



# *Chapter 6*

## *Analysis of Past Data*

One of the systems formulated upon the creation of the Philippine Ports Authority (PPA) is the port statistics system. This system defines the flow in the generation of information and data at the ports, the required data, the source of data and the format to which the data and the information shall be entered into.

The necessary data are grouped into four sets of information, each having their own forms. The groupings are (1) Shipping Statistics (2) Cargo and Passenger Statistics (3) Containers Handled and (4) Labor Statistics. The information that will tie up the data and forms are the control and voyage numbers of each vessel which are entered in all these forms with the assigned control number arranged in the chronological order. The data in the forms are for each vessel. Hence, there are as many of these sets of data as there are ship calls.

The data are gathered in all the ports under the jurisdiction of the Authority including those data from the private ports. The data are categorized as either at berth or at anchorage, domestic or foreign cargo and vessels, inward or outward flow of volume and containerized or non-containerized cargo. The inward or outward cargo and passenger manifests for each ship and the reports of the port cargo handling operators are the sources of the data. The former are the source of shipping, cargo and passenger statistics and the latter are the source of statistics for the number of the containers handled at the ports and the labor used per vessel and their productivity.

The specific information contained in each of the groupings is shown below.

#### A. SHIPPING TRAFFIC STATISTICS

- a1. Control number in the chronological order based on the order of the vessel arrival at the port.
- a2. Name and voyage number of the arriving vessels.
- a3. Last and next port of call of the vessels.
- a4. Type of the vessels.
- a5. Vessel characteristics in terms of GRT, NRT, DWT, beam, draft at arrival and at departure and the length of the vessels.
- a6. Arrival and departure time of the vessels at the port.
- a7. Service time at berth or at anchorage and waiting time of the vessels if any.
- a8. Name of the shipping line as operator of the vessel.

**B. LABOR STATISTICS**

- b1. Control and voyage numbers of the vessels as indicated in the Shipping Traffic data.
- b2. Number of men and gangs that worked on the vessels.
- b3. Gross and net gang hours for the cargo handling.
- b4. Idle time and the causes.
- b5. Total cargo tonnage handled per gang.

**C. CARGO AND PASSENGER STATISTICS**

- c1. Control and voyage numbers of the vessels as indicated in the Shipping Traffic data.
- c2. Total cargo volume handled.
- c3. Volume of cargo in metric tons per type of packaging as containers, breakbulk and bulk and per flow of traffic as inward or outward and foreign or domestic.
- c4. Types and volume of commodities per type of packaging and per flow of the cargo traffic.
- c5. Number of passenger disembarked and embarked

**D. CONTAINERS HANDLED**

- d1. Control and voyage numbers of the vessels as indicated in the Shipping Traffic data.
- d2. Number of FCL containers by size and flow.
- d3. Number of LCL containers by size and flow.
- d4. Number of empty containers by size and flow.

The information and data gathered by the Authority are the same data being gathered by other port bodies throughout the world. However, the commodity classifications being used by the Authority do not follow the guideline in the classification of the standard commodity as used worldwide and promulgated by the government. Levels as adopted by the Authority cut across the commodity levels.

The information and data being gathered by the Authority are very comprehensive which are considered adequate for planning exercises. As a matter of fact, the levels of the commodity classifications as used by the Authority are more convenient to use as they highlighted the commodities with large volumes that are handled at the port. One very important data which was not captured in the statistics however, is the origin and the destination (O-D) of the port cargo traffic.

An attempt was made in the early 1980s to consolidate the data requirements of the various government agencies on the marine transport statistics. An inter-agency committee was formed which was composed of the PPA, the Central Bank, the National Census and Statistics Office (NCSO), Department of Trade and Industry (DTI), the Maritime Industry Authority (MARINA) and other agencies. The computerization and reproduction of the data on an agreed format were the responsibilities of the NCSO while PPA codes the types of commodities at the port level.

The coded data were transmitted to NCSO by PPA. However, PPA was not able to get the data it needed up to 1989. One data that is supposed to be produced by NCSO is the (ORIGIN-DESTINATION) O-D of traffic by commodity type. However, if some of the traffic data are not submitted, then the O-D could not be completed and other data which are to be generated from the O-D then could not be produced. The Authority reverted to its original system of the data generation starting 1990. During this period, PPA was not able to generate information on the types and volumes of commodities handled at the port.

The PPA office in all its port collects the manifests and the reports of the operators and transfer the information therein into the PPA forms mentioned above. Since they are on a per vessel basis, all the information contained therein are added up on a monthly basis for the monthly statistical reports for each port. The data are consolidated at the Port Management Office (PMO) and copies of the reports are transmitted to the Port District Office (PDO). All the PDOs in turn transmit a copy to PPA Head Office for the processing of the nationwide monthly, annual, and special port traffic statistical reports.

The following pages show the typical statistical forms/tables of the monthly reports produced by the Authority. The forms show the name of the port, month and year covered, and totals of the data gathered as well as the cumulative total for the year and whether it is a government or private port.

All the information and data presented in this Chapter on the port traffic are taken from these PPA statistical reports and from the discussions with the officials of PPA when the field visits were undertaken for the feasibility study. There are available information and data since 1980 to the present that can be used in the study.

## EXHIBIT 1

### MONTHLY REPORT

PORT OF:

PMO:

PDO:

- ☐ BASE PORT
- ☐ TERMINAL PORT
- ☐ OTHER GOVERN. PORT
- ☐ PRIVATE PORT

- ☐ BERTH
- ☐ ANCHORAGE

- ☐ MONTH
- ☐ YEAR

#### PARTICULARS THIS MONTH YEAR TO DATE

##### A. SHIPPING TRAFFIC

1. Number of Vessels
  - Domestic
  - Foreign
2. Gross Registered Tonnage
  - Domestic
  - Foreign
3. Net Registered Tonnage
  - Domestic
  - Foreign
4. Deadweight Tonnage
  - Domestic
  - Foreign
5. Length of Vessel (m.)
  - Domestic
  - Foreign
6. Beam of Vessel (m.)
  - Domestic
  - Foreign
7. Draft of Vessel (m.)
  - Domestic
  - Foreign
8. Waiting Time (hrs)
  - Domestic
  - Foreign
9. Service Time (hrs)
  - Domestic
  - Foreign
10. Berth Occupancy Rate (%)
  - a. Total Effective Berth Length (m)
  - b. Spacing Factor
  - c. Number of Days

## EXHIBIT 2

### MONTHLY REPORT

PORT OF:

PMO:

PDO:

- ☐ BASE PORT  
☐ TERMINAL PORT  
☐ OTHER GOVERN. PORT  
☐ PRIVATE PORT

- ☐ BERTH  
☐ ANCHORAGE

- ☐ MONTH  
☐ YEAR

PARTICULARS

THIS MONTH

YEAR TO DATE

## B. CARGO AND PASSENGER TRAFFIC

## 1. Total Cargo Throughput

## a. Domestic

## Inbound

Breakbulk

Bulk

Containerized

## Outbound

Breakbulk

Bulk

Containerized

## b. Foreign

## Import

Breakbulk

Bulk

Containerized

## Export

Breakbulk

Bulk

Containerized

## c. Transit Cargo

Domestic

Foreign

## 2. Total Passengers

## a. Disembarking

## b. Embarking

### EXHIBIT 3

#### MONTHLY REPORT

PORT OF:

PMO:

PDO:

- ☐ BASE PORT  
☐ TERMINAL PORT  
☐ OTHER GOVERN. PORT  
☐ PRIVATE PORT

- ☐ BERTH  
☐ ANCHORAGE

- ☐ MONTH  
☐ YEAR

PARTICULARS

THIS MONTH

YEAR TO DATE

## C. LABOR STATISTICS FOR NON-CONT. CARGO

## 1. DOMESTIC

- a. Total Number of Men
- b. Number of Gangs
- c. Ave. No. of Men/Gang
- d. Cargo Handled/Gang (MT)
- e. Gang Hours Work
  - Gross
  - Net
  - Idle
- f. Tonnage Handled/Gang Hour
  - Gross
  - Net
- g. Tonnage Handled/Manhour
  - Gross
  - Net

## 2. FOREIGN

- a. Total Number of Men
- b. Number of Gangs
- c. Ave. No. of Men/Gang
- d. Cargo Handled by Gang
- e. Gang Hours Worked
  - Gross
  - Net
  - Idle
- f. Tonnage Handled/Gang Hour
  - Gross
  - Net
- g. Tonnage Handled/Manhour
  - Gross
  - Net

## EXHIBIT 4

## MONTHLY REPORT

PORT OF:

PMO:

PDO:

- ☐ BASE PORT  
☐ TERMINAL PORT  
☐ OTHER GOVERN. PORT  
☐ PRIVATE PORT

- ☐ BERTH  
☐ ANCHORAGE

- ☐ MONTH  
☐ YEAR

PARTICULARS

THIS MONTH

YEAR TO DATE

## D. CONTAINER TRAFFIC

## 1. TOTAL CONTAINERS (TEU)

## a. DOMESTIC

Inbound

Empty

Loaded - FCL/LCL

Outbound

Empty

Loaded - FCL/LCL

## b. FOREIGN

Import

Empty

Loaded - FCL/LCL

Export

Empty

Loaded - FCL/LCL

## E. LABOR STATISTICS FOR CONTAINERIZED CARGO

## 1. DOMESTIC

a. Total Containers Handled

b. Gang Hours Worked

Gross

Net

Idle

c. No. of Cont. Handled/Gang

Gross

Net

## 2. FOREIGN

a. Total Containers Handled

b. Gang Hours Worked

Gross

Net

Idle

c. No. of Cont. Handled/Gang

Gross

Net

## MARITIME TRADE IN THE PHILIPPINES

The Philippines being an archipelago and composed of numerous islands that are separated from any country by big expanse of water depends greatly on water transportation in the movement of its cargo and people for both domestic and foreign trades. It is not surprising then to see more than one thousand ports in the country to connect the water and land transport modes. More than 60% of domestic commodities and probably more than 80% of the foreign cargo traffic are being transported by the combine modes of the water and land transportation from their origin to their final destination of the commodities. Hence the need for port facilities to handle the transfer of these commodities between these modes of transportation. Based on the PPA statistics, a volume of 72.92 million metric tons of cargo was handled by both the government and private ports of the country in 1980. Around 47% of the total cargo traffic in ports were domestic commodities and the rest were foreign cargo volume while only 6% of the total cargo at that time were containerized.

Between 1980 and 1986, the volume of cargo traffic fluctuated and even decreased to 62.75 million metric tons in 1986 hence the negative growth rate during the period. The quantity of the domestic cargo traffic has remained at the same volume of around 34.00 million metric tons while the foreign cargo went down from 38.80 million metric tons in 1980 to 26.91 million tons in 1986. The decreased of the foreign cargo volume was the cause of the decreased in total cargo traffic.

Starting 1987, both domestic and foreign cargo traffic showed sign of an increasing trend and the total volume increased to 160.12 million metric tons in 1997. The domestic volume was 86.91 million metric tons and the foreign cargo reached 73.21 million metric tons in 1997. Except for 1980 and 1981, the share of the domestic cargo traffic was more than 50% of the total traffic volume.

The average growth rate of the total cargo traffic was 4.74% per year for the period from 1980 to 1997. In the first six years, from 1980 to 1985, the growth rate was negative 3.26% per year but in the next six years, 1985 to 1990, the rate of growth was 9.86% per year and from 1990 to 1997, the increase was at the rate of 7.13% per year. The domestic volume grew at 5.65% per year on the average while the foreign cargo grew at only 3.81% per year from 1980 to 1997.

Table 6-1  
TOTAL PORT CARGO TRAFFIC  
(in million metric ton)

YEAR	DOMESTIC	FOREIGN	TOTAL
1980	34.42	38.80	72.92
1985	34.40	27.40	61.80
1990	57.96	40.94	98.90
1991	58.63	46.94	105.57
1992	61.85	48.99	110.84
1993	65.07	50.64	115.71
1994	71.11	52.80	123.91
1995	76.71	60.77	137.48
1996	81.48	69.32	150.80
1997	86.91	73.21	160.12

The number of ships calling at the Philippine ports increased with the cargo traffic but at a higher rate. The ship calls in 1980 were 139,590 vessels and increased to 342,060 vessels in 1997. The growth rate was 5.41% per year from 1990 up to 1997. In view of the bigger volume of cargo and lower load per vessel, there were much more domestic ship calls than the foreign ship calls. There were 132,790 domestic ship calls as against only 6,800 foreign ship calls in 1980. In 1997, there were 327,560 domestic ship calls while there were only 14,500 foreign ship calls at the ports.

The average cargo load per domestic ship in 1997 was only 265 metric tons which is not far from the average load in 1980 at 257 metric tons. On the other hand, the average cargo load per foreign vessel in 1997 was around 5,050 metric tons while in 1980, the load was even higher at around 5,700 metric tons per vessel. This means that the growth rate of the vessels was more or less the same as the growth rate of cargo in the domestic trade while the growth of the vessels was more than the growth of the cargo on the foreign trade.

**Table 6-2**  
**TOTAL SHIP CALLS**  
(in thousand unit)

YEAR	DOMESTIC	FOREIGN	TOTAL
1980	132.79	6.80	139.59
1985	110.42	5.19	115.61
1990	150.23	7.47	157.70
1991	164.49	7.44	171.93
1992	177.78	7.71	185.49
1993	188.42	8.17	196.59
1994	209.60	8.92	218.52
1995	227.85	9.64	237.49
1996	274.29	10.65	284.94
1997	327.56	14.50	342.06

The passenger traffic was 13.23 million in 1980 and increased to 52.12 million people in 1997. The growth was rather high at 8.40% per year for the period of 18 years. The passenger traffic from 1980 to 1985 was increasing at a very slow rate of only 1.74% per year, however in the succeeding years, 1985 to 1990, the passenger traffic grew at 15.64% per year and at 8.30% per year from 1990 to 1997. It appears to be the same pattern as the cargo volume trend for each period.

**Table 6-3**  
**TOTAL PASSENGER TRAFFIC**  
(in million people)

YEAR	DISSEMB.	EMBARKED	TOTAL
1980	8.07	5.16	13.23
1985	7.60	6.82	14.42
1990	15.22	14.60	29.82
1991	16.17	15.54	31.71
1992	17.16	16.58	33.74
1993	18.39	17.98	36.37
1994	20.44	20.00	40.44
1995	22.34	21.97	44.31
1996	25.38	24.03	49.41
1997	26.97	25.15	52.12

### 6.3 TRAFFIC OF THE DAVAO PORT COMPLEX

There are several ports located in the Davao Gulf area. In our study, two are government ports namely the Port of Davao (Sasa) and the Port of Sta. Ana. One private port, the Port of Tefasco is a commercial port handling the same commodities like those of the government ports. The other private ports are handling purely their own products using specialized type of equipment which are not available at the government ports and/or using specialized type of vessels to carry their products and are on chartered basis.

Based on the types of commodities, only the government ports and the Port of Tefasco can be considered as in competition for the cargoes and passengers within the same influence area. While the products handled at the other private ports are for the same influence area, these ports offer no competition as they only handle their own products. Hence, the cargoes and passengers handled at the Port of Davao (Sasa) are just part of the total traffic which can be handled in any of the three ports and as such the growth of the traffic in each of these ports in the future will be influenced by their share of the total traffic volume within the influence area, among other factors.

The presentation of the traffic handled in these three ports shall be called Davao Port Complex. Unfortunately, no data are available from 1982 to 1989 for the Port of Tefasco which was the period that NCSO was supposed to provide these data. However, the available data is enough to show the picture of the trend in the growth of the traffic in the port complex.

#### 6.3.1 Domestic Cargo Volume of Davao Port Complex

The three ports handled domestic cargoes and the total volume in 1980 was 1,070,217 metric tons. The Port of Davao (Sasa) accounted for 56.24% or 601,935 metric tons while the Port of Tefasco accounted for 25.91% or 277,289 metric tons and the Port of Sta. Ana handled 190,993 metric tons.

The domestic cargo volume increased to 2,409,268 metric tons in 1997. The average growth rate was 4.89% per year for the span of 18 years from 1980 to 1997. The share of the Port of Davao increased to 67.83% or 1,634,312 metric tons while the share of the Port of Tefasco has practically remained the same at 26.26% or 648,631 metric tons and the volume at the Port of Sta. Ana decreased to 126,325 metric tons or a share of only 5.24% of the total volume.

The average growth rate at the Port of Davao was 6.05% per year and the growth rate at the Port of Tefasco was 5.13% per year while there was a negative growth rate at the Port of Sta. Ana 2.40%.

**Table 6-4**  
**DOMESTIC CARGO TRAFFIC OF DAVAO PORT COMPLEX**  
 (in metric ton)

YEAR	DAVAO		STA. ANA		TEFASCO		TOTAL VOLUME
	%	VOL.	%	VOL.	%	VOL.	
1980	56.24	601,395	17.85	190,993	25.51	277,289	1,070,217
1981	50.12	511,212	22.44	228,869	27.44	279,926	1,020,007
1982		606,726		128,914			
1983		797,846		166,401			
1984		1,140,236		120,558			
1985		936,246		167,111			
1986		895,250		138,615	Data not available		
1987		1,135,121		138,118			
1988		1,430,907		253,013			
1989		1,269,150		109,870			
1990	72.82	1,394,545	7.68	146,996	19.50	373,558	1,915,099
1991	70.96	1,175,940	9.09	150,693	19.95	330,502	1,657,135
1992	65.45	1,069,286	8.59	140,285	25.96	424,229	1,633,800
1993	67.64	1,227,474	7.17	130,183	25.19	456,998	1,814,655
1994	66.29	1,401,960	6.66	140,897	27.05	572,142	2,114,999
1995	68.89	1,539,421	5.62	125,489	25.49	569,559	2,234,469
1996	62.11	1,376,201	6.72	148,878	31.17	690,579	2,215,658
1997	67.83	1,634,312	5.24	126,325	26.93	648,631	2,409,268

### 6.3.2 Foreign Cargo Volume of Davao Port Complex

Only the Ports of Davao and Tefasco handled the foreign cargo volume. The Port of Sta. Ana handled foreign cargoes but for only six years between 1990 and 1996 and the volume was very small compared to those handled at the other two ports. The volume was less than 2,000 metric tons per year, hence it is no longer included in the presentation below.

Total foreign cargo traffic volume in 1980 was 399,643 metric tons of which the Port of Davao handled 38.93% of the total cargo volume or 155,569 metric tons while the Port of Tefasco handled 244,074 metric tons. This cargo volume increased to 1,020,663 metric tons in 1997 where the Port of Davao handled 776,966 metric tons while the Port of Tefasco handled 243,697 metric tons.

The average growth rate of the total foreign cargoes was 5.67% per year. At the Port of Davao, the average growth rate was 9.92% per year while the average growth rate for the Port of Tefasco was nil.

The foreign cargo traffic is presented showing separately the import and export cargo volume in order to be consistent with the method in the projection of the cargo where import volume and export volume are projected separately.

