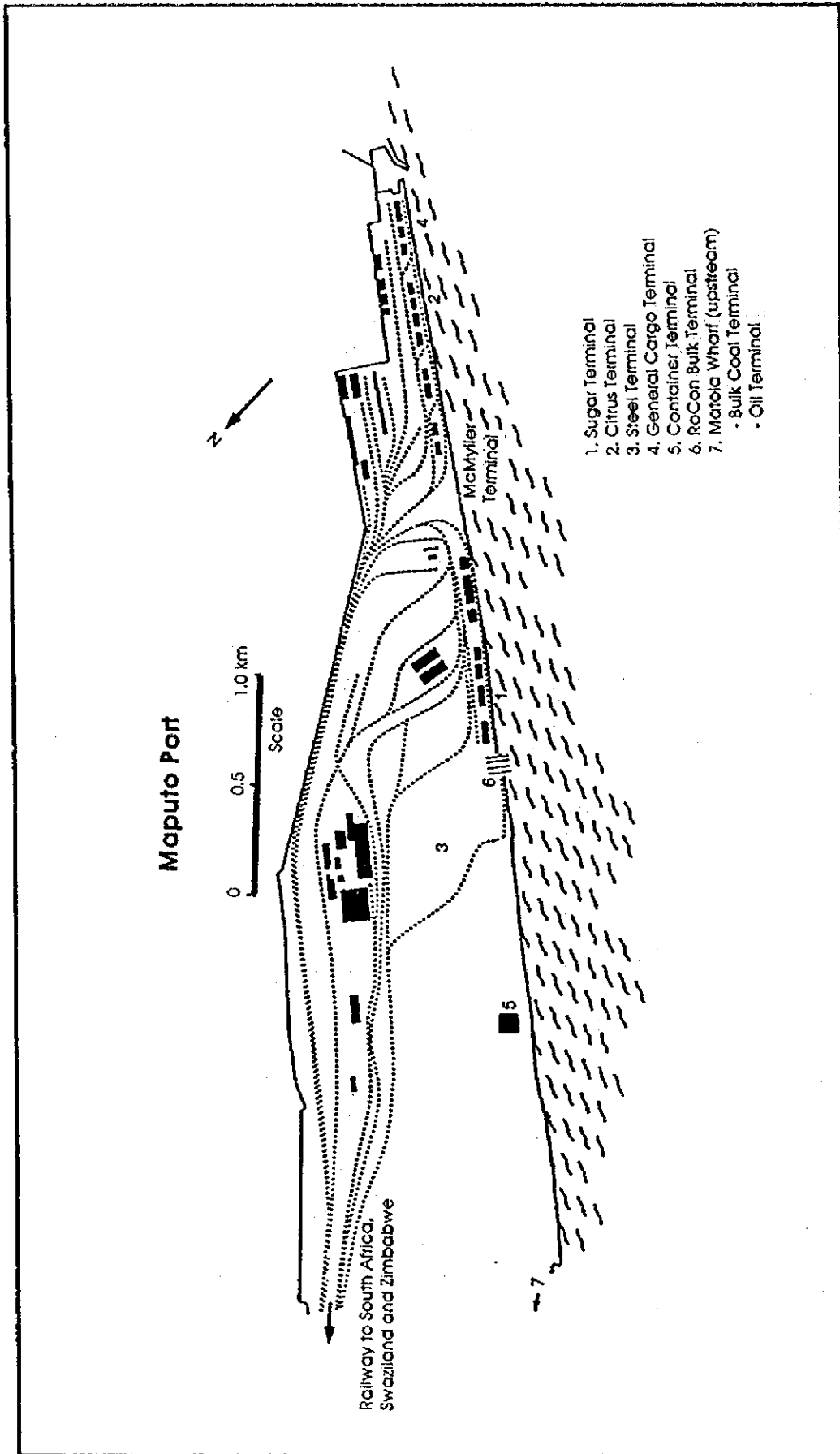


Figure 2.4.1-1 Outline of Maputo Port