**Table 6-5**  
**FOREIGN CARGO TRAFFIC OF DAVAO PORT COMPLEX**  
(in metric ton)

YEAR	IMPORT			EXPORT		
	DAVAO	TEFASCO	TOTAL	DAVAO	TEFASCO	TOTAL
1980	48,379	21,019	69,398	107,190	223,055	330,245
1981	28,450	45,672	74,122	82,514	224,175	306,689
1982	59,100					
1983	40,605	103,465				
1984	32,839	99,975				
1985	144,958	271,344				
1986	110,517	149,456				
1987	203,881	173,054				
1988	219,034	176,656				
1989	176,664	57,020				
1990	248,986	173,819	422,805	39,870	67,204	107,074
1991	210,021	87,261	297,282	41,815	34,970	76,785
1992	321,027	56,126	377,153	26,959	30,131	57,090
1993	294,094	75,254	359,348	40,229	18,344	58,573
1994	273,484	80,882	354,366	15,072	901	15,973
1995	379,728	68,225	446,990	33,740	10,367	44,107
1996	101,884	1,018,847	1,100,961	55,750	138,928	194,678
1997	604,748	91,773	696,521	172,218	151,924	324,142

### 6.3.3 Passenger Traffic of Davao Port Complex

Only the Port of Davao and Port of Sta. Ana handled passenger traffic. The volume in 1980 was 182,908 passengers with the Port of Davao handling only 3,342 passengers and the Port of Sta. Ana handling 179,566 passengers. This volume increased to 953,289 passengers in 1997 where the Port of Davao handled 148,015 passengers while the Port of Sta. Ana handled 805,274 passengers. However, the volume of passengers at the Port of Sta. Ana in 1996 was only 285,289 passengers. The increase of the passenger volume in 1997 was due to the development of a new tourist resort at the Samal Island where this port has been used as its connecting point.

**Table 6-6**  
**PASSENGER TRAFFIC OF DAVAO PORT COMPLEX**

YEAR	DAVAO		STA. ANA		TOTAL VOLUME
	%	VOL.	%	VOL.	
1980	1.83	3,342	98.17	179,566	182,908
1981	0.00	0	100.00	273,160	273,160
1982	33.11	67,989	66.89	137,364	205,353
1983	32.70	64,427	67.30	132,612	197,039
1984	55.08	83,465	44.92	680,79	151,544
1985	48.62	39,424	51.38	41,666	81,090
1986	47.94	32,167	52.06	34,927	67,094
1987	18.76	67,055	81.24	290,383	357,438
1988	26.71	99,376	73.29	269,965	369,341
1989	37.21	107,726	62.79	181,807	289,533

YEAR	DAVAO		STA. ANA		TOTAL VOLUME
	%	VOL.	%	VOL.	
1990	32.95	107,339	67.05	218,417	325,756
1991	34.99	116,441	65.01	216,370	332,811
1992	37.04	118,326	62.96	201,157	319,483
1993	53.21	166,327	46.79	146,287	312,614
1994	48.02	184,798	51.98	200,068	384,866
1995	37.50	188,991	62.50	314,920	503,911
1996	35.09	154,213	64.91	285,289	439,502
1997	15.53	148,015	84.47	805,274	953,289

#### 6.4 TOTAL CARGO TRAFFIC

The Port of Davao handled domestic and foreign cargo traffic. As a matter of fact, several privately owned ports located at the Gulf of Davao handled big volume of foreign cargoes. The exports dominated the trade where our bananas were handled in these ports for shipment to Asian countries.

The port handled 757,500 metric tons of cargoes in 1980 and increased to 2.411 million metric tons in 1997. The traffic volume of the cargoes handled at this port over the span of 18 years increased at the average growth rate of 7.05% per year. In the last five years, from 1993 to 1997, the growth rate of the cargo volume was impressive at 9.87% per year.

The yearly domestic cargo traffic accounted for more than 70% of the total cargo traffic except for the last 2 years where the share decreased to 56% due to large volumes in the import of cement, logs, mineral fuel and fertilizer at about 840,000 metric tons. The reason for the smaller volume of foreign cargoes handled at the Port of Davao in spite of the very big volume within the Davao Gulf area is that the exportations of bananas were all handled at the privately owned ports of the banana growers and exporters.

The inward cargoes dominated the flow of the traffic. It was 58.79% of the total cargo traffic in 1980 and the share went up to 66.87% in 1997. However, for the period from 1983 to 1986, outward cargo dominated the flow of traffic at about 55 to 60% of the total cargo volume.

The total cargo traffic volume at the port was characterized by fluctuating trends and occurred in three periods. First was in 1981 when there was the world recession which, started in 1980 when the price of the crude oil went up. The second started in 1984 when the peso devaluated tremendously and the third was from 1990 to 1997 where there was the power crisis. During these periods, the traffic volume of cargoes went down. These incidents were not unique for the Port of Davao as they affected also other ports of PPA. Some economists concluded that the 1983 incident has triggered the timidity of several businesses to invest as they became apprehensive not only on the stability of the peso but also the political stability of the country at that time. The power crisis has slowed down the production capability of the industrial and manufacturing sector to produce the needs of our country.

The cargo traffic is normally categorized as either domestic or foreign but starting in 1990, PPA used a separate category called transit cargo. The Port of Davao handled such cargoes in both the domestic and foreign traffic. These cargoes were included to the total cargo traffic volume but there were not categorized as either inward or outward cargoes and there were no details of the commodities and level of containerization.

Domestic transit cargoes are export products but shipped first to another domestic port where they are shipped out as export cargoes. Hence, these cargoes should be classified as outward domestic cargoes at the port. Foreign transit cargoes, on the other hand, are import cargoes handled at the port but have to be transported to another port of destination hence should be classified as inward foreign cargo traffic volume.

For the presentation then of the cargo traffic the figures do not show the transit cargoes anymore as a distinct traffic but incorporated already into the outward domestic volume for the domestic transit cargoes and to the import foreign volume for the foreign transit cargoes.

**Table 6-7**  
**TOTAL CARGO TRAFFIC VOLUME**  
(in metric ton)

YEAR	DOMESTIC	FOREIGN	TOTAL	% DOMESTIC
1980	601,935	155,569	757,504	79.46
1984	1,140,236	132,814	1,273,050	89.57
1985	938,246	416,302	1,354,548	69.27
1986	685,250	259,973	1,125,223	76.90
1987	1,135,121	376,935	1,512,056	75.07
1988	1,430,907	395,720	1,826,627	78.34
1989	1,269,150	233,684	1,502,834	84.45
1990	1,394,545	288,856	1,683,401	82.84
1991	1,175,940	251,836	1,427,776	82.36
1992	1,069,286	347,986	1,417,272	75.45
1993	1,227,474	324,323	1,551,797	79.10
1994	1,401,960	288,556	1,690,516	82.93
1995	1,539,421	413,468	1,952,889	78.83
1996	1,376,201	1,074,597	2,450,798	56.15
1997	1,634,312	776,966	2,411,278	67.78

**Table 6-8**  
**FLOW OF TOTAL CARGO TRAFFIC**  
(in metric ton)

YEAR	INWARD	OUTWARD	TOTAL	% DOMESTIC (inward)
1980	445,196	312,308	757,504	58.79
1984	518,812	754,238	1,273,050	40.75
1985	605,975	748,573	1,354,548	44.74
1986	521,193	604,030	1,125,223	46.32
1987	846,375	665,681	1,512,056	55.98
1988	1,010,872	815,755	1,826,627	58.19
1989	874,550	628,284	1,502,834	66.27
1990	1,077,440	605,961	1,683,401	64.02
1991	931,564	496,212	1,427,776	65.25
1992	987,987	429,285	1,417,272	69.71
1993	987,592	564,205	1,551,797	63.64
1994	1,144,553	545,963	1,690,516	67.70
1995	1,290,538	662,351	1,952,889	66.08
1996	1,822,151	628,647	2,450,798	74.35
1997	1,612,539	798,739	2,411,278	66.87

Containerization of the cargo traffic started even before the 1980. It started just after the North Harbor containerized its cargo in 1975. The 1980 volume of containerized cargoes was 300,570 metric tons or 39.68% of the total traffic. It has steadily increased to 1,346,031 metric tons and was 55.82% of the total cargo traffic in 1997. The average growth rate of the increase in volume was 9.22% per year for the span of 18 years. It is expected that the growth rate to be higher than the growth rate of the total cargoes since the container penetration has been increasing.

The volume of inward containerized cargoes was higher than the outward volume except for four years covering the period from 1982 to 1985. Again, this is to be expected in view of the higher percentage of the total inward volume than the outward volume, which is affecting the volume to be containerized for both the flows.

However, in spite of the lower containerized volume, outward cargoes have higher container penetration at 78.92% in 1997 as compared to 47.59% of the normal inward cargoes. This higher containerization level of the outward cargoes started in 1990 as shown in the following table and their levels of container penetration for 1995 and 1996 were more than 80%. The level of the containerization of the outward cargoes can reach even a higher percentage because the commodities being handled at the port are easily containerizable.

Table 6-9  
FLOW OF CONTAINERIZED TOTAL CARGO TRAFFIC

YEAR	TOTAL VOLUME (MT)			% CONTAINERIZED		
	INWARD	OUTWARD	TOTAL	INWARD	OUTWARD	TOTAL
1980	171,103	129,467	300,570	38.43	41.45	39.68
1984	270,199	291,698	561,897	52.08	38.67	44.14
1985	268,799	278,300	547,099	44.46	37.18	40.39
1986	275,746	246,394	522,140	52.91	40.79	46.40
1987	423,909	292,223	716,132	50.09	43.90	47.36
1988	516,223	313,439	829,662	51.07	38.42	45.42
1989	496,104	304,898	801,002	56.73	48.53	53.30
1990	484,223	339,490	823,713	44.94	61.91	50.67
1991	552,561	352,528	905,089	65.58	71.13	67.64
1992	499,886	324,962	824,848	56.99	75.82	63.17
1993	481,838	377,733	859,571	54.47	67.00	59.35
1994	603,540	404,374	1,007,914	54.23	79.24	62.10
1995	655,564	484,190	1,139,754	50.80	83.13	60.85
1996	600,842	444,092	1,044,934	2.97	81.30	44.12
1997	767,416	578,615	1,346,031	47.59	78.92	57.38

In terms of containers, there were 65,819 TEUs in 1990 with a load of 823,713 metric tons which is equivalent to a load of 12.51 metric tons per TEU. The number of containers reached 113,225 TEUs in 1997 with a load of 1,346,031 metric tons and the average unit load is 11.89 tons per TEU.

Table 6-10  
FLOW OF TEU CONTAINERS

YEAR	INWARD	OUTWARD	TOTAL
1990	32,649	33,170	65,819
1991	36,691	36,563	73,254
1992	38,387	36,230	74,617
1993	45,542	40,673	86,215
1994	45,392	44,639	90,031
1995	44,751	41,826	86,577
1996	47,354	45,704	93,058
1997	56,937	56,289	113,226

There were cargoes handled at the anchorage at the Davao Port. The volume was 145,913 metric tons in 1980 which accounted to 19.26% of the total cargo traffic. Their share decreased to less than 10% of the total cargo traffic volume from 1985 to 1993. However, they began to increase again in 1995 and by 1997, the volume was 313,420 metric tons which accounted for about 13% of the total cargo traffic.

Table 6-11  
DISTRIBUTION OF CARGO TRAFFIC BY HANDLING SITE  
(in metric ton)

YEAR	AT BERTH	AT ANCHORAGE	TOTAL	% AT BERTH
1980	611,591	145,913	757,504	80.74
1984	1,142,542	130,508	1,273,050	89.75
1985	1,252,161	102,387	1,354,548	92.44
1986	1,074,063	51,160	1,125,223	95.45
1987	1,466,767	45,269	1,512,036	97.01
1988	1,675,925	150,702	1,826,627	91.75
1989	1,502,834	0	1,502,834	100.00
1990	1,508,823	174,578	1,683,401	89.62
1991	1,319,942	107,834	1,427,776	92.45
1992	1,289,467	127,805	1,417,272	90.98
1993	1,396,941	154,846	1,551,787	90.02
1994	1,510,152	180,364	1,690,516	89.33
1995	1,725,283	227,606	1,952,889	88.35
1996	2,128,177	322,261	2,450,438	86.84
1997	2,097,858	313,420	2,411,278	87.00

## 6.5 DOMESTIC CARGO TRAFFIC

### 6.5.1 Cargo Volume

There are two government ports in the City of Davao handling domestic cargoes for the same market. One is located at Sta. Ana (Port of Sta. Ana) where it is practically at the central area of the city and the other one is located at about 10km. north of the city at Sasa (Port Of Davao). It is the latter port that handles most of the domestic cargoes.

The quantity of domestic cargo traffic handled at the Port of Davao in 1980 was 601,935 metric tons. The volume increased to 1.634 million metric tons in 1997. The average increase in the volume was 60,728 metric tons per year in a span of 18 years. The average growth rate was 6.05% per year from 1980 to 1997, the long term rate of increase.

However, the growth was characterized by fluctuations and the causes have been mentioned earlier. The traffic volume went down for several occasions, which coincided with the incidents described above. The incidents in 1983-84 and 1990-91 have more negative impact on the volume of domestic cargo traffic. The tremendous devaluation of the peso in 1984 has triggered the increase in the prices of commodities. The economy went down and the country registered a negative growth rate. The incident caused the decrease of the domestic cargo traffic at the port for two years. Just as the traffic was recovering, came the power crisis and oil price increase.

The volume of cargoes in 1981 went down by around 15% from the volume of 1980 but recovered the following year with more or less the same volume as in 1980. The domestic cargo traffic decreased in 1985 by 17.71% from the 1984 traffic and further went down by 7.78% in 1986. The volume in 1984 at 1,140,236 metric tons decreased to 865,250 metric tons in 1986 with the total decreased of 24%. The domestic cargo traffic in 1990 at 1.337 million metric tons went down to 1.07 million metric tons two years later. It was only in 1994 that the domestic cargo volume recovered to the cargo level of 1990. In spite of these fluctuations in the volume, the general trend was an increasing domestic cargo traffic for the Port of Davao.

The average growth rate for the first six years, from 1980 to 1985 was 2.98% per year while the average growth rate of 1985 to 1990 was 7.34% per year. The average growth rate however from 1990 to 1995 or to 1997 was very low at less than 3% per year on the average. This very low rate of increase of the volume was caused by the prolonged impact of the power crisis where there was no electricity for almost half of the day for more than of 2 years. The growth rates at different periods and intervals are as shown below.

PERIOD	AVE. GROWTH RATE PER YEAR
1980 - 1985	2.98%
1985 - 1990	8.25%
1990 - 1995	2.00%
1990 - 1997	2.29%
1993 - 1997	5.28%
1988 - 1997	1.48%
1980 - 1997	6.05%

There were imbalances between the inward and the outward flow of cargoes in the domestic trade handled at the port of Davao. The inward cargoes dominated the flow of around 55% to 62% out of the total domestic traffic handled at the port since 1987. It was more than 60% in 1980 to 1981 then decreased to 52% in the following year. By 1983, it was the outward cargoes that dominated the flow of traffic but at only around 51.5% of the total volume. This domination of the outward cargoes lasted for four years from 1983 to 1986. Thereafter, inward cargoes took over again at around 63% of the total traffic up to 1989 and by 1990 they controlled 60% of the domestic traffic up to 1997. The growth rate of the inward cargoes was 5.04% on the average per year and the outward cargoes was 6.79% per year on the average for the span of 18 years from 1980 to 1997.

YEAR	INWARD	OUTWARD	TOTAL	% INWARD
1980	396,817	205,118	601,935	65.92
1981	310,398	200,814	511,212	60.72
1982	313,864	292,862	606,726	51.73
1983	385,572	412,274	797,846	48.33
1984	485,973	654,263	1,140,236	42.62
1985	461,017	477,229	938,2,6	49.14
1986	410,676	454,574	865,250	47.46
1987	642,494	492,627	1,135,121	56.60
1988	791,838	639,069	1,430,907	55.34
1989	697,886	571,264	1,269,150	54.99
1990	828,454	566,091	1,394,545	59.41
1991	721,543	454,397	1,175,940	61.36
1992	666,690	402,326	1,069,286	62.37
1993	703,498	523,976	1,227,474	57.31
1994	871,069	530,891	1,401,960	62.13
1995	910,810	628,611	1,539,421	59.17
1996	803,304	572,897	1,376,201	58.37.
1997	1,007,791	626,521	1,634,312	61.66

The domestic cargo traffic handled at the anchorage basin in 1984 was 120,310 metric tons which was only 10.55% already of the total domestic cargo volume. Thereafter, the volume was less than 10% and remained at less than 10% up to 1996 but it went up to 11.14% in 1997 at 182,089 tons. The commodities handled were the refined petroleum products and logs.

**Table 6-13**  
**DOMESTIC CARGO HANDLED AT ANCHORAGE**  
 (in metric ton)

YEAR	INWARD		OUTWARD		TOTAL	
	VOL.	%	VOL.	%	VOL.	%
1980	99,721	25.13	17,503	8.83	117,224	19.47
1981	86,055	27.72	9,439	4.70	95,494	18.68
1982	0	0.00	0	0.00	0	0.00
1983	0	0.00	0	0.00	0	0.00
1984	73,593	15.14	46,717	7.14	120,310	10.55
1985	73,244	15.89	20,038	4.20	93,282	9.94
1986	38,378	9.35	9,238	2.04	47,661	5.51
1987	32,249	5.02	13,020	2.64	45,269	3.99
1988	72,853	9.20	77,849	12.18	150,702	10.53
1989	0	0.00	0	0.00	0	0.00
1990	110,814	13.38	13,841	2.45	124,655	8.94
1991	64,789	8.98	15,179	2.79	79,968	6.32
1992	56,145	8.42	18,253	3.56	74,398	6.30
1993	85,319	12.13	20,302	3.24	105,621	7.94
1994	109,648	12.59	4,157	0.74	113,805	7.94
1995	120,112	13.19	207	0.03	120,319	7.82
1996	101,471	12.63	11,286	1.97	112,757	8.19
1997	171,817	17.05	10,272	1.64	182,089	11.14

On the other hand, the traffic handled at berth comprised the bigger volume. It was 484,711 metric tons in 1980 and went up to 1,452,223 metric tons in 1997, an increase of 0.67% per year. The inward volume was 297,096 metric tons in 1980 and increased to 835,974 metric tons in 1997 an increase of 6.27% per year and the outward volume increased from 187,615 metric tons in 1980 to 616,249 metric tons in 1997 for a growth rate of 7.25% per year.

**Table 6-14**  
**DOMESTIC CARGO HANDLED AT BERTH**  
 (in metric ton)

YEAR	INWARD	OUTWARD	TOTAL
1980	297,096	187,615	484,711
1981	224,343	191,375	415,718
1982	313,864	292,862	606,726
1983	385,572	412,274	797,846
1984	412,380	607,546	1,019,926
1985	387,773	457,191	811,964
1986	372,298	445,291	817,589
1987	610,245	479,607	1,089,852
1988	718,985	561,220	1,280,205
1989	697,886	571,264	1,269,150
1990	717,640	552,250	1,269,890
1991	656,754	439,218	1,095,972
1992	610,815	384,073	994,888
1993	618,179	503,674	1,121,853
1994	761,421	526,734	1,288,155
1995	790,698	628,404	1,419,102
1996	701,833	561,611	1,263,444
1997	835,974	616,249	1,452,223

### 6.5.2 Commodity Volume

Commodity classification is one of the information concerning cargo traffic that is generated by the Authority. It is one of the data gathered when data generation system was used but discontinued when NSCO is supposed to process the data coming from the forms coded by PPA. The Authority resumed the data generation in 1990 when NSCO could no longer provide the data required by PPA. As already mentioned, the classification used by the Authority is a multi-level type which cut across the standard classification level defined by the government.

It seems that the levels in the classification of commodities as used by PPA depend on the significance of the commodity in terms of quantity. Some very detailed classifications used are rice, sugar, palay, cement, corn, plywood and fertilizer. These commodities in this group of classification are classed by the name of the goods. The other group of classification is by sectoral products. Goods in this group are classed in the commodity line they belong like steel products, wood and wood products, petroleum products and the transport equipment to name a few. For goods that cannot be classified in any of the two groups are placed under the general classification of Other General Cargo which is the catch-all classification of commodities not otherwise specifically classified.

The major commodities handled at the Port of Davao other than those classified under Other General Cargo were the petroleum products, bottled cargo, chemicals, fertilizer, animal feeds, transport equipment, logs and paper and pulp under the inward cargoes while animal feeds, copra, corn, fruits and vegetables and plywood and veneer under the outward cargoes.

Presented below are the types and the quantities of 16 major commodities being handled at the Port of Davao with the cargo volume of at least 20,000 metric tons in 1997.

#### A. REFINED PETROLEUM PRODUCTS

The petroleum products were the biggest specific commodity handled at the Davao Port at 119,085 metric tons in 1997. A large part of these cargoes were handled at the anchorage as inward traffic. The oil firms were suppose to handle these products at their own piers. Since these products were handled instead at the anchorage, they formed part of the cargo volume to be handled by the port. The products under this classification are gasoline, lube oil and other products of the oil companies. They were increasing very rapidly at around 90% per year from 1993 with a volume of only 9,173 metric tons to 1997.

FLOW	1993	1994	1995	1996	1997
In	9,018	45,635	58,499	79,790	118,578
Out	155	55	0	1701	507
TOTAL	9,173	45,690	58,499	81,451	119,085

## B. LOGS

Logs like the refined petroleum products were all handled at the anchorage as inward cargoes. The trend in the last five years is decreasing at a rate of 7.49% a year for the inward and declining rapidly for the outward cargoes. The volume was more than 100,000 metric tons in 1993 and went down to 62,700 metric tons in 1997. The log requirements of the area were augmented by the importation of logs.

FLOW	1993	1994	1995	1996	1997
In	9,018	45,635	58,499	79,790	118,578
Out	155	55	0	1701	507
TOTAL	9,173	45,690	58,499	81,491	119,085

## C. CORN

Corn is one of the major agricultural products of Mindanao and has been the supplier of the corn requirements of Cebu and the feed millers in Metro Manila in the manufacture of animal feeds. The Port of General Santos, Port of Davao and the Port of Cagayan de Oro are the outlets of the corn products in Mindanao.

Hence, this commodity was mostly an outward cargo however, it decreased from a volume of about 134,000 metric tons in 1993 to 53,100 metric tons by 1997. It was decreasing at a rate of 19.21% per year.

FLOW	1993	1994	1995	1996	1997
In	501	750	310	1,714	112
Out	134,019	99,760	125,446	79,907	57,104
TOTAL	134,517	100,510	125,756	81,621	57,216

## D. TRANSPORT EQUIPMENT

These are products related to the transportation industry.

As a metropolitan area, Davao City needs such equipment to complement their growth. The volume of this traffic was increasing at the rate of 21.74% per year. On the other hand, there were some outward volume of this commodity and increasing also at a rate of 11.34% per year.

FLOW	1993	1994	1995	1996	1997
In	22,319	23,886	18,038	32,028	49,019
Out	4,127	3,326	2,694	4,531	6,343
TOTAL	26,446	27,212	20,725	36,559	55,362

## E. FERTILIZER

The surrounding areas of the province of Davao are devoted to agriculture specially as plantations for bananas, which are being exported to other countries. Hence, they need fertilizer and this product is naturally an inward cargo.

The volume handled at the port was increasing at a rate of 9.29% per year from 30,103 metric tons in 1993 to 43,383 metric tons in 1997.

FLOW	1993	1994	1995	1996	1997
In	29,038	27,706	38,242	54,514	41,420
Out	1,065	1,774	7,270	5,314	1,963
<b>TOTAL</b>	<b>30,103</b>	<b>29,480</b>	<b>45,512</b>	<b>59,828</b>	<b>43,383</b>

#### F. MACHINERY AND ELECTRICAL EQUIPMENT

These products like the transport equipment are needed by growing urban areas like Davao City. They need equipment for factories, transportation, electricity and other such industries. The inward volume has been increasing at the rate of 5.20% per year. There was a significant outward cargo ranging from 4,840 to 5,858 metric tons.

FLOW	1993	1994	1995	1996	1997
In	29,991	31,816	43,912	29,401	36,727
Out	4,840	2,833	3,778	3,067	5,858
<b>TOTAL</b>	<b>34,831</b>	<b>34,649</b>	<b>47,690</b>	<b>32,468</b>	<b>42,585</b>

#### G. PAPER AND PULP

The general trend for the inward volume of paper and pulp has been decreasing from as high as around 107,000 metric tons in 1993 to only 35,200 metric tons by 1997. On the other hand, the outward volume which was smaller than the inward volume was showing an increasing trend at the rate of 15.65% per year.

FLOW	1993	1994	1995	1996	1997
In	107,653	12,6460	65,326	31,999	35,223
Out	2,947	3,345	5,016	6,081	5,320
<b>TOTAL</b>	<b>110,600</b>	<b>129,805</b>	<b>70,342</b>	<b>38,080</b>	<b>40,543</b>

#### H. FRUITS AND VEGETABLES

This category includes fresh, frozen or preserved fruits, tubers and other edible vegetable products. The products that were mostly handled at the port were fresh fruits as outward cargoes. This is obvious since the Davao province and other neighboring provinces situated in the south east part of Mindanao have several large commercial plantations of fruit trees like the bananas, papayas, pomelo and other fruits which are only coming from that area.

The outward fruits were decreasing at the rate of 18.26% a year but had stabilized in the last three years at around 35,000 metric tons per year. In the inward traffic cargo volume, it remained at a level of around 3,500 metric tons but has reached 8,000 metric tons in 1995.

FLOW	1993	1994	1995	1996	1997
In	3,375	6,653	8,307	7,889	3,584
Out	79,784	81,107	38,195	34,034	35,627
<b>TOTAL</b>	<b>83,159</b>	<b>87,760</b>	<b>46,502</b>	<b>41,923</b>	<b>39,211</b>

## I. MANUFACTURE OF METALS

The manufacture of metals are products made of metals like galvanized iron sheets and metal panels. The volume was increasing at the rate of 45.14% a year from 7,112 metric tons in 1993 to 31,560 metric tons in 1997. The outward cargo traffic volume for the product was also significant which even reached more than 38,000 metric tons in 1995.

FLOW	1993	1994	1995	1996	1997
In	7,112	18,973	14,125	5,448	31,560
Out	2,374	19,064	38,525	16,800	7,072
TOTAL	9,486	38,037	52,650	22,248	38,632

## J. CHEMICALS

Chemical products include industrial chemicals, medicinal and pharmaceutical and other non-industrial chemicals like essential oils, perfume products, explosives and plastic products.

The volume was mostly an inward cargo and the quantity has remained at around 35,000 metric tons.

FLOW	1993	1994	1995	1996	1997
In	36,995	38,066	56,108	42,907	34,442
Out	3,985	5,300	5,884	5,116	2,964
TOTAL	40,980	43,366	61,992	48,023	37,406

## K. ANIMAL FEEDS

Both inward and outward cargo volumes of animal feeds were significant. The inward cargoes have practically remained at around 14,000 metric tons per year while outward cargoes have almost remained the same at around 22,000 metric tons per year. The abundance of the production of corn in the area has contributed to the development and manufacture of this product within the area.

FLOW	1993	1994	1995	1996	1997
In	13,806	12,355	16,984	18,115	14,322
Out	23,039	21,312	33,289	21,923	21,914
TOTAL	36,845	33,667	50,273	40,038	36,236

## L. PLYWOOD AND VENEER

The Davao area is the home of many plywood manufacturers. The presence then of virgin forests in the eastern part of Mindanao especially in the Agusan area has contributed the establishment of plywood plants in the area and the Davao Port is their outlet in the distribution of their product.

Plywood is one of the forest products which used to be one of the major exports of the country. This product was an outward cargo and has been increasing at the rate of 30.12% per year.

FLOW	1993	1994	1995	1996	1997
In	1,094	1,773	2,147	915	1,353
Out	10,817	20,225	27,785	29,212	31,009
TOTAL	11,911	21,998	29,932	30,127	32,362

#### M. BOTTLED CARGO

Bottled cargo is the category composed of several products but limited to the general classification of beverages and the non-beverage bottled products like fish sauce, vinegar and soy sauce are included under the Other General Cargo.

The bottled cargo is mostly inward volume composed of the soft drinks and beer, but the trend is going down. There might be one problem with this classification. The soft drinks and beer are no longer all in bottles and some are already in cans and plastics. Are they still be classed as bottled cargo or already under Other General Cargo?

FLOW	1993	1994	1995	1996	1997
In	73,193	88,645	76,122	33,759	27,760
Out	1,136	416	1,663	821	733
TOTAL	74,329	89,601	77,785	34,580	28,493

#### N. PALAY AND RICE

Palay and rice are traditionally handled as outward cargoes at the port with minimal inward cargo volume. However in 1997, the outward volume suddenly decreased from the level of around 23,000 metric tons to 6,600 metric tons but the inward volume increased suddenly from the level of 2,500 metric tons to 17,830 metric tons.

FLOW	1993	1994	1995	1996	1997
In	474	292	2,569	2,271	17,835
Out	25,949	16,722	41,134	23,113	6,606
TOTAL	26,423	17,014	43,703	25,384	24,441

#### O. IRON AND STEEL PRODUCTS

Iron and steel products are composed of the specific goods related to these two metals. They are pig iron, ingots, iron and steel bars and rods, steel plates, iron and steel wires, pipes and other iron and steel primary products.

The inflow of these products has been increasing at a rate of 33.18% per year. They are needed in the construction and manufacturing sectors in the economy of Davao area.

FLOW	1993	1994	1995	1996	1997
In	6,937	19,291	31,383	7,754	21,822
Out	655	1,328	1,963	497	2,039
TOTAL	7,592	20,619	33,351	8,251	23,861

**P. COPRA**

Like in several ports in the Visayas and Mindanao copra is one of products that is on the outward cargo. The volume was increasing at a very high rate.

FLOW	1993	1994	1995	1996	1997
In	90	139	48	966	275
Out	2,757	9,003	6,961	17,551	20,245
<b>TOTAL</b>	<b>2,847</b>	<b>9,142</b>	<b>7,009</b>	<b>17,817</b>	<b>20,520</b>

**Q. OTHER GENERAL CARGO**

This is not commodity classification. This is a category adopted by PPA as catch-all classification of commodities, which can not be classified in the categorization, adopted by the Authority. The volume of the specific commodity under this category is not big but since there are several types of the commodities, then the total volume under this classification is very big. This classification has been the biggest volume in both the inward and outward traffic.

Both volumes have been increasing.

FLOW	1993	1994	1995	1996	1997
In	181,056	268,478	314,362	345,341	441,314
Out	50,347	100,758	165,217	178,378	315,478
<b>TOTAL</b>	<b>231,403</b>	<b>369,236</b>	<b>479,579</b>	<b>523,719</b>	<b>756,792</b>

**R. SUMMARY OF COMMODITIES**

The volume of the other products was very small hence, are no longer presented in details. However, all commodities handled at the port in 1997 are presented below. There were 31 commodities each for the inward and outward cargo traffic.

**Table 6-15**  
**1997 DOMESTIC CARGO BY COMMODITY ITEMS**  
**(in metric ton)**

COMMODITY TYPE	INWARD	OUTWARD	TOTAL
Abaca	124	3,441	3,565
Animal Feeds	14,322	21,914	36,236
Bottled Cargo	27,760	733	28,493
Cement	240	834	1,074
Chemicals	34,442	2,964	37,406
Coconut Oil	0	1,100	1,100
Copra	275	20,245	20,520
Corn	112	57,104	57,216
Crude Minerals	6,342	9,416	15,758
Dairy Products	14,412	130	14,542
Fertilizer	41,420	1,963	43,383
Fish/Fish Prep.	10,391	535	10,926
Fruits/Veg.	3,584	35,622	39,206
Furniture	12,232	3,449	15,681
Iron/Steel	21,822	2,039	23,861
Live Animals	47	3,117	3,164
Logs	61,860	874	62,734
Lumber	5,838	8,323	14,161
Mach./Elec. Equip.	36,727	5,858	42,585
Manufactures of Metal	31,560	7,072	38,632
Metaliferous Ores	501	54	555
Mineral Fuel	135	0	135
Other Gen. Cargo	441,314	315,478	756,792
Palay/Rice	17,835	6,606	24,441
Paper /Pulp	35,223	5,320	40,543
Plywood/Veneer	1,353	31,009	32,362
Ref. Petroleum Prod.	118,578	507	119,085
Sugar	3,277	111	3,388
Textile/Garments Prod.	1,496	292	1,788
Tobacco	13,358	243	13,601
Transport Equip.	49,019	6,343	68,963
Wheat	2,192	8,277	10,469
<b>TOTAL</b>	<b>1,007,791</b>	<b>560,972</b>	<b>1,568,763</b>

### 6.5.3 Containerized Volume

Containerization is another information related to the cargo traffic which is generated by PPA. It is one of the methods in the packaging and handling of commodities. It started in the Philippines at South Harbor sometime in 1971 for foreign cargoes. The containerization of the domestic cargoes started only in 1976 by one of the local shipping lines and then was followed by the other shipping lines two years after.

Containerization of domestic cargoes at the port began in 1977 and there were 300,570 metric tons containerized in 1980 that accounted for 50% of the total domestic cargo volume. Since then, both the volume and level of containerization have been increasing. The containerized volume increased to 1,156,528 metric tons and reached 70.8% of total domestic cargoes. The containerized volume was also affected by incidents mentioned above but not as significant as the total volume.

The average growth rate of the containerized cargoes was 8.25% per year from 1980 to 1997. Obviously, the growth rate was higher than the growth of the total cargo traffic because the level of penetration was increasing. In the first six years from 1980 to 1985 the average growth rate was 12.20% per year but the rate went down to 9.03% per year from 1985 up to 1990 and further down to 6.65% in 1990 to 1995.

**Table 6-16**  
**CONTAINERIZED AND NONCONTAINERIZED DOMESTIC CARGO**  
(in metric ton)

YEAR	CONTAINERIZED	NON CONTAINERIZED	TOTAL
1980	300,570	301,365	601,935
1981	276,436	234,786	511,222
1982	400,928	205,798	606,726
1983	509,518	288,768	797,846
1984	561,819	578,417	1,140,236
1985	534,463	403,783	938,246
1986	519,894	345,356	865,250
1987	703,591	431,530	1,135,121
1988	765,848	665,059	1,430,907
1989	799,718	469,432	1,269,150
1990	823,713	513,221	1,336,934
1991	905,089	270,264	1,175,353
1992	819,850	248,725	1,068,575
1993	823,830	388,145	1,226,975
1994	1,007,914	358,406	1,366,320
1995	1,136,679	402,742	1,539,421
1996	979,303	396,898	1,376,201
1997	1,156,528	477,784	1,634,312

Like the total cargo, there were more containerized cargoes in the inward than the outward flow. They accounted for 60% of total domestic containerized cargoes. There were 171,103 metric tons of containerized inward cargoes in 1980 increasing to 679,233 metric tons in 1997. The containerization levels were 42.27% and 67.40% respectively. Their average rate of growth was 8.45% per year from 1980 to 1997.

On the other hand, the containerization levels of the outward cargoes were 63.12% in 1980 and 76.18% in 1997. Their growth rate from 1980 to 1997 was 7.98% per year. It is surprising to see that in spite of the lower volume of the outward cargo traffic, they have much higher containerization levels. The reason is that there were large volumes of inward commodities like refined petroleum products and logs that were handled as bulk and at the anchorage better than in containers. On the other hand, the outward domestic commodities at the port were easily containerizable.

The effect of the transit cargo must be explained in relation to the level of containerization. While there were reports on the volume of the transit cargo from 1990 to 1997 separate from the normal inward and outward flows, there were no data on their level of containerization. As explained above, the volume of domestic transit cargo was included in the domestic outward flow. However, the containerized volume based on the statistics of PPA is only for the normal outward flow.

The containerized volume then should only be compared to the normal flow without the transit cargoes to determine the level of containerization but the problem is that prior to 1990 the volume of the transit cargoes may have been included already in the outward flow. Hence, the level of containerization will be compared to with the transit cargoes prior to 1990 and without the transit cargoes from 1990 to the present. To be consistent, the determination of the containerization level of the past domestic cargo volume at the port should be based on the outward flow with the transit cargoes.

Table 6-17  
FLOW OF CONTAINERIZED DOMESTIC CARGO  
(in metric ton)

YEAR	INWARD		OUTWARD		TOTAL	
	VOLUME	%	VOLUME	%	VOLUME	%
1980	171,103	46.27	129,467	63.12	300,570	49.93
1981	142,540	45.91	133,896	66.68	276,436	54.07
1982	192,732	61.41	208,196	71.09	400,928	66.08
1983	242,633	62.93	266,945	64.75	509,578	63.87
1984	270,121	55.58	291,698	44.58	561,819	49.27
1985	258,131	55.99	276,332	57.90	534,463	56.96
1986	275,742	67.14	244,152	53.71	519,894	60.09
1987	414,833	54.57	288,758	58.62	703,591	61.98
1988	483,222	61.03	282,626	44.22	765,848	53.52
1989	496,104	71.09	303,614	53.15	799,718	63.01
1990	484,223	58.45	339,490	66.77	823,713	61.61
1991	552,561	76.58	352,528	77.68	905,089	77.00
1992	499,096	74.83	320,754	79.87	819,850	76.72
1993	476,475	67.73	362,355	69.22	838,830	68.37
1994	603,540	69.29	404,374	81.65	1,007,914	73.77
1995	654,181	71.82	482,498	76.76	1,136,679	73.84
1996	563,642	70.17	415,661	72.55	979,303	71.06
1997	679,233	67.40	477,295	76.18	1,156,528	70.77

The highly containerized inward commodities were the bottled cargo, animal feeds, chemicals, copra, mineral fuel, cement, paper and pulp, tobacco and manufactures, dairy products and several other commodities. These commodities have attained more than 90% level of containerization.

There were also several commodities which have high degree of containerization. They were sugar, crude minerals and mach. and elect. equipment and animal feeds which have at least 50% level of containerization. Commodities with a repeatable level of containerization were iron and steel, transportation equipment, plywood and veneer with the containerization level of at least 20% of the total volume of the commodity.

The commodities with very low level of containerization were fertilizer, logs, palay and rice, refined petroleum products and lumber. The logs were handled at the anchorage area as breakbulk cargoes and so with most of the refined petroleum as bulk cargoes.

On the other hand, the outward commodities which were highly containerized were more or less the same commodities as those as the inward domestic cargo traffic. However, the refined petroleum products, palay and rice were highly containerized unlike in the inward cargo.

The outward commodities with high degree for containerization were fumitures, iron and steel, fertilizer, mach. and elect. equipment and manufactures of metals. Except for fertilizer at 46.46%, the other commodities have more than 50% of their volumes being containerized.