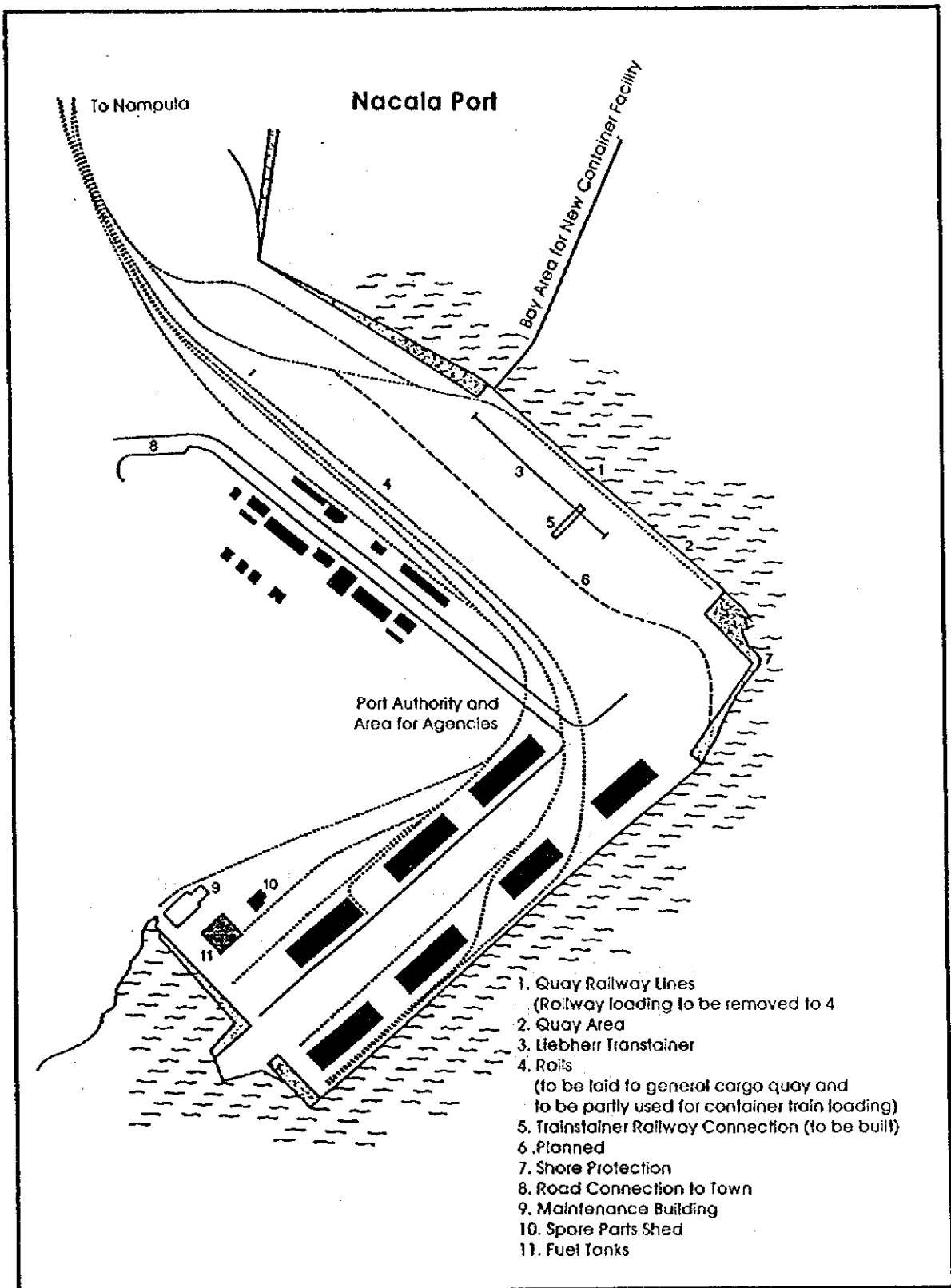


Figure 2.4.2-1 Outline of Nacala Port