The commodities with very low level of containerization were crude minerals, plywood and veneer, coconut oil and the logs. The coconut oil was handled in liquid bulk and the logs were handled at the anchorage. These two commodity items are not expected to be containerized.

The following table shows the 1997 containerized commodities. It is to be noted that the transit cargoes which were domestic outward volume at 65,549 metric tons in 1997 are not included since their commodity classification and containerized volume were not undertaken by the Authority.

**Table 6-18**  
**1997 CONTAINERIZED DOMESTIC COMMODITIES**  
**(in metric ton)**

COMMODITIES	TOTAL	CONTAINERIZED	% CONTAINERIZED
<b>I. INWARD CARGO</b>			
<b>A. Above 70%</b>			
1. Abaca	124	124	100.00
2. Mineral Fuel	135	135	100.00
3. Copra	275	275	100.00
4. Tobacco Products	13,358	13,358	100.00
5. Wheat	2,192	2,192	100.00
6. Dairy Products	14,412	14,384	99.81
7. Paper and Pulp	35,223	35,142	99.77
8. Tex. and Garments	1,496	1,492	99.73
9. Cement	240	238	99.17
10. Fumitures	12,232	11,950	97.69
11. Bottled Cargo	27,760	26,933	97.02
12. Fruits and Veg.	3,584	3,458	96.48
13. Manuf. of Metals	31,560	30,352	96.17
14. Gen. Cargo	441,314	420,331	95.25
15. Chemicals	34,442	32,324	93.85
16. Live Animals	47	44	93.62
17. Metaliferous Ores	501	458	91.42
18. Fish and Fish Products	10,391	9,323	89.72
19. Corn	112	91	81.25
20. Animal Feed	14,322	11,151	77.86
21. Sugar	3,277	2,326	70.98
22. Mach./Elec. Equipment	36,727	25,869	70.44
<b>TOTAL</b>	<b>663,724</b>	<b>641,950</b>	<b>93.89</b>
<b>B. Between 20% and 70%</b>			
1. Crude Minerals	6,342	3,253	51.29
2. Iron and Steel	21,822	8,030	36.80
3. Trans. Equipment	49,019	11,571	23.61
4. Plywood/Veneer	1,353	277	20.47
<b>TOTAL</b>	<b>78,536</b>	<b>23,131</b>	<b>29.45</b>

COMMODITIES	TOTAL	CONTAINERIZED	% CONTAINERIZED
<b>C. Below 20%</b>			
1. Ref. Pet. Products	118,578	13,381	11.28
2. Lumber	5,838	84	1.43
3. Fertilizer	41,420	485	1.17
4. Palay/Rice	17,835	202	1.13
5. Logs	61,860	0	0.00
<b>TOTAL</b>	<b>245,531</b>	<b>23,131</b>	<b>29.45</b>
<b>GRAND TOTAL</b>	<b>1,007,791</b>	<b>679,233</b>	<b>67.40</b>
<b>II. OUTWARD CARGO</b>			
<b>A. Above 70%</b>			
1. Animal Feeds	21,914	21,914	100.00
2. Cement	834	834	100.00
3. Copra	20,245	20,245	100.00
4. Dairy Products	130	130	100.00
5. Metaliferous Ores	54	54	100.00
6. Tex. and Garments	292	292	100.00
7. Tobacco Products	242	242	100.00
8. Paper and Pulp	5,320	5,312	99.98
9. Bottled Cargo	733	732	99.86
10. Corn	57,104	56,962	99.75
11. Palay and Rice	6,606	6,577	99.56
12. Live Animals	3,117	3,103	99.55
13. Abaca	3,441	3,418	99.33
14. Wheat	8,277	8,140	98.34
15. Fruits and Vegetables	35,622	34,408	96.59
16. Sugar	111	107	96.40
17. Chemicals	2,964	2,835	95.65
18. Fish and Fish Products	535	499	93.27
19. Gen. Cargo	315,478	289,848	91.88
20. Ref. Pet. Products	507	423	83.43
21. Furnitures	3,449	2,648	76.78
22. Manuf. Metals	7,072	5,038	71.24
<b>TOTAL</b>	<b>502,370</b>	<b>468,988</b>	<b>93.36</b>
<b>B. Between 20% and 70%</b>			
1. Iron and Steel	2,039	1,319	64.69
2. Mach./Elec. Equip.	5,858	3,484	59.47
3. Fertilizer	1,963	912	46.46
<b>TOTAL</b>	<b>9,860</b>	<b>5,715</b>	<b>57.96</b>
<b>C. Below 20%</b>			
1. Trans. Equip.	6,343	1,063	16.76
2. Crude Materials	9,416	465	4.94
3. Plywood/Veneer	31,009	1,064	3.43
4. Coconut Oil	1,100	0	0.00
5. Logs	874	0	0.00
<b>TOTAL</b>	<b>48,742</b>	<b>2,592</b>	<b>5.32</b>
<b>GRAND TOTAL</b>	<b>550,972</b>	<b>477,295</b>	<b>85.08</b>

### 6.5.4 Containers

Containers for containerized cargo are expressed as either in boxes or twenty equivalent units (TEU). A 20-foot container is one TEU while a 40-foot container is two TEUs. In 1990, there were 65,819 TEUs handled at the Port of Davao with the load of 823,713 metric tons of containerized domestic cargoes. The container volume increased to 96,018 TEUs in 1997 with a load of 1.157 million metric tons. The containers have been increasing at the rate of 5.54% per year.

The share of empty containers in the inward flow for the last 8 years was 15.74% per year of the total containers. Except for two years from 1991 and 1993, where the empty containers accounted for more than 20%, the average share of the empties to the total inward container traffic for the remaining years was around 13.50% per year.

On the other hand, the percentage share of the empties in the outward domestic containers was 18.4% in 1990 and went up to around 42% in 1997. This is to be expected since the inward containerized domestic cargoes have the bigger volume than the outward containerized cargoes hence, they required more number of containers which the latter may not need. The result was higher level of empty outward containers and their number was based as a residual volume.

The following tables show the distribution of the containers in terms of flow, loaded and empty and the percentage of the loaded containers for the period from 1990 to 1997.

Table 6-19  
FLOW OF DOMESTIC TEU CONTAINERS

YEAR	INWARD	OUTWARD	TOTAL
1990	32,649	33,170	65,819
1991	36,689	36,563	73,252
1992	38,202	35,890	74,092
1993	44,487	38,948	83,435
1994	45,392	44,639	90,031
1995	44,632	41,820	86,452
1996	44,154	42,755	86,929
1997	48,143	47,875	96,018

Table 6-20  
LOADED AND EMPTY DOMESTIC TEU CONTAINERS

YEAR	INWARD			OUTWARD		
	LOADED	EMPTY	% EMPTY	LOADED	EMPTY	% EMPTY
1990	28,356	4,293	13.15	23,734	9,436	28.45
1991	29,168	7,521	20.50	27,286	9,277	25.37
1992	31,905	6,297	16.50	25,799	10,091	28.12
1993	34,277	10,210	22.95	26,379	12,569	32.27
1994	39,471	59,21	13.04	27,740	16,899	37.86
1995	39,497	51,35	11.51	27,969	13,851	33.12
1996	37,415	63,79	15.26	28,761	14,014	32.73
1997	41,638	65,05	13.51	27,911	19,964	41.70

The load per loaded container at the Port of Davao appears to be on the high side. The maximum load of the 20 footers and 8 feet high is 21.50 metric tons. If the average load is 18 tons per TEU, the upper volume in the range of loading may be more than the maximum load per TEU. However, as compared to the loading at North Harbor which reached the average of even more than 20 metric tons per TEU, the load per TEU at the Port of Davao was much lower.

The average load of the inward domestic containers was 17.08 metric tons each TEU in 1990 but this load decreased to 16.31 metric tons in 1997. The highest average load ever attained within the 8 years period was 18.94 metric tons per TEU which occurred in 1991 while the lowest average load which happened in 1993 was 13.90 metric tons per TEU and the overall average load for the period was 16.02 metric tons per TEU.

On the outward flow, the average load in 1990 was 14.3 metric tons per TEU and increased to 17.1 metric tons in 1997. The highest average load was 17.25 metric tons per TEU which was attained in 1995 and the lowest average load was 12.43 metric tons per TEU with overall average load of 14.63 metric tons.

**Table 6-21**  
**LOAD PER LOADED DOMESTIC TEU CONTAINERS**  
(in metric ton)

YEAR	INWARD	OUTWARD	TOTAL
1990	17.08	14.30	15.81
1991	18.94	12.92	16.03
1992	15.64	12.43	14.21
1993	13.90	13.74	13.83
1994	15.29	14.58	15.00
1995	16.56	17.25	16.85
1996	15.06	14.45	14.80
1997	16.31	17.10	16.63
AVE.	16.02	14.63	15.42

The volume of TEUs is actually derived from the containers in boxes. In the domestic traffic at the Port of Davao, 10 and 20-foot containers were the mostly used boxes which accounted for more than 90% of the total boxes and the rest were the 40 foot containers. Boxes smaller than 10 footers that were in used during the early part of domestic cargo containerization are no longer being used in bigger ports like Port of Davao.

The percentage of 10 footers has been decreasing from 23.82% in 1994 to 19.90% in 1997. It is obvious that the 20 and 40 footers increased to fill up the reduction of the 10 footers.

**Table 6-22**  
**DISTRIBUTION OF DOMESTIC CONTAINER BOXES**

YEAR	SIZE	EMPTY	LOADED	TOTAL	% OF TOTAL	TEU
1994	10	4,663	18,513	23,176	23.62	11,588
	20	17,841	51,996	69,837	71.76	69,837
	40	1,324	2,979	4,303	4.42	8,606
TOTAL		23,828	73,488	97,316	100.00	90,031
1995	10	3,101	16,755	19,856	21.88	9,928
	20	14,457	50,778	65,235	71.90	65,235
	40	1,490	4,155	5,645	6.22	11,290
TOTAL		19,048	71,688	90,736	100.00	86,453
1996	10	2,999	12,688	15,687	17.94	7,843
	20	15,157	49,220	64,377	73.65	64,377
	40	2,048	5,306	7,354	8.41	14,708
TOTAL		20,204	67,214	87,418	100.00	86,928
1997	10	5,532	14,463	19,995	19.90	9,997
	20	19,695	55,262	74,957	74.60	74,957
	40	2,004	3,528	5,532	5.50	11,603
TOTAL		27,231	73,253	100,484	100.00	96,018

## 6.6 FOREIGN CARGO TRAFFIC

### 6.6.1 Volume of Cargo

The Port of Davao handled significant volume of foreign cargo traffic ranging from around 20% in 1980 to about 32% in 1997.

The volume of foreign cargo traffic at the Port of Davao has been increasing at much higher rate than the domestic cargoes. In 1980, the volume was 155,569 metric tons and has increased to 776,966 metric tons in 1997 in the span of 18 years. The rate of growth for that span of years was on the average 9.92 percent per year.

The volume of foreign cargoes fluctuated and even decreased in some years which appeared affected also by the same incidents mentioned earlier which affected the domestic cargoes, only at different magnitudes. The volume of the cargoes went down by 28.67% in 1981 and thereafter began increasing up to 1985 but again decreased in the following year. The volume of cargoes up to 1995 has not shown any sign of an upward trend because the increase in import volume was dampened by the decrease in the export volume. The increase in the volume which started in 1995 was very abrupt as both flows increased. The volume reached 1,074,597 metric tons in 1996 which was only 288,556 metric tons two years before.

The reason for the big volume of foreign cargoes was the large quantity of imports of cement, fertilizer, crude minerals and logs in 1996 and 1997 where their aggregate volume accounted for 78% of the total import volume handled at the port. The products were varied hence, to be used in several activities. It is suspected then that the excess imports over the normal requirements of the area were needed in other areas which were unloaded at the Port of Davao as diverted traffic.

For the last ten years from 1988 to 1997, the average rate of growth was 7.78% a year and in the last five years, from 1993 to 1997, the average growth rate was even much higher at more than 24.00% per year. The average growth rate for the first 6 years, 1980 to 1985 was also impressive at 21.76% per year. On the other hand, from 1985 to 1990, the rate of growth was negative at 7.05% per year, the indication of the fluctuating trend in the increase of foreign cargo traffic at the Port of Davao. Another characteristic of the foreign cargoes handled at the port was some sudden increases of volume that occurred in 1985 and in 1996.

PERIOD	AVE. GROWTH RATE/YEAR
1993 – 1997	24.41%
1988 – 1997	7.78%
1980 – 1985	21.76%
1985 – 1990	-7.05%
1990 – 1995	7.43%
1980 – 1997	9.92%

There were imbalances in the volume of foreign cargoes between exports and imports as well as shifts in the imbalance of the volume. From 1980 to 1986, the volume of exports was higher than the imports and thereafter up to 1997, the import volume was higher. Actually, the volume of the export cargoes after 1985 was decreasing from 271,344 metric tons to 15,072 metric tons only in 1994 while the volume of imports was increasing. By 1997, the import traffic accounted for 604,748 metric tons out of the 776,966 metric tons or 77.83% of the total foreign cargo traffic at the port.

The average growth rate of import cargoes was 16.02% per year and that of the export cargoes was only 2.83% per year in 1980 to 1997. The following table shows the yearly foreign cargo traffic as well as the flow of the cargoes.

Table 6-23  
FLOW OF FOREIGN CARGO  
(in metric ton)

YEAR	IMPORT	EXPORT	TOTAL	% IMPORT
1980	48,379	107,190	155,569	31.10
1981	28,450	85,514	110,964	25.64
1982	59,150	57,810	116,910	50.55
1983	40,605	103,465	144,070	28.18
1984	32,839	99,975	132,814	24.73
1985	144,958	271,344	416,301	34.82
1986	110,517	149,456	259,973	42.51
1987	203,881	173,054	376,935	54.09
1988	219,034	176,686	395,720	55.35
1989	176,664	57,020	233,684	75.60
1990	248,986	39,870	288,856	86.20
1991	210,021	41,815	251,836	83.40
1992	321,027	26,959	347,986	92.25
1993	284,094	40,229	324,323	87.60
1994	273,484	15,072	288,556	94.78
1995	379,728	33,740	413,468	91.84
1996	1,018,847	55,750	1,074,597	94.81
1997	604,748	172,218	7,769,66	77.83

Some foreign cargo traffic were handled at the anchorage and their volume has been fluctuating. There were 28,689 metric tons in 1980 and increased to 131,331 metric tons in 1997.

The export traffic handled at the anchorage was more than 30% of the total exports in 1982, however, their volume decreased and was less than 10% from 1983 to 1986. After 1986, there was no more export cargo at the anchorage except in 1993.

On the other hand, there was no import traffic handled at the anchorage prior to 1990. However after 1990, all the cargoes handled at anchorage were imports except in 1993. The cargo volume was more than 20% of the total import cargo since 1994 and this was due to the big volume of the importation of logs which were handled at the anchorage.

**Table 6-24**  
**FOREIGN CARGO HANDLED AT ANCHORAGE**  
(in metric ton)

YEAR	EXPORT		TOTAL		VOLUME	%
	VOLUME	%	VOLUME	%		
1980	0	0.00	28,689	26.76	28,689	14.38
1981	3,540	12.44	33,293	40.35	36,833	33.19
1982	0	0.00	0	0.00	0	0.00
1983	0	0.00	0	0.00	0	0.00
1984	3,002	9.14	7,196	7.20	10,198	7.68
1985	0	0.00	9,105	3.36	9,105	2.19
1986	0	0.00	3,499	2.34	3,499	1.35
1987	0	0.00	0	0.00	0	0.00
1988	0	0.00	0	0.00	0	0.00
1989	0	0.00	0	0.00	0	0.00
1990	49,923	20.05	0	0.00	49,923	17.28
1991	27,866	13.27	0	0.00	27,866	11.06
1992	53,407	16.64	0	0.00	53,407	15.35
1993	36,988	13.02	12,237	30.42	49,225	15.18
1994	66,559	24.34	0	0.00	66,559	23.07
1995	107,287	28.25	0	0.00	107,287	25.95
1996	209,864	20.60	0	0.00	209,864	19.53
1997	131,331	21.72	0	0.00	131,331	16.90

The volume of foreign cargo traffic handled at the berth was 126,880 metric tons in 1980 and increased to 645,635 metric tons in 1997. The import cargo volume increased from 48,379 metric tons in 1980 to 473,417 metric tons in 1997 while the export cargo volume increased from 78,501 metric tons in 1980 to 172,218 metric tons in 1997.

**Table 6-25**  
**FOREIGN CARGO HANDLED AT BERTH**  
 (in metric ton)

YEAR	IMPORT	EXPORT	TOTAL
1980	48,379	78,501	126,880
1981	24,910	49,221	74,131
1982	59,100	57,910	116,910
1983	40,605	103,465	144,070
1984	29,837	92,779	122,616
1985	144,958	262,239	407,197
1986	110,517	145,957	256,474
1987	203,881	173,054	376,935
1988	219,034	176,686	395,720
1989	176,664	57,020	233,684
1990	199,063	39,870	238,933
1991	182,155	41,815	223,970
1992	267,620	26,959	294,579
1993	247,106	27,992	275,098
1994	206,925	15,072	221,997
1995	272,441	33,740	306,181
1996	808,983	55,750	864,733
1997	473,417	172,218	645,635

#### 6.6.2 Commodity Volume

There were several foreign products which were handled at the Port of Davao as import and export cargo traffic. However, there were only five or six commodities that were significant as import cargoes namely, crude minerals, mineral fuel, logs, fertilizer and cement. The products together with the Other General Cargo comprised almost the total importation in 1997 handled at the port.

On the other hand, there were only two or three major exports handled at the port namely, copra, fruits and vegetables and lately lumber. Including general cargo, they comprised over 90% of the total exportation in 1997 handled at the port.

##### A. COCONUT OIL AND COPRA

Copra and coconut oil are related products of coconut with the former as the dried meat of the fruits of the coconuts and when processed will produce the oil. The Philippines is one of the exporting countries of coconut products like copra and coconut oil among others hence, they are outward cargoes at the ports. The volume of the coconut oil being handled at the port has not increased much at 4,500 metric tons from 1993 to 1997 although it has increased to 14,600 metric tons in 1995.

The volume however, of copra handled at the port increased rapidly from only 8,100 metric tons in 1993 to 50,100 tons in 1997. The outward volume of both products were nil.

COCONUT OIL					
FLOW	1993	1994	1995	1996	1997
EXPORT	4,500	6,208	14,600	13,340	4,711
IMPORT	0	0	0	67	0
TOTAL	4,500	6,208	14,600	13,407	4,711
COPRA					
EXPORT	8,114	5,500	17,448	2,930	50,166
IMPORT	0	0	0	0	0
TOTAL	8,114	5,500	17,448	2,930	50,166

## B. FRUITS AND VEGETABLES

Lately, the port began handling fruits as export cargoes at the volume of 42,481 in 1997. The exportations of fruits in the area specially bananas are basically handled at the privately owned ports of the growers and exporters located along the gulf of Davao. If this trend will continue in the future where government ports specifically the Port of Davao becomes one of the outlets of this commodity, fruits may become the biggest specific commodity to be handled at the port as an export commodity which may even surpass the export commodities from coconut products.

FLOW	1993	1994	1995	1996	1997
EXPORT	152	0	0	13,927	42,481
IMPORT	0	2	0	0	485
TOTAL	152	2	0	13,927	43,966

## C. OTHER GENERAL CARGO

The volume of commodities classified as the Other General Cargo has been fluctuating in the export side. There was no volume in 1994 but prior to and after 1994, there were exports of these commodities at 11,535 metric tons in 1993 and 56,600 metric tons in 1997. The import cargoes seemed to be increasing, on the other hand and was 52,500 metric tons in 1997.

FLOW	1993	1994	1995	1996	1997
EXPORT	11,535	0	1,656	18,417	56,598
IMPORT	1,849	11	253	12,098	52,473
TOTAL	13,384	11	1,909	30,515	109,071

## D. LUMBER

Lumber was handled at the port mainly as export cargoes and was handled only recently. It reached the volume of more than 10,000 metric tons in 1997.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	1,495	10,693
IMPORT	0	0	0	86	1,019
TOTAL	0	0	0	1,581	11,712

## E. CEMENT

The construction of several infrastructures and buildings around the country specially in Metro Manila for the past four or five years needed large volume of cement. While the local cement factories expanded their capacities to be able to meet the demand for cement, the production was not big enough to meet the requirements hence, the importation of the commodity. The Port of Davao is one of the ports used in the unloading on imported cement. The volume of imports was around 16,000 metric tons in 1995 and 1997 but the import volume in 1996 was 228,279 metric tons which is suspected to be mostly diverted cargo.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	0	0
IMPORT	0	0	15,853	228,279	16,250
TOTAL	0	0	15,853	228,279	16,250

## F. CRUDE MINERALS

Crude minerals were handled at the port mainly as imported cargoes which the port has been handling for several years already unlike some cargoes that were handled only recently at the port. This commodity classification includes some unprocessed minerals like the gypsum which are being used in the manufacture of cement.

The average volume handled at the port was on the range of 35,000 to 45,000 metric tons per year. However, like the cement, there was a large quantity of the products handled at the port in 1996 at 175,569 metric tons which was above the normal volume.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	140	226
IMPORT	4,4324	7,683	34,728	175,429	45,570
TOTAL	4,4324	7,683	34,728	175,569	45,796

## G. FERTILIZER

The presence of several plantations for bananas and other fruit orchards and the traditional agricultural activities would require a large supply of fertilizer. The imports handled at the port augment the inward domestic fertilizer needed by the agricultural sector. The traffic continued to increase from 78,263 to 135,000 metric tons in 1993 to 1997 respectively. This product was the third commodity that suddenly increased in volume handled in 1996.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	20	120
IMPORT	78,263	162,545	158,348	225,697	132,500
TOTAL	78,263	162,545	158,348	225,717	132,620

## H. LOGS

What used to be one of the biggest exports of the country is now being imported by the Philippines. This commodity has been increasing from around 37,000 metric tons in 1993 to 132,700 metric tons in 1997 and has been handled at the anchorage. This commodity was the fourth import products handled at the port in 1996 where the volume was above the normal import volume of the commodity.

FLOW	1993	1994	1995	1996	1997
EXPORT	12,237	0	0	0	0
IMPORT	36,988	66,536	112,014	209,778	132,706
TOTAL	48,225	66,536	112,014	209,778	132,706

## I. MINERAL FUEL

The handling of the mineral fuel at the Port of Davao only started lately but the volume was very significant already at 150,855 metric tons of imported cargoes in 1997 from the volume of 71,443 metric tons in 1996 when it started being handled at the port.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	377	2,260
IMPORT	0	0	0	71,443	150,855
TOTAL	0	0	0	71,820	153,115

## J. PAPER AND PULP

Paper and pulp is one of the very few commodities that was purely an import cargo. The data do not show whether the commodity has been handled at the port for several years. It appears that the handling of this commodity at the port was only recently. The volume in 1995 was around 45,000 metric tons and 23,400 metric tons in 1997.

FLOW	1993	1994	1995	1996	1997
EXPORT	0	0	0	0	0
IMPORT	57	0	45,123	24,596	23,412
TOTAL	57	0	45,123	24,956	23,412

## K. SUMMARY OF COMMODITIES

Commodities with minimal volume were no longer included in the detailed presentation. The summary of 1997 products handled at the port includes all the commodities.

Table 6-26  
1997 FOREIGN CARGO COMMODITIES  
(in metric ton)

COMMODITY TYPE	IMPORT	EXPORT	TOTAL
Abaca	0	604	604
Animal Feeds	1,418	0	1,418
Bottled Cargo	450	0	450
Cement	16,250	0	16,250
Chemicals	7,136	3,040	10,176
Coconut Oil	0	4,711	4,711
Copra	0	50,166	50,166
Crude Minerals	45,570	226	45,796
Fertilizer	137,500	120	137,620
Fish/Fish Prep.	0	672	672
Fruits/Vegetable	485	42,481	42,966
Furniture	16,500	152	16,652
Iron/Steel	2,581	2	2,583
Live Animals	2,034	0	2,034
Logs	132,706	0	132,706
Lumber	1,019	10,693	11,712
Mach./Elec. Equip.	6,498	213	6,711
Manuf. Of Metals	3,403	0	3,403
Metaliferous Ores	1,051	0	1,051
Mineral Fuel	150,855	2,260	153,115
Other Gen. Cargo	52,473	56,698	107,171
Paper/Pulp	23,412	0	23,412
Plywood/Veneer	1504	122	1,626
Ref. Pet. Prod.	29	0	29
Sugar	1,110	0	1,110
Transport Equip.	764	58	822
<b>TOTAL</b>	<b>604,784</b>	<b>172,218</b>	<b>776,966</b>

### 6.6.3 Containerized Volume

The containerized volume of the foreign cargo traffic handled at the Port of Davao was very erratic from 1980 to 1997 where there were five years without any containerized foreign cargo handled. There was none in 1980, 1983, 1990, 1991 and 1994 and almost nothing in 1984 when the containerized traffic was only 78 metric tons. The volume of containerized cargoes has changed drastically from one year to another.

In short, there was no definite trend that can be established in the growth of the containerized cargo traffic at the port. There were 4,216 metric tons containerized in 1981 and in the following year, 22,661 metric tons were containerized but no foreign cargo was containerized 1983. However, by 1997, the volume increased to 189,503 metric tons.

**Table 6-27**  
**CONTAINERIZED AND NON-CONTAINERIZED FOREIGN CARGO**  
**(in metric ton)**

YEAR	CONTAINERIZED	NON-CONTAINERIZED	TOTAL	% CONTAINERIZED
1980	0	155,569	155,569	0.00
1981	4,216	106,748	110,964	3.80
1982	22,661	94,249	116,910	19.38
1983	0	144,070	144,070	0.00
1984	78	132,736	132,814	NEG.
1985	12,631	403,671	416,302	3.03
1986	2,246	257,727	259,973	0.86
1987	12,541	364,394	376,935	3.33
1988	63,814	331,906	395,720	16.33
1989	1,284	232,400	233,684	0.55
1990	0	288,856	288,856	0.00
1991	0	251,836	251,836	0.00
1992	4,998	342,993	347,986	1.44
1993	20,741	303,582	324,323	6.40
1994	0	288,556	288,556	0.00
1995	3,075	410,393	413,468	0.74
1996	65,631	1,008,966	1,074,597	6.11
1997	189,503	587,463	776,966	24.39

Both the import and the export containerized volumes tell the same story as the total containerized foreign cargoes. There were imbalances in the traffic between them. The imbalances were aggravated by the shifts of the imbalances. There were years when the imports have more cargoes but there were years also when the exports have more cargoes. It is the sign of a starting activity where things are not yet established.

There were containerized foreign cargoes in 1985 with a volume of 12,631 metric tons and has increased to 63,814 metric tons in 1988. For the next 3 years, practically no containerized volume was handled but some quantities were again handled in 1992 and 1993 after which there was none again. Small cargo traffic was handled in 1995 but the volume increased abruptly to 189,503 metric tons in 1997 or 24.39% of the total foreign cargoes. The handling of fruits as export cargoes caused the increase of containerized foreign cargoes.

Table 6-28  
FLOW OF CONTAINERIZED FOREIGN CARGO  
(in metric ton)

YEAR	IMPORT		EXPORT		TOTAL	
	VOLUME	%	VOLUME	%	VOLUME	%
1980	0	0.00	0	0.00	0	0.00
1981	4,216	14.82	0	0.00	4,216	3.80
1982	18,177	30.76	4,484	7.76	22,661	19.38
1983	0	0.00	0	0.00	0	0.00
1984	78	0.24	0	0.00	78	NEG.
1985	10,668	7.36	1,968	0.73	12,631	3.03
1986	4	NEG.	2,242	1.50	2,246	0.86
1987	9,076	4.45	3,465	2.00	12,541	3.33
1988	33,001	15.07	30,813	17.44	63,814	16.13
1989	0	0.00	1,284	2.25	1,284	0.55
1990	0	0.00	0	0.00	0	0.00
1991	0	0.00	0	0.00	0	0.00
1992	790	0.38	4,208	15.61	4,998	2.11
1993	5,363	2.96	15,378	38.23	20,741	9.37
1994	0	0.00	0	0.00	0	0.00
1995	1,383	0.36	1,692	5.01	3,075	0.74
1996	37,200	6.35	28,431	51.00	65,631	6.11
1997	88,183	14.58	101,320	58.83	189,503	24.39

The foreign import commodities being handled at the port were those types of commodities which are better handled as either in breakbulk or in bulk especially if the quantities are big.

These commodities with big quantities are the logs which were handled at the anchorage, the fertilizers which were handled in bags or in bulk and the cement, crude minerals and mineral fuel which were handled mostly in bulk. These products are considered hardly containerizable. The import products that were highly containerized were Other General Cargo and Paper and Pulp. Hence, the import commodities were basically not suitable for containerized handling.

The export foreign commodities handled at the port were also not good for containerized handling. The copra exports have big volumes but were handled mainly as bulk together with the coconut oil. Other export cargoes were highly containerized but their quantities were small. However, when the port was used as the outlet of fruits for export, the containerization level of the export went up to more than 50%.

**Table 6-29**  
**1997 CONTAINERIZED FOREIGN COMMODITIES**  
**(in metric ton)**

COMMODITIES	TOTAL	CONT.	% CONT.
<b>I. IMPORT CARGO</b>			
<b>A. Above 70%</b>			
1. Animal Feed	1,418	1,418	100.00
2. Bottled Cargo	450	450	100.00
3. Fruit/Vegetables	485	485	100.00
4. Metaliferous Ores	1,051	1,051	100.00
5. Paper/Pulp	23,412	23,412	100.00
6. Ref. Pet. Prod.	29	29	100.00
7. Sugar	1,110	1,110	100.00
8. Chemicals	7,136	7,123	99.82
9. Mach./Elec. Equip.	6,498	5,847	89.98
10. Mach./Elec. Equipment	52,743	45,047	85.85
<b>TOTAL</b>	<b>94,062</b>	<b>85,972</b>	<b>91.40</b>
<b>B. Between 20% and 70%</b>			
1. Iron and Steel	2,581	807	31.27
<b>TOTAL</b>	<b>2,581</b>	<b>807</b>	<b>31.27</b>
<b>C. Below 20%</b>			
1. Transport Equip.	764	66	8.14
2. Manuf. of Metals	3,403	208	6.11
3. Crude Minerals	45,570	1,002	2.20
4. Plywood/Veneer	1,504	17	1.13
5. Fertilizer	137,500	62	0.05
6. Logs	132,706	49	0.04
7. Furniture	16,500	0	0.00
8. Cement	16,250	0	0.00
9. Live Animals	2,034	0	0.00
10. Lumber	1,019	0	0.00
11. Mineral Fuel	150,855	0	0.00
<b>TOTAL</b>	<b>508,105</b>	<b>1,404</b>	<b>0.28</b>
<b>TOTAL IMPORT</b>	<b>604,749</b>	<b>88,183</b>	<b>14.58</b>
<b>II. EXPORT CARGO</b>			
<b>A. Above 70%</b>			
1. Abaca	604	604	100.00
2. Chemicals	3,040	3,040	100.00
3. Crude Minerals	226	226	100.00
4. Fertilizer	120	120	100.00
5. Fish/Fish Prep.	672	672	100.00
6. Furniture	152	152	100.00
7. Iron/Steel	2	2	100.00
8. Lumber	10,693	10,693	100.00
9. Mach./Elec. Equip.	213	213	100.00
10. Mineral Fuel	2,260	2,260	100.00
11. Plywood/Veneer	122	122	100.00
12. Other Gen. Cargo	56,698	53,339	91.08
<b>TOTAL</b>	<b>74,802</b>	<b>71,443</b>	<b>95.51</b>

COMMODITIES	TOTAL	CONT.	% CONT.
<b>B. Between 20% and 70%</b>			
1. Fruits/Vegetable	42,481	26,500	62.38
TOTAL	42,481	26,500	62.38
<b>C. Below 20%</b>			
1. Coconut Oil	4,711	711	15.09
2. Copra	50,166	2,666	5.31
3. Trans. Equip.	58	0	0.00
TOTAL	54,935	3,377	6.15
<b>TOTAL EXPORT</b>	<b>172,218</b>	<b>101,320</b>	<b>58.58</b>

#### 6.6.4 Containers

The number of containers was 525 TEUs in 1992 and has gone up to 2,780 TEUs the following year but none in 1994. The port resumed handling containers in 1995 with a volume of 203 TEUs and has increased to 17,208 TEUs in 1997. With this growth, it would be very hard to determine the trend, like the volume of the cargo that they carry. The percentage of the empties to the total volume of containers was very erratic. For the import side, the empty containers ranged from 75% in 1992 to 4% in 1996 of the total import containers. For the exports, the empties ranged from 41% in 1995 to nothing in 1995 of the total export containers. The percentage of empty containers of the controlling cargo which were the exports was 18.55% of the total export containers in 1997 which quite high. Other ports have empty containers with less than ten percent of the total containers of the controlling flow.

The average load per loaded TEU container for the imports was 11.34 metric tons in 1995 increasing to 14.91 metric tons in 1997. However, in 1992 and 1993, the average load was about 15.00 metric tons per TEU. On the export side, it was about the same average loading as the import cargoes at 15.00 metric tons per TEU. In terms of boxes, 40-foot containers were in used more than the 20-foot containers. In 1996, the 40-foot containers comprised 56.35% of the total boxes and more than 70.19% in 1997, hence the ratio of 1.56 and 1.70 respectively of the TEUs to a box.

The following tables show the flow of the TEU containers, the distribution and percentage of the loaded TEUs, the load per loaded TEU and the sizes of the containers in boxes.

**Table 6-30**  
**FLOW OF FOREIGN TEU CONTAINERS**

YEAR	IMPORT	EXPORT	TOTAL
1990	0	0	0
1991	2	0	2
1992	185	340	525
1993	1,055	1,725	2,780
1994	0	0	0
1995	150	80	230
1996	3,200	2,929	6,129
1997	8,794	8,414	17,208

**Table 6-31**  
**LOADED AND EMPTY FOREIGN TEU CONTAINERS**

YEAR	INWARD			OUTWARD		
	LOADED	EMPTY	% EMPTY	LOADED	EMPTY	% EMPTY
1990	0	0	0.00	0	0	0.00
1991	0	2	100.00	0	0	0.00
1992	47	128	69.19	185	58	17.06
1993	358	697	66.07	1,236	489	28.35
1994	0	0	0.00	0	0	0.00
1995	122	28	18.67	30	0	0.00
1996	3,074	126	3.94	1,728	1201	41.00
1997	5,913	2,881	32.76	6,853	1651	18.55

**Table 6-32**  
**LOAD PER LOADED TEU CONTAINER**  
(in metric ton)

YEAR	IMPORT	EXPORT	TOTAL
1990	0.00	0.00	0.00
1991	0.00	0.00	0.00
1992	16.81	14.92	15.19
1993	14.98	12.44	13.01
1994	0.00	0.00	0.00
1995	11.34	21.15	15.22
1996	12.10	16.45	13.67
1997	14.91	14.78	14.84

**Table 6-33**  
**SIZE DISTRIBUTION OF FOREIGN CONTAINER BOXES**

YEAR	SIZE	EMPTY	LOADED	TOTAL	% TOTAL	TEU
1996	20	83	1,628	1,711	43.65	1,711
	40	622	1,587	2,209	56.35	4,418
TOTAL		705	3,215	3,920	100.00	6,129
1997	20	549	2,447	2,996	29.66	2,996
	40	1,942	5,147	7,089	70.19	14,178
	45	4	11	15	0.15	34
TOTAL		2,495	7,605	10,100	100.00	17,208

## 6.7 PASSENGER TRAFFIC

The Port of Davao at Sasa is more of a cargo port unlike some other ports of say the Port of Zamboanga and Port of Batangas where large volumes of passengers were being handled at these ports. Even if the volume of passengers handled at the Port of Sta. Ana is combined with the volume of passengers at Port of Davao, the total volume of passengers would still be small compared to the volume of passengers handled in either of the ports mentioned above.

The statistics produced by the Authority show that there were only 3,342 passengers handled by the Port of Davao in 1980 and no passengers in 1981. It seems that the port has just started then handling passengers and the Port of Sta. Ana was the main port where passengers embarked and disembarked.

Between these two government ports in Davao City, the Port of Davao handled the lower volume of passengers. The volume of passengers increased to 67,989 people in 1982 and increased further to 148,015 passengers in 1997. Within this period from 1982 to 1997, the average growth rate was 5.32% per year however, it was an uneven rate of increase. The volume went down in 1986 to only 32,167 passengers and then increased to 188,991 passengers in 1995 and again decreased thereafter.

There were 31,190 disembarking passengers at the port in 1982 and increased to 80,590 passengers in 1997. The growth rate was 6.53% a year for the disembarking passengers. Actually, the volume was decreasing from 1982 to 1986 and the trend was reversed when the volume in 1986 at 17,676 passengers went up to 94,799 passengers in 1994 although the volume has remained at around 55,000 passengers from 1988 to 1992.

On the other hand, there were 36,799 embarking passengers at the port in 1982 and increased to 67,425 embarking passengers in 1997. The average growth rate was 4.12% per year. The volume also decreased in 1986 at 14,491 embarking passengers and then increased to 94,192 passengers in 1994.

The passengers handled at the port were mostly of interisland origin or destination hence, the volume is quite small. The reason is that the air transport offers competitive edge over the water transport for long distances in view of the shorter travel time. The opening of the Pan Philippine Highway also added to the competition where passengers from Luzon can take the land transport in going to Davao and vice versa.

Table 6-34  
PASSENGER TRAFFIC

YEAR	DISEMBARKED	EMBARKED	TOTAL
1980	2,644	698	3,342
1981	0	0	0
1982	3,190	36,799	67,989
1983	35,832	28,595	64,427
1984	39,577	43,888	83,465
1985	23,375	16,049	29,424
1986	17,676	14,491	32,167
1987	41,154	25,901	67,055
1988	55,634	43,742	99,376
1989	53,097	54,629	107,726
1990	52,586	54,753	107,339
1991	54,303	62,138	116,441
1992	58,357	59,969	118,326
1993	83,811	82,516	166,327
1994	94,853	89,945	184,798
1995	94,799	94,192	188,991
1996	73,565	80,648	154,213
1997	80,590	67,425	148,015

## 6.8 TOTAL VESSEL TRAFFIC

The ship calls of both domestic and foreign vessels have been increasing at the Port of Davao. There were 726 ship calls in 1980 and 1,099 ship calls in 1997. The vessels have been increasing with an average rate of 2.45% per year. In 1980, there were 652 domestic ship calls and increased to 846 ship calls in 1997 giving an average growth rate of 1.54% a year. On the other hand, there were 74 foreign ship calls in 1980 and 254 in 1997 for an average growth rate of 7.52% per year.

**Table 6-35**  
**TOTAL SHIP CALLS**

YEAR	DOMESTIC	FOREIGN	TOTAL
1980	652	74	726
1981	602	76	678
1982	673	51	724
1983	665	103	768
1984	792	91	883
1985	630	101	731
1986	546	90	636
1987	720	103	823
1988	801	111	912
1989	647	71	718
1990	735	78	813
1991	645	63	708
1992	518	88	606
1993	666	92	758
1994	669	83	752
1995	783	169	952
1996	698	507	1,205
1997	846	254	1,099

The vessels that called at the port to load and unload cargoes have an average tonnage of 1,735 GRT in 1980 and increased to 5,869 GRT in 1997. The rate of increase was 7.43% per year. The corresponding average vessel length was 72.16 meters and 111.10 meters respectively which grew at a rate of 2.57% per year. The average load of cargo per ship call has likewise increased from 1,043 to 2,194 metric tons of the same period.

However, the average load per vessel has practically remained the same from 1990 to 1997.

The general trend of the average service time per vessel was decreasing from 74.78 hours to 50.99 hours. Since the load per vessel was increasing with a decreasing service time, the productivity then was increasing. It increased from a very low 13.95 metric tons an hour in 1980 to 43.03 metric tons an hour in 1997. From 1980 to 1997, it was only in 1995 where there was no vessel waiting for berth. The average waiting time in 1980 was 2.59 hours per vessel but decreased to less than one hour by 1997. However, the waiting time increased in 1987 and 1988 to more than 5 hours per vessel. By 1989, it began decreasing and the less than one hour of waiting per vessel started in 1991.

**Table 6-36**  
**AVERAGE PARTICULARS OF VESSELS**

YEAR	GRT (t)	LOA (m)	LOAD (mt)	S.T. (hr)	W.T. (hr)	PRODUCTIVITY (t/hr)
1980	1,735	72.16	1,043	74.78	2.59	13.95
1981	1,776	70.65	918	74.08	0.73	12.39
1982	1,733	69.85	999	49.72	0.96	20.09
1983	2,474	78.06	1,226	56.59	1.16	21.66
1984	2,413	80.12	1,442	74.71	1.04	19.30
1985	3,122	82.86	1,853	112.47	2.51	13.95
1986	3,463	81.98	1,769	60.00	2.91	29.48
1987	3,199	75.00	1,837	63.16	4.92	29.10
1988	2,753	84.31	2,003	69.87	4.76	28.67
1989	2,964	89.42	2,093	80.46	3.45	26.01
1990	2,811	82.95	2,071	68.79	1.27	30.10
1991	3,591	95.75	2,142	49.58	0.72	43.21
1992	3,706	96.52	2,522	77.08	0.63	32.72
1993	3,557	96.46	2,183	71.69	0.59	30.45
1994	4,317	101.14	2,290	63.01	0.74	36.34
1995	4,743	101.52	2,051	55.20	0.00	37.17
1996	4,435	88.08	2,034	76.69	2.87	26.52
1997	5,869	111.10	2,194	50.99	0.89	43.03

#### 6.8.1 Domestic Vessels

The domestic vessels which called at the port have an average length of 67.30 meters and average GRT of 1,388 tons in 1980. These particulars of the domestic vessels increased to 107.64 meters and 5,059 tons in 1997. These data on domestic ships show the rate of increase at 7.90% for the GRT and 2.85% for the length. There was a sudden increased in the GRT and the length of the domestic vessels in 1991, however, they stayed at that level up to 1993 and thereafter began again to go up.

The average load per ship call based on the domestic traffic was 923 metric tons per vessel in 1980. This load increased to 1,932 metric tons in 1997 thus giving the rate of increase at 4.44% a year. In spite of the increasing average load of the vessels, the service time of vessels decreased. It was 64.11 hours in 1980 to 46.55 hours per vessel in 1997. This is a good sign since it means the increase in productivity in the handling of traffic. This productivity was 14.40 metric tons per hour in 1980 and increased to 41.50 metric tons per hour in 1997. It should be noted however, that there was an increasing trend in containerization level of the cargo which by this technology tends to increase the productivity.

The average waiting time of domestic vessels in 1980 was 2.04 hours per vessel. It increased to around 4.4 hours per ship call in 1988 but went down to 1.15 hours in 1990 and further down to 0.37 hour per vessel in 1997.

**Table 6-37**  
**AVERAGE PARTICULARS OF DOMESTIC VESSELS**  
**(at berth and anchorage)**

YEAR	GRT (t)	LOA (m)	LOAD (mt)	S.T. (hr)	W.T. (hr)	PRODUCTIVITY (t/hr)
1980	1,388	67.30	923	64.11	2.04	14.40
1981	1,187	63.71	849	73.38	0.66	11.57
1982	1,395	66.07	902	47.12	0.61	19.14
1983	1,571	70.30	1200	51.79	0.66	23.17
1984	1,668	74.09	1440	74.74	1.04	19.27
1985	1,932	74.13	1489	58.21	1.68	25.58
1986	2,079	83.94	1585	51.71	2.75	30.65
1987	1,973	65.85	1577	54.20	4.42	29.10
1988	1,868	77.06	1786	63.30	4.40	28.21
1989	2,366	82.12	1962	68.31	3.75	28.72
1990	2,482	79.97	1897	64.30	1.15	29.50
1991	3,226	92.80	1961	46.70	0.27	41.99
1992	3,203	92.19	2278	73.54	0.16	30.98
1993	3,249	93.36	1996	68.34	0.66	29.21
1994	3,946	98.04	2143	58.20	0.83	36.82
1995	4,394	101.36	1966	47.36	0.00	41.51
1996	5,054	102.14	1972	49.21	2.89	40.07
1997	5,059	107.64	1932	46.55	0.37	41.50

There were domestic cargo traffic handled at the anchorage in the entire 18 years of the available data. The cargo volume handled at berth was more than 90% of the total cargo traffic except in 1997 when it went down to 88.86%. The vessels at berth were bigger in terms of GRT and length, carry more load and attained a higher productivity than the vessels serviced at the anchorage area. These vessels have an average length of more than 110 meters, a GRT of more than 5,000 tons, more than 2,000 metric tons of load and productivity of more than 70 metric tons per hour by 1995.

On the other hand, vessels serviced at the anchorage have an average length of around 55 meters, GRT of almost 1,000 tons, load of nearly 1,000 metric tons and a very low productivity of around 8 metric tons per hour. Since their average load was almost the same as their GRT, these vessels were tankers and/or barges that carried the petroleum and the small cargo vessels that carried the logs. The waiting time is only for the vessels going to the berth since it is the time for ships to wait for an available berth space. Ships to be serviced at the anchorage naturally do not have to wait.

Table 6-38  
AVERAGE PARTICULARS OF DOMESTIC VESSEL AT BERTH

YEAR	VOLUME (mt)			SHIP CALLS	AVERAGE LOAD (mt)		
	IN	OUT	TOTAL		IN	OUT	TOTAL
1980	297,096	187,615	484,711	492	604	381	985
1981	224,343	191,375	415,718	470	477	407	884
1982	313,864	292,862	606,726	673	466	435	901
1983	385,572	412,274	797,846	665	580	620	1,200
1984	412,380	607,546	1,019,926	671	615	905	1,520
1985	387,773	457,191	844,964	550	705	831	1,536
1986	372,298	445,291	817,589	494	754	901	1,655
1987	610,246	479,607	1,089,852	668	914	718	1,632
1988	718,985	561,220	1,280,205	701	1,026	801	1,827
1989	697,886	571,264	1,269,150	647	1,079	883	1,962
1990	717,640	552,250	1,269,890	564	1,272	979	2,251
1991	656,754	439,218	1,095,972	531	1,237	827	2,064
1992	610,815	384,073	994,888	425	1,437	904	2,341
1993	618,179	503,674	1,121,853	546	1,132	922	2,054
1994	761,421	526,734	1,288,155	558	1,364	944	2,308
1995	790,698	628,404	1,419,102	644	1,228	976	2,204
1996	701,833	561,611	1,263,444	559	1,256	1,005	2,261
1997	835,974	161,249	1,452,223	675	1,238	913	2,151

YEAR	AVERAGE				INWARD PROD (mt/hr)	LOAD PER GRT
	GRT (t)	LOA (m)	S.T. (hr)	W.T. (hr)		
1980	1611	73.08	46.08	2.71	21.38	37.44
1981	1299	66.96	49.68	0.85	17.79	36.72
1982	1395	61.62	47.12	0.61	19.12	33.41
1983	1571	70.30	51.79	0.66	23.17	36.92
1984	1705	74.93	66.55	1.23	22.84	36.07
1985	1991	74.88	51.58	1.93	29.78	35.41
1986	2173	86.27	46.86	3.04	35.32	34.70
1987	2051	65.20	55.97	4.76	29.16	44.56
1988	1986	77.02	60.22	5.02	30.34	51.66
1989	2366	82.12	68.31	3.75	28.72	45.60
1990	2956	87.00	53.96	1.50	41.72	43.03
1991	3651	101.13	37.80	0.33	59.05	33.88
1992	3722	101.09	44.20	0.19	58.87	38.61
1993	3698	99.98	48.94	0.80	45.83	30.61
1994	4534	105.82	37.48	0.99	63.10	30.08
1995	5144	110.94	31.14	0.00	70.78	23.87
1996	6088	114.73	35.65	3.61	63.42	20.63
1997	6054	118.80	28.27	0.47	76.09	20.45

**Table 6-39**  
**AVERAGE PARTICULARS OF DOMESTIC VESSELS AT ANCHORAGE**

YEAR	VOLUME (mt)			SHIP CALLS			AVE. LOAD (mt)
	IN	OUT	TOTAL	IN	OUT	TOTAL	
1980	99,721	17,503	117,224	160	623	109	732
1981	86,055	9,439	95,494	132	652	72	724
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	73,593	46,717	120,310	121	608	386	994
1985	73,244	20,038	93,282	80	916	250	1,166
1986	38,378	9,283	47,661	52	738	179	917
1987	32,249	13,020	45,269	52	620	250	870
1988	72,853	77,849	150,702	100	729	778	1,507
1989	0	0	0	0	0	0	0
1990	110,814	13,841	124,655	171	648	81	729
1991	64,789	15,179	79,968	114	568	133	701
1992	56,145	18,253	74,398	93	604	196	800
1993	85,319	20,302	105,621	120	711	169	880
1994	109,648	4,157	113,805	111	988	37	1,025
1995	120,112	207	120,319	139	864	2	866
1996	101,471	11,286	112,757	139	730	81	811
1997	171,817	10,272	182,089	171	1,005	60	1,065

YEAR	AVERAGE				% LOAD PER GRT
	GRT (t)	LOA (m)	S.T. (hr)	PROD (mt/hr)	
1980	7024	9.53	119.56	6.13	88.75
1981	7915	2.12	157.78	4.59	82.43
1982	0	0.00	0.00	0.00	0.00
1983	0	0.00	0.00	0.00	0.00
1984	1458	69.48	120.17	8.27	41.70
1985	1522	68.93	103.78	11.24	60.18
1986	1183	61.88	97.83	9.37	62.38
1987	971	74.19	31.52	27.62	63.85
1988	1045	78.05	84.94	17.74	69.76
1989	0	0.00	0.00	0.00	0.00
1990	915	56.77	98.44	7.40	70.82
1991	849	53.96	88.19	7.95	66.90
1992	828	51.47	207.61	3.85	72.95
1993	1204	63.24	156.59	5.62	59.05
1994	989	58.90	162.35	6.32	99.90
1995	919	56.96	122.52	7.07	94.02
1996	891	51.49	103.73	7.82	81.93
1997	1134	63.59	118.72	8.97	85.62

### 6.8.2 Foreign Vessels

The foreign vessels, which called at the port have an average length of 115.00 meters in 1980 and that average increased to 122.66 meters in 1997 while the GRT increased from 4,799 tons in 1980 to 8,575 tons in 1997. In the span of 18 years, the length of the vessels grew at a very slow rate of only 0.38% per year while the GRT grew at 3.47% per year. These rates mean that the foreign vessels, which called at the port on the average have not changed very much. However, these foreign vessels have attained a high average length of 137.31 meters in 1985 with a tonnage of 10,549 GRT. On the other hand, in 1996, these vessels have only an average tonnage of 3,586 GRT and an average length of only 68.73 meters. The reason for the decreased in the size of the vessels has been that ships, which carried the additional import cargo in 1996 were either barge type or small cargo vessels on chartered basis.

Table 6-40  
AVERAGE PARTICULARS OF FOREIGN VESSELS  
(at berth and at anchorage)

YEAR	GRT (t)	LOA (m)	LOAD (mt)	S.T. (hr)	W.T. (hr)	PRODUCTIVITY (t/hr)
1980	4,799	115.00	2,102	168.76	7.42	12.46
1981	6,439	125.62	1,460	79.63	1.28	18.33
1982	6,183	119.73	2,292	84.08	5.59	27.26
1983	8,305	128.19	1,399	87.59	4.39	15.97
1984	8,905	132.55	1,459	74.48	1.03	19.59
1985	10,549	137.31	4,122	450.90	7.70	9.14
1986	11,865	140.77	2,889	110.23	3.83	26.21
1987	11,772	138.99	3,660	125.77	8.39	29.10
1988	9,138	136.63	3,565	117.23	7.36	30.41
1989	8,411	155.97	3,291	191.10	0.69	17.22
1990	5,916	111.08	3,703	111.08	2.41	33.34
1991	7,330	126.00	3,997	79.06	5.27	50.56
1992	6,669	122.05	3,954	97.90	3.39	40.39
1993	5,784	118.96	3,525	95.98	0.08	36.73
1994	7,304	126.13	3,476	101.81	0.00	34.13
1995	6,359	102.27	2,447	91.48	0.00	26.74
1996	3,583	68.73	2,120	114.53	2.84	18.51
1997	8,575	122.66	3,071	65.82	2.59	46.66

The average cargo load of these vessels was 2,102 metric tons per vessel in 1980 and has increased to 3,071 metric tons per vessel in 1997 giving the rate of increase of 2.26% per year. The average service time per vessel was decreasing hence, the productivity in the handling of the cargo was increasing from 12.46 metric tons in 1980 to 46.66 metric tons in 1997.

The productivity, however, was very erratic. It was 9.14 metric tons per hour in 1985 when the average service time of the vessels was 18.75 days at the port. It went up to 33.34 metric tons an hour in 1990 but again decreased to 18.51 tons per hour in 1996. The waiting time of ships for some years from 1980 to 1988 was quite high at about 8.0 hours per ship. This time went down to 2.59 hours per vessel in 1997.

Foreign vessels were also serviced at the anchorage as there were foreign cargo handled in the area. Vessels serviced at berth were bigger than those serviced at the anchorage during the early '90s but starting 1995, the vessels serviced at the anchorage were much bigger. The tonnage of vessels at berth was on the average 6,674 tons in 1990 and has increased only to 7,642 tons in 1997 and the average length has not changed much. The average GRT of vessels at the anchorage was 3,717 tons only in 1990 and increased to 15,505 tons in 1997 while the length increased from 84.40 to 160.87 meters. The trend of the average load per vessel at berth was decreasing while the average load per vessel at the anchorage was increasing.

The productivity appears to be higher at the anchorage. The difference, however, is not as wide as in the domestic cargo handling rate. As mentioned earlier, there was that sudden increase in cargo volume in 1996 and it was traced to be the abrupt increase in the import of around four products which is suspected to be diverted cargo volume. In the same year, the ship calls at berth have increased and these vessels were much smaller with a very low productivity.

**Table 6-41**  
**AVERAGE PARTICULARS OF FOREIGN VESSELS AT BERTH**

YEAR	VOLUME (mt)			SHIP CALLS	AVERAGE LOAD (mt)		
	IN	OUT	TOTAL		IN	OUT	TOTAL
1980	48,379	78,501	126,880	60	806	1,308	2,114
1981	24,910	49,221	74,131	39	639	1,262	1,901
1982	59,100	57,810	116,910	51	1,159	1,134	2,293
1983	40,605	103,465	144,070	103	394	1,005	1,399
1984	29,837	92,779	122,616	81	363	1,145	1,508
1985	144,958	262,239	407,197	88	1,647	2,980	4,627
1986	110,517	145,957	256,474	86	1,285	1,697	2,982
1987	203,881	173,054	376,935	103	1,979	1,680	3,659
1988	219,034	176,686	395,720	109	2,009	1,621	3,630
1989	176,664	57,020	233,684	71	2,488	803	3,291
1990	199,063	39,870	238,933	58	3,432	687	4,119
1991	182,155	41,815	223,970	55	3,312	760	4,072
1992	267,620	26,959	294,579	72	3,717	374	4,091
1993	247,106	27,992	275,098	75	3,295	373	3,668
1994	206,925	15,072	221,997	67	3,088	225	3,312
1995	272,441	33,740	306,181	143	1,905	236	2,141
1996	808,983	55,750	864,733	471	1,718	118	1,836
1997	473,417	172,218	645,635	223	2,123	772	2,895

YEAR	AVERAGE					% LOAD PER GRT
	GRT (t)	LOA (m)	S.T. (hr)	W.T. (hr)	PROD. (mt/hr)	
1980	4,981	116.88	118.50	9.15	17.84	26.26
1981	6,016	126.97	85.44	2.48	22.25	20.98
1982	6,183	119.72	84.08	5.59	27.27	18.74
1983	8,305	128.19	87.59	4.39	15.97	12.10
1984	8,649	129.60	72.30	1.16	20.86	13.24
1985	10,502	140.52	106.92	8.84	43.28	28.38
1986	12,224	142.13	113.86	4.01	26.19	13.88
1987	11,772	138.99	125.77	8.39	29.09	16.81
1988	9,184	136.33	119.38	7.50	30.41	21.88
1989	8,411	155.97	191.10	0.69	17.22	29.58
1990	6,674	122.17	127.72	3.24	32.25	51.42
1991	7,871	129.76	80.35	6.04	50.68	42.08
1992	7,223	124.71	77.46	4.14	52.81	51.46
1993	5,690	116.41	87.05	0.09	42.14	57.91
1994	7,686	128.21	96.01	0.00	34.50	40.18
1995	5,460	95.98	92.52	0.00	23.14	34.89
1996	2,896	60.52	114.01	3.06	15.35	59.32
1997	7,642	117.52	63.56	2.94	45.55	27.78

Table 6-42  
AVERAGE PARTICULARS OF FOREIGN VESSEL AT ANCHORAGE

YEAR	S.C.	IMPORT		AVERAGE				% LOAD PER GRT
		VOL	LOAD	GRT	LOA	S.T.	PROD	
1990	20	49,923	2,496	3,717	84.40	62.80	39.75	67.15
1991	8	27,866	3,483	3,614	100.13	70.25	49.58	96.38
1992	16	53,407	3,378	4,179	110.06	189.88	17.58	80.83
1993	17	39,988	2,176	6,203	130.18	135.35	21.39	35.08
1994	16	66,559	4,160	5,706	117.44	126.25	32.95	72.41
1995	26	107,287	4,126	11,306	136.85	85.77	48.11	36.49
1996	36	209,864	5,830	12,563	176.22	120.92	48.21	46.41
1997	30	131,331	4,378	15,505	160.87	82.67	52.96	28.24

Table 6-42 above, shows only the traffic beginning 1990 since the cargo traffic at the anchorage prior to 1990 were small and there were several years without any cargo handled in the area. The volume from 1990 to 1997 was only for imports as there were no export volume handled during the period except in 1993.

# *Chapter 7*

## *Traffic Projection*

## Chapter 7

# TRAFFIC PROJECTION

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### 7.1 CONCEPTS FOR TRAFFIC PROJECTION

The future cargo, vessel and passenger traffic expected to be handled at the port provides the information that will define the magnitude and type of the port facilities to be provided. On the other hand, there are parameters and conditions which will affect the future growth or trend of the traffic volume and there are uncertainties that will affect the magnitude of this traffic volume, hence, the need to define a conceptual framework by which traffic shall be projected in the future.

There are two general concepts of projection depending on the data to be used as the basis to determine the future traffic. These concepts are either based on the analyses of past data, or based on the analysis of future data, of which the results serve as the bases in the determination of the future traffic volume. Both concepts are sometimes used in a study for the projection of traffic where there may be different sources of traffic like normal, diverted or generated volumes.

There are several methods used in the analysis of past data. The most common are the linear regression, the growth rate, and the correlation methods. The computations of their values are explained below:

#### 7.1.1. Growth Rate Method

The past data are analyzed to determine the average growth rate per year over the span of years of the analyzed data. Actually, the first and the latest year figures of the set of data are used to determine the average growth rate per year where the ratio between the two figures is determined first before computing the rate. The formula is the same as used in determining future value of money based on rate of interest earned yearly in compounding manner.

The formula is  $S = P(1 + r)$  or  $(1 + r) = (S/P)$  and  $S/P$  is the ratio between the two figures. Knowing the period of time ( $n$ ) between the figures, then the growth rate per year ( $r$ ) can be determined. If this growth rate is to be used in the projection of the future traffic, this rate is applied to the latest figure for the year volume from which to apply again the same rate for the succeeding year volume. This same procedure is applied for the following years until the period of projection is reached.

#### 7.1.2. Linear Regression Method

The past data are analyzed by fitting a straight line into the data. The formula for the line is  $Y = a + bx$  where  $b$  in the equation is the slope of the line which corresponds to the average change in the volume per year at a constant value. However, the value of the variables in the above equation should be determined first by using all the data. The values then are substituted into the formula which is the equation of the line that is fitted into the data.

If this equation is to be used in the determination of the future traffic the value of  $b$  shall be added algebraically to the computed value of the latest figure ( $y$ ) and not to the actual last data for the next year volume. The value of slope then is added to this volume for succeeding years until the period of projection is reached.

### 7.1.3. Correlation Method

Actually, this method uses growth rate also but is derived differently. The yearly growth rates of the traffic data are computed and then correlated to the growth rate of GNP or GRP for the same year. The results are ratios between the growth rates of the traffic and the GNP for each year. The average of all the yearly ratios is determined.

If the average ratio is to be used to determine the future traffic volume, this ratio is multiplied to the yearly GNP that was projected by the government to compute the yearly rate of growth for the traffic volume in the future. The computed growth rate for the year after the latest figure shall be applied to this latest figure to compute for the next year volume. The succeeding computed growth rate is applied to this volume and so on.

All the three methods presented above determine the trend of the past data but with different parameters. Growth rate is based on a percentage change, the linear regression is based on a quantity change and the correlation is based on a quantity change and the correlation is based on a ratio change in the volume of traffic. Any of these methods could be used for the projection of the trend of the traffic as long as the results of these methods are derived from data for long period of time.

Each method has their disadvantages. The growth rate method does not involve the data between the first and the last data hence, the growth rate is influenced solely by the volume of these two figures. If any of them was affected by incident, then the rate will either be lower or be higher than what it should have been. However, provided that this is recognized and proper adjustment of the future growth rate is made, then this method is appropriate.

The linear regression method involves all the yearly data and if any of the data is extraneous, then the resulting equation does not reflect the real trend of the data. In the case of the correlation method, the variance among the ratios are too wide that it appears that there is no correlation between the growth of traffic and growth of the GNP.

Another point to consider in the application of these methods is the implicit assumption behind their use in the projection of the volume. This assumption is that the conditions which have affected the past traffic would on the same level affect also the future traffic. However, the value of the growth rate or the regression equation or the correlation ratio has to be altered in the projection of the future traffic to take into account for any foreseeable changes on the conditions which may affect the future traffic volume differently from that of the past figures.

### 7.1.4 Other Methods

On the other hand, the methods using the future data approach are the surplus-deficit, the future planned requirements and the empirical formula methods. These methods are used when there are no past data, an unreliable or limited data or when the data to be projected consist only of few specific items.

#### 7.1.4.1. Surpass-Deficit Method

The first thing to determine here is the influence are of the proposed facility to be provided as this serve as the limit of the other analysis to be made. Within the area, the future production of commodities shall be quantified. An example is the future volume in the production of corn by multiplying the area to be planted and productivity per unit area. On the other hand, the consumption of corn in the area is to be quantified also.

If the production is in excess over the consumption, then there is surplus volume that is expected to get out of the area. If the production is less, then there is a deficit which is expected to be augmented coming from the outside of the area. If the only access to the area is by water transportation, then the surplus volume may be the outward cargoes and the deficit volume may be the inward cargoes.

#### 7.1.4.2. Future Planned Requirement Method

This method of traffic projection has limited application and is used to determine the input requirements of some of the few known existing industries. The first step is to analyze the planned future production of each industry to determine the volume of the raw materials that are needed to attain the target production level. Depending on the sources of the raw materials and the destinations of their products, the inward and outward cargo traffic volume for the port can be determined.

#### 7.1.4.3. Empirical Formula Method

This is similar to the Future Planned Requirements Method only the industries are not yet existing. This method is being used for proposed industrial ports or economic zones with proposed port facilities. Industrialized countries like Japan have determined the quantities of raw materials that are required and the corresponding output per type of industry per unit of land area to be used as locations for industries or economic zone. Depending on the sources of their raw materials and the destinations of their finished products, the inward and outward cargo traffic volume can be determined for the port.

There are still other methods of projection. One is the use of the income-demand elasticity. This is a very complicated method and not as straight forward as those mentioned above. Another is based on the per capita consumption. Each method has its own advantages and disadvantages and the limitations in their use for a particular situation. The choice of the method to be used will greatly depend on the availability of the data that are necessary in the projection.

### 7.2 CONCEPTS AND METHODOLOGY USED IN TRAFFIC PROJECTION

When the Philippine Ports Authority took over the management and operation of the ports, it also started the generation of port traffic statistical reports. There are almost 20 years of available data and these are more than sufficient to define the trend of cargo traffic volume in the past. The data are also presented in very detailed manner in which relationships among traffic can be derived which are very useful in the projection of the future magnitude of some volumes. Hence, the projection of traffic should be based on the concepts of using the past data.

### 7.2.1 Cargo and Passenger Traffic

Consumer's products and raw materials are produced because of the demand by the people and producers. These commodities are transported to where the demand is hence, some are handled at the port. The variables that affect the demand like cost and income are not changing in linear manner. The GDP which is the summation of all the economic activities are expressed in growth rates since the increase is more of the compounding manner than linear. Hence, the volume of the cargo traffic at the port is changing in the same manner. The growth rate method should be used to define the change in the past cargo traffic at the port and to determine the future cargo traffic volume to be handled by the port. The domestic and foreign cargo traffic are projected separately. The imports and the exports are projected separately also. The same method will be used too in the projection of the passenger traffic but if there are induced or generated traffic they will be projected too separately from the normal passenger traffic.

Where the total traffic is the one projected to determine the future volume, the inward and outward volume shall be defined based on their percentage share of the total traffic and not based on their growth rates. Irrespective on how the inward and outward traffic is determined, the containerized traffic volume and anchorage traffic volume shall also be defined based on their percentage share of the inward and outward volume. The future share is based more on the linear basis where the average change in the share is used except for the containerized cargo where the maximum share is defined based on the containerizability of the commodities. Their growth rates are not the same as the total traffic hence, higher rate will result to the situation where a part is bigger than the total which is impossible. As such, the percentage is used.

### 7.2.2 Containers and Ship Calls

The number of containers is a function of the volume of cargo traffic containerized and average load per container. Since the containerized cargo volume has been determined, then the average load per container should be determined. In turn, it is dependent on the maximum design load of the containers and load factor. Since there are different container sizes with different design load, the weighted average maximum load is determined based on the design load per container and the percentage share of each size. The load factor is defined taking into consideration the types of the commodities.

The containerized cargo volume from which to determine number of the containers should either be the inward or outward flow whichever has the bigger volume. The number of containers based on the bigger volume is more than enough for the lesser volume. In effect, irrespective of the volume of the lesser flow, the number of containers remains the same based on the needs of the bigger volume. The total number of containers then is twice this number of containers. The result is the number of containers in TEUs. Container boxes is determined by dividing the TEUs with the ratio of the TEU per box which is computed based on the share of the sizes of the container boxes. Hence, the change in the number of the containers is not based on their past trend.

The number of ship calls is a function also of the volume of cargo traffic and the average load per vessel. Since total cargo volume has been determined, then the average load will be computed. For the containers, the average load is based on the design load of the containers. It should be the same for the vessels based on their design load. However, there are numerous ship calls each with their own design load that to determine their weighted maximum load would be improbable. In the containers,

there are only at most three sizes with a standard design load per size hence, much easier to determine. The average load then of the vessels are projected using the growth rate method based on the past trend.

The average tonnage of vessels is determined by dividing the average load per vessel by the load factor which is the ratio of the load to the GRT. The load factor is based on the trend of the past traffic. The vessel length is determined based on the information of vessel sizes in terms of the tonnage and with their corresponding length.

### 7.3 PROJECTED GROWTH RATE

#### 7.3.1 Identification of Parameters

The average growth rate of the traffic in each port under the Package V Port Study for the last 18 years from 1980 to 1997 has been determined in Chapter 6. This growth rate of each port based on the past traffic volume shall serve as the base growth rate for the future. However, there are foreseeable events taking place recently that would alter the future growth rate of the traffic.

The domestic cargo traffic in all of the study ports has one common characteristic. The cargo volumes are characterized by fluctuating trends and seemed to have occurred in at least three periods between 1980 to 1997. In each of the periods, incidents have occurred that can be attributed to have caused the fluctuating trend. The first incident happened in 1980 or 1981, when there was the worldwide recession brought about by the increase in the price of crude oil in the world market that also affected the country. The second incident started about 1984 when the peso devaluated tremendously by more than 200%. This incident was preceded which happened in August 1983 and has been felt nationwide. Some economists have concluded that the incident in 1983 triggered the timidity for several businesses to invest for it became apprehensive not only in the stability of the peso but as well as the political stability of the nation at that time. The same economists further concluded that the devaluation of the peso became inevitable due to said incident.

The third incident is actually a series of several incidents one after the other. It started with a coup de tat in mid 1987 then after a year there was an increase of oil prices and then came the power crisis that lasted in almost three years. The power crisis has slowed down the production capabilities of the manufacturing sector to produce the commodities needed by the country. These mean lower volume of commodities to be transported and lower volume to be handled at the ports.

There were also some localized incidents that have affected the volume of traffic especially for the Port of Zamboanga and the Port of Isabela, Basilan like the level of peace and order situation in the area. All these incidents have caused the decrease in cargo volume of the domestic traffic in all study ports and the difference lies only in the magnitude of their impact.

It is expected that there still be some peso devaluation and oil price increase in the future however, it is estimated that their impact on the volume of cargo traffic will be less than their impact in the past volume. The peso devaluation which started in the middle of 1997 has so far depreciated by only about 50% which is much less than the 1984 devaluation. It devaluated at most by 70% in early 1998. Secondly, it is expected that there will be no more power crisis in the foreseeable future. Recently, completed and on-going power projects have assured the power supply needed by the country for the next ten years or fifteen years. Thirdly, it is expected that there will be no more conditions that could be perceived as a sign of political instability of the country.

The future scenario then is estimated to induce higher growth rate of the domestic cargo traffic to be handled at the port in the long run. This is the first parameter that is being considered which will alter the future growth rate and to be called "Less Incidents".

There were recent developments within the influence area of some of the ports under the Study which are expected to spur further economic development over their normal development. The agro-industrial and infrastructure development in General Santos area has started and some had been completed. It is expected that these developments will create more products in the area. Davao area accelerated their tourism development recently, which can be seen already by the sudden increase in the number of tourists in the area and passengers at the Port of Sta. Ana in Davao. While tourism mainly pertains to the growth of passengers, it will require also more commodities needed by the tourists. On the other hand, in both cases of development, it will create more job opportunities among the people in the area that will result to higher income and more demand for commodities. This is second parameter to be considered in the determination of the future growth rate of the volume of cargo and to be called "Spur Development".

Based on the flow of commodities at the Port of Zamboanga, it has assumed a transshipment function handling cargoes for the islands of Basilan, Sulu and Tawi-tawi. It is expected that this function of the port will continue in the future in view of the increasing size vessels. This will naturally add to the volume of traffic to be handled at the port specially that such cargoes are handled twice in the port. This is the third parameter to be considered that increase the growth of cargo volume to be handled by the port and this parameter is called "Transshipment Function".

The foreign cargo traffic handled at the Port of Davao, the Port of Zamboanga and the Port of General Santos appeared to have been affected by other factors aside from those already mentioned above. Secondly, the import and export flows were affected by different factors. The imports fluctuated since it augmented in some years shortages in the domestic supply like rice and cement. Hence, the projection of the foreign cargoes shall be analyzed differently. The growth rates then based on the above parameters will only be for the projection of the domestic cargo traffic.

### 7.3.2 Quantification of Domestic Cargo Growth Rates

The growth rates from 1980 to 1997 are 4.90% per year for the Davao Port Complex, 2.35% per year for the Port of Zamboanga, 3.70% per year for the Port of General Santos and 3.25% per year for Port of Basilan. The Port of Kaputian at Samal Island is not included since its traffic is mainly passenger.

The least affected domestic cargo volume by the incidents was those handled at the Davao Port Complex and the most affected was the cargo volume at the Port of Zamboanga. The Port of Basilan is used as the reference point assigning 1% for the "Less Incidents" and the other ports were assigned values based on the impact of the incidents relative to that of the Port of Basilan. Hence, 0.40% is assigned to the Davao Port Complex, 0.80% for the Port of General Santos and 1.65% for the Port of Zamboanga.

Under the "Spur Development" 1% is assigned to the Port of General Santos. The value for the Davao Port Complex should be lower, estimated at 0.70%, since the development is mainly the growth of passengers. The "Transshipment Function" is only for the Port of Zamboanga and is assigned 1%.

Based on these analysis, the future growth rate are 6% per year for the Davao Port Complex, 5.50% per year for the Port of General Santos, 5% per year for the Port of Zamboanga and 4.25% per year for the Port of Isabela, Basilan. These expected growth rates are considered on the high side. Two scenarios are also formulated with lower values of the three parameters and the lowering of the values for each port is proportionate to one another to avoid arbitrary assignment of values. The resulting growth rates are shown below.

#### PROPOSED GROWTH RATE OF DOMESTIC CARGO TRAFFIC

FACTORS	DAVAO	GENERAL SANTOS	ZAMBOANGA	ISABELA
<b>A. HIGH</b>				
1. Past Growth Rate	4.90	3.70	2.35	3.25
2. Less Incidents	0.40	0.80	1.65	1.00
3. Spur Development	0.70	1.00	0.00	0.00
4. Transship. Function	0.00	0.00	1.00	0.00
<b>TOTAL</b>	<b>6.00</b>	<b>5.50</b>	<b>5.00</b>	<b>4.25</b>
<b>B. MEDIUM</b>				
1. Past Growth Rate	4.90	3.70	2.35	3.25
2. Less Incidents	0.30	0.60	1.35	0.75
3. Spur Development	0.50	0.70	0.00	0.00
4. Transship. Function	0.00	0.00	0.80	0.00
<b>TOTAL</b>	<b>5.70</b>	<b>5.00</b>	<b>4.50</b>	<b>4.00</b>
<b>C. LOW</b>				
1. Past Growth Rate	4.90	3.70	2.35	3.25
2. Less Incidents	0.20	0.40	1.05	0.50
3. Spur Development	0.30	0.40	0.00	0.00
4. Transship. Function	0.00	0.00	0.60	0.00
<b>TOTAL</b>	<b>5.40</b>	<b>4.50</b>	<b>4.00</b>	<b>3.75</b>

The total domestic cargo traffic for each port is projected based on the three above scenarios but the details are based only on the medium scenario. In effect, the medium scenario is adopted to be the growth rate of the future domestic cargo traffic volume.

The traffic data for 1998 are already available hence, should be taken into consideration in the application of the derived growth rates as shown above. The volume of the 1998 traffic shows minimal effect of the peso devaluation compared to 1984 peso devaluation. As a matter of fact, the cargo volume of some of the ports has an increase that seems to have not been affected at all. Where the growth rate of the cargo volume is lower than the derived growth rate, a transition period is provided from 1999 to 2001 where the yearly growth rates are higher so that the 2001 volume has a yearly growth rate from 1997 more or less the same as the derived growth rate.

#### 7.4 PROJECTION OF THE DOMESTIC CARGO TRAFFIC

##### 7.4.1 Total Cargo Volume for Davao Port Complex

There were 1,597,255 metric tons of domestic cargo volume in 1998 handled at the Port of Davao, 143,983 metric tons at the Port of Sta. Ana and 658,653 metric tons handled at the Port of Tefasco. The total domestic cargo volume then handled at the Davao Port Complex was 2,399,891 metric tons in 1998 and decreased only by 0.39% from the 1997 domestic cargo volume.

The cargo volume at the Port of Tefasco and the Port of Sta. Ana increased but the volume at the Port of Davao decreased.

Table 7-1  
1998 DOMESTIC CARGO TRAFFIC AT DAVAO PORT COMPLEX  
(in metric ton)

ITEMS	PORTS			TOTAL VOLUME
	DAVAO	STA. ANA	TEFASCO	
<b>A. AT BERTH</b>				
INWARD				
1. Non-Cont.	179,265	124,920	74,113	378,298
2. Cont.	604,772	0	234,054	838,826
Total	784,037	124,920	308,167	1,217,124
OUTWARD				
1. Non-Cont.	131,208	19,063	50,957	201,228
2. Cont.	480,531	0	299,529	780,060
Total	611,739	19,063	350,486	981,288
<b>TOTAL AT BERTH</b>	<b>1,395,776</b>	<b>143,983</b>	<b>658,653</b>	<b>2,198,412</b>
<b>B. TRANSIT CARGO</b>				
INWARD	10,672	0	0	10,672
OUTWARD	14,842	0	0	14,842
<b>TOTAL</b>	<b>25,514</b>	<b>0</b>	<b>0</b>	<b>25,514</b>
<b>C. ANCHORAGE</b>				
INWARD	175,087	0	0	175,087
OUTWARD	778	0	0	778
<b>TOTAL</b>	<b>175,865</b>	<b>0</b>	<b>0</b>	<b>175,865</b>
<b>GRAND TOTAL</b>	<b>1,597,155</b>	<b>143,983</b>	<b>658,653</b>	<b>2,399,791</b>

The decrease in the domestic cargo traffic for 1998 could be attributed to the peso devaluation that started in July 1997 (part of the Asian economic crisis). However, it is be noted that the decrease in the volume is much lower than the impact of the previous 1984 devaluation. Some experts predicted that the country will start recovering in 1999 hence, the growth rate will just be a modest one for this year, full recovery is expected by year 2000 and higher growth rates are expected until 2001. The yearly growth rate from years 1999 to 2001 will result to a volume of 2001 where the average annual growth rate from 1997 to 2001 is the same as the computed growth rates of the three scenario.

The yearly growth are 6% for 1999, 10.5% for 2000, and 8.2% for 2001 for the high scenario before the 6% per year is used starting 2002. The yearly growth rates for the medium scenario are 5.7% for 1999, 2000 and 7.78% for 2001. The yearly growth rates for the low scenario are 5.4% for 1999, 9.5% for 2000 and 7.35% for 2001. The table below shows the domestic cargo traffic volume for the Davao Port Complex for each scenario:

**Table 7-2**  
**PROJECTED DOMESTIC CARGO TRAFFIC**  
**(in metric ton)**

YEAR	HIGH		MEDIUM		LOW	
	GROWTH RATE	VOLUME	GROWTH RATE	VOLUME	GROWTH RATE	VOLUME
1980		1,070,217		1,070,217		1,070,217
1997		2,409,268		2,409,268		2,409,268
1998	-0.39	2,399,891	-0.39	2,399,891	-0.39	2,399,891
1999	6.00	2,544,000	5.70	2,537,000	5.40	259,000
2000	10.50	2,811,000	10.00	2,790,000	9.50	2,770,000
2001	8.20	3,041,000	7.78	3,007,000	7.35	2,973,000
2002	6.00	3,224,000	5.70	3,179,000	5.40	3,134,000
2003	6.00	3,417,000	5.70	3,360,000	5.40	3,303,000
2004	6.00	3,622,000	5.70	3,552,000	5.40	3,482,000
2005	6.00	3,840,000	5.70	3,754,000	5.40	3,670,000
2006	6.00	4,070,000	5.70	3,968,000	5.40	3,868,000
2007	6.00	4,314,000	5.70	4,194,000	5.40	4,077,000
2008	6.00	4,573,000	5.70	4,433,000	5.40	4,297,000
2009	6.00	4,848,000	5.70	4,686,000	5.40	4,529,000
2010	6.00	5,139,000	5.70	4,953,000	5.40	4,773,000
2012	6.00	5,774,000	5.70	5,534,000	5.40	5,303,000
2017	5.85	7,672,000	5.60	7,267,000	5.25	6,848,000
2022	5.75	10,146,000	5.50	9,500,000	5.25	8,845,000

The medium scenario is adopted and the domestic cargo volume by 2007 is 4,194,000 metric tons and this volume increases to 9,500,000 by 2022. The average growth rate is 5.64% a year.

#### 7.4.2 Share of the Port of Davao

The past domestic cargo data show that the share of the Port of Davao has been increasing, the share of the Port of Sta. Ana has been decreasing and the share of the Port of Tefasco has remained the same. As of 1997, the share of the Port of Davao was almost 68%, around 27% for the Port of Tefasco and around 5% for the Port of Sta. Ana. It is expected that the future role of the Port of Sta. Ana in cargo handling will be minimal and the cargo volume still to be handled are those to and from Samal Island. The share of the Port of Tefasco will slightly decrease to 26.25% by 2002 and remains at this level to 2007 and then decreases to 20% by 2022. The share of the Port of Davao is expected to increase to almost 80% by 2022. The share of the Port of Tefasco may even be absorbed by the Port of Davao as its permit will soon expire.

**Table 7-3**  
**SHARE OF THE DAVAO PORTS**

YEAR	DAVAO		STA. ANA		TEFASCO	
	%	VOL. (t)	%	VOL. (t)	%	VOL. (t)
1980	56.34	601,935	17.85	190,993	25.91	277,289
1997	67.83	1,634,312	5.24	126,325	26.93	648,631
1998	66.56	1,597,255	6.00	143,983	27.44	658,653
1999	67.50	1,713,000	5.25	133,000	27.25	691,000
2000	68.50	1,911,000	4.50	126,000	27.00	753,000
2001	69.50	2,090,000	4.00	120,000	26.50	797,000
2002	70.25	2,233,000	3.50	111,000	26.25	835,000
2003	70.25	2,377,000	3.00	101,000	26.25	882,000
2004	71.25	2,531,000	2.50	89,000	26.25	932,000
2005	71.25	2,693,000	2.00	75,000	26.25	986,000
2006	72.25	2,867,000	1.50	60,000	26.25	1,041,000
2007	72.25	3,051,000	1.00	42,000	26.25	1,101,000
2008	73.25	3,247,000	0.75	33,000	26.00	1,153,000
2009	73.25	3,456,000	0.50	23,000	25.75	1,207,000
2010	74.25	3,678,000	0.25	12,000	25.50	1,263,000
2012	75.25	4,164,000	0.20	11,000	24.55	1,359,000
2017	77.75	5,650,000	0.15	11,000	22.10	1,606,000
2022	79.90	7,590,000	0.10	10,000	20.00	1,900,000

Based on the above sharing of the Ports under the Davao Port Complex, the domestic cargo volume to be handled at the Port of Davao by 2007 is 3,051,000 metric tons and will increase to 7,590,000 metric tons by 2022. The average growth rate from 1997 to 2007 is 6.44% per year and from 1997 to 2022, it is 6.34% per year which are higher than the past growth rate of 6.05% per year. On the other hand, the average growth of the Port of Tefasco is 4.39% per year from 1997 to 2022.

The inward cargoes have dominated the flow of domestic traffic in the past but as the decreasing share of the total traffic volume at the rate of 0.25% point per year. It is estimated that the same trend will occur in the future. The share in 1997 was 61.66% and 60.72% in 1998 of the total traffic. It will increase to 61.25% by 1999 in line with the trend before decreasing to 59.25% by 2007 and to 55.50% by 2022. Inward cargo volume in 1997 was 1,007,791 metric tons but decreased to 969,796 metric tons by 1998. Thereafter, the volume will increase to 1,808,000 metric tons by 2007 and will increase further to 4,212,000 metric tons by 2022.

The share of the outward volume in 1997 was 38.34% and 39.28% in 1998. The share will increase every year by 0.25% point per year. The volume was 626,521 metric tons in 1997 and it increases to 1,243,000 metric tons by 2007 and will increase further to 3,378,000 metric tons by 2022.

The resulting average growth rate of inward volume is 5.89% a year from 1997 to 2022 while the outward volume is increasing at the rate of 6.97% per year for the same period. The same relationship occurred in the past where the inward volume was increasing at a lower rate than the outward volume.

**Table 7-4**  
**FLOW DISTRIBUTION OF DOMESTIC CARGO TRAFFIC**

YEAR	TOTAL (mt)	INWARD		OUTWARD	
		%	VOL. (mt)	%	VOL. (mt)
1997	1,634,312	61.66	1,007,791	38.34	626,521
1998	1,597,255	60.72	969,796	39.28	627,459
1999	1,713,000	61.25	1,049,000	38.75	664,000
2000	1,911,000	61.00	1,166,000	39.00	745,000
2001	2,090,000	60.75	1,270,000	39.25	820,000
2002	2,233,000	60.50	1,351,000	39.50	882,000
2003	2,377,000	60.25	1,432,000	39.75	945,000
2004	2,531,000	60.00	1,519,000	40.00	1,012,000
2005	2,693,000	59.75	1,609,000	40.25	1,084,000
2006	2,867,000	59.50	1,706,000	40.50	1,161,000
2007	3,051,000	59.25	1,808,000	40.75	1,243,000
2008	3,247,000	59.00	1,916,000	41.00	1,331,000
2009	3,456,000	58.75	2,030,000	41.25	1,426,000
2010	3,678,000	58.50	2,152,000	41.50	1,526,000
2012	4,164,000	58.00	2,415,000	42.00	1,749,000
2017	5,650,000	56.75	3,206,000	43.25	2,444,000
2022	7,590,000	55.50	4,212,000	44.50	3,378,000

A volume of 171,817 metric tons or around 17% of the total inward cargo traffic was handled at the anchorage in 1977 and increased slightly to 175,087 metric tons or 18.05% in 1998. However, in previous years, the volume was even less than 10% of the total inward cargoes. It is expected that there will still be inward cargoes to be handled at the anchorage in the future as the logs and refined petroleum products will be required by the industries in the area. However, the volume will be increasing at a decreasing rate.

The share of the inward domestic cargo traffic to be handled at the anchorage is estimated at 17.50% by 1999 of the total inward volume and the share will continue to decrease at the rate of 0.50% point a year. The percentage share is 13.5% by 2007 and to 7% by 2022.

The volume of the outward cargoes handled at the anchorage was very small in the last 18 years. Since 1990, the volume was less than 5% per year of the total outward cargo volume. It was 10,272 metric tons or 1.64% of the total outward cargo in 1997 and it was 778 metric tons by 1998. There are really no outward commodities with big volume that are expected to be handled at the anchorage. There might be some commodities to be handled at the anchorage in the future for the outward cargoes but the volume is expected to be very small that there is no need to consider in the determination of the outward traffic handled at anchorage area. Besides, the past data indicated a decreasing trend.

**Table 7-5**  
**DOMESTIC CARGO HANDLED AT BERTH AND AT ANCHORAGE**  
 (in metric ton)

YEAR	INWARD		OUTWARD		TOTAL AT BERTH
	% ANCHORAGE	ANCHORAGE	BERTH	BERTH ONLY	
1997	17.05	171,817	835,974	616,249	1,452,223
1998	18.05	175,087	794,709	626,681	1,421,390
1999	17.50	184,000	865,000	664,000	1,529,000
2000	17.00	198,000	968,000	745,000	1,713,000
2001	16.50	210,000	1,060,000	820,000	1,880,000
2002	16.00	216,000	1,135,000	882,000	2,017,000
2003	15.50	222,000	1,210,000	945,000	2,155,000
2004	15.00	228,000	1,291,000	1,012,000	2,303,000
2005	14.50	233,000	1,376,000	1,084,000	2,460,000
2006	14.00	239,000	1,467,000	1,161,000	2,628,000
2007	13.50	244,000	1,564,000	1,243,000	2,807,000
2008	13.00	249,000	1,667,000	1,331,000	2,998,000
2009	12.50	254,000	1,776,000	1,426,000	3,202,000
2010	12.00	258,000	1,894,000	1,526,000	3,420,000
2012	11.00	266,000	2,149,000	1,749,000	3,898,000
2017	9.00	289,000	2,917,000	2,444,000	5,361,000
2022	7.00	295,000	3,917,000	3,378,000	7,295,000

#### 7.4.3 Containerized Cargo Volume

The level of containerization for both the inward and the outward flows as presented in Chapter 6 is based on the total traffic volume to include those handled at the anchorage. The level is higher if compared only to the cargo volume handled at the berth since no containerized cargo volume was handled at the anchorage. The inward domestic volume handled at berth was 835,974 metric tons in 1997 of which 679,233 metric tons were containerized or 81.25% level of the containerization. For the outward domestic cargo volume, there were 550,700 metric tons handled at berth with 477,295 metric tons containerized for a level of 86.67% containerization in 1997. These percentages and volumes excluded the domestic transit cargoes because PPA was not able to record their containerization level. If the cargo volume handled at anchorage in 1997 is included, their level of containerization was 67.40% of the inward and 85.08% for the outward domestic cargoes.

The domestic transit cargo volume was only 4% of the total domestic traffic in 1997 and volume in 1998 was 25,614 metric tons or 1.60% of the total volume. It is expected that this cargo type will eventually no longer be handled at the port. With the increase of traffic volume in the future, there will be more vessels calls that will carry the cargo traffic volume directly to their final destination hence, transit cargo will be eliminated. While there may be transit cargo in the next few years, the volume will be very small that will not affect the level of containerized cargoes in the future. The future containerized cargo volume does not take into account anymore the future traffic volume of the domestic transit cargoes.

The existing and the envisioned developments of the influence area of the Port of Davao are not expected to radically alter the types of raw materials needed and the products that will be manufactured or produced in the area. Hence, practically the same types of commodities and products are expected to be handled at the port except their share of the total volume.

The typical commodities handled at the port in 1997 are shown in Table 7-13 of Chapter 6. An evaluation of these products which were handled at the berth only would indicate that the inward commodities could be containerized up to 86.50% while the outward commodities could be containerized up to 91%. The derivation of the estimate of these percentages are shown below using the 1997 commodities handled.

**Table 7-6**  
**PROJECTED LEVEL OF CONTAINERIZED DOMESTIC CARGO**  
(in metric ton)

ITEMS	TOTAL VOLUME	1997 CONT.		MAX. CONT.	
		VOL	%	VOL	%
<b>A. INWARD CARGO</b>					
1. Above 70%	683,724	641,950	93.89	656,375	96.00
2. 20 % to 70%	78,536	23,131	29.45	39,268	50.00
3. Below 20%	73,714	14,152	20.20	25,800	35.00
<b>TOTAL</b>	<b>835,974</b>	<b>679,233</b>	<b>81.25</b>	<b>721,443</b>	<b>86.30</b>
<b>B. OUTWARD CARGO</b>					
1. Above 70%	502,370	468,988	93.36	482,275	96.00
2. 20 % to 70%	9,860	5,715	57.96	6,902	70.00
3. Below 20%	38,470	2,592	6.74	11,541	30.00
<b>TOTAL</b>	<b>550,700</b>	<b>477,295</b>	<b>86.67</b>	<b>500,718</b>	<b>90.92</b>

The containerization level started at a fast rate of increase up to 1991 and thereafter slowly increasing its share to the total volume. This is a natural trend where part of a whole tends to decreasing rate. As such, the future increase in the level is only at 0.50% point per year for the inward and outward cargo volume. The containerization level in 1998 went down to around 77% in both flows. With the recovery by 1999, it is estimated that it will be just below the 1997 level at 80% for the inward cargoes and 82% for the outward cargo volume.

With these percentage shares, the total containerized volume by year 2000 will be 1,426,000 metric tons or 83.25% of the total domestic volume at berth. The inward volume will be 789,000 and the outward volume will be 637,000 metric tons. By 2007 there will be 2.44 million metric tons of containerized cargo volume or 85.75% of the total traffic and in 2012, the volume will increase further to 3.45 million metric tons at a level 88.53%. This volume will reach 6.46 million metric tons in 2022 at 88.58% of the total domestic volume at berth. Inward containerized volume increases at 6.64 per year and outward containerized volume increases at 7.73% per year.

**Table 7-7**  
**PROJECTED CONTAINERIZED DOMESTIC CARGO**  
 (in thousand metric ton)

YEAR	INWARD			OUTWARD		
	VOL.	% CONT.	CONT.	VOL.	% CONT.	CONT.
1997	835,974	81.25	679,233	550,700	86.67	477,295
1998	784,037	77.14	604,772	611,739	78.55	480,531
1999	865,000	80.00	692,000	664,000	82.00	544,000
2000	968,000	81.50	785,000	745,000	85.50	637,000
2001	1,060,000	82.00	869,000	820,000	86.00	705,000
2002	1,135,000	82.50	936,000	882,000	86.50	763,000
2003	1,210,000	83.00	1,004,000	945,000	87.00	822,000
2004	1,291,000	83.50	1,078,000	1,012,000	87.50	886,000
2005	1,376,000	84.00	1,156,000	1,084,000	88.00	954,000
2006	1,467,000	84.50	1,240,000	1,161,000	88.50	1,027,000
2007	1,564,000	85.00	1,329,000	1,243,000	89.00	1,106,000
2008	1,667,000	85.50	1,425,000	1,331,000	89.50	1,191,000
2009	1,776,000	86.00	1,527,000	1,426,000	89.50	1,283,000
2010	1,894,000	86.50	1,638,000	1,526,000	90.50	1,381,000
2012	2,149,000	86.50	1,859,000	1,749,000	91.00	1,592,000
2017	2,917,000	86.50	2,523,000	2,444,000	91.00	2,224,000
2022	3,917,000	86.50	3,388,000	3,378,000	91.00	3,074,000

As mentioned earlier, the total domestic cargo will increase on the average by 6.34% per year from 1997 to 2022. On the other hand, the containerized cargo volume will increase from 1.16 million metric tons in 1997 to 6.46 million metric tons by 2022 giving an average growth rate of 7.12% a year. The non-containerized cargo volume was 295,695 metric tons in 1997 and will be 833,000 metric tons by 2022. The average growth rate is 4.23% a year. The volume of cargoes handled at the anchorage in 1997 was 182,000 metric tons and this will go up to 295,000 metric tons by 2022. The average growth rate per year is only 1.95%.

**Table 7-8**  
**DISTRIBUTION OF TOTAL DOMESTIC CARGO**  
 (metric tons in thousand)

YEAR	INWARD			OUTWARD		TOTAL		
	CONT.	NC.	ANC.	CONT.	NC.	CONT.	NC.	ANC.
1997	679	157	172	477	139	1,156	296	172
1998	605	190	175	480	146	1,085	336	175
1999	692	173	184	544	120	1,236	293	184
2000	789	179	198	637	108	1,426	287	198
2001	869	191	210	705	115	1,574	306	210
2002	936	199	216	763	119	1,699	318	216
2003	1,104	206	222	822	123	1,826	329	222
2004	1,078	213	228	886	126	1,964	339	228
2005	1,156	220	233	954	130	2,110	350	233
2006	1,240	227	239	1,027	134	2,267	361	239

YEAR	INWARD			OUTWARD		TOTAL		
	CONT.	NC.	ANC.	CONT.	NC.	CONT.	NC.	ANC.
2007	1,329	235	244	1,106	137	2,435	372	244
2008	1,425	242	249	1,191	140	2,616	382	249
2009	1,527	249	254	1,283	143	2,810	392	254
2010	1,638	256	258	1,381	145	3,019	401	258
2012	1,859	290	266	1,592	157	3,451	447	266
2017	2,523	394	289	2,224	220	4,747	614	289
2022	3,388	529	295	3,074	304	6,462	833	295

There were significant LCL containerized domestic volume from 1990 to 1994. It ranged from 20% to 24% of the total inward containerized cargo volume and it ranged from 5% to 9% of the total outward containerized volume. From 1995, there was no more LCL volume for both flows and by 1997, the volume was very small. It is estimated then that there will be 10% and 7.50% LCL for the inward and outward volume in the future respectively.

There were no significant volume of bulk cargo volume handled at the berth except for 1% of the inward volume. The bulk cargoes were handled at the anchorage, hence, it is estimated that there will be no significant bulk cargo to be handled at the berth in the future and if there will be any, the volume would not be more than 1% of the inward volume and is not expected to alter the proposed development.

A. CONTAINERIZED	FCL	LCL
Inward	90.00%	10.00%
Outward	92.50%	7.50%
B. NON-CONTAINERIZED	BULK	BREAKBULK
Inward	0.00%	100%
Outward	0.00%	100%

#### 7.4.4 Containers

With the increasing volume of the containerized cargo traffic at the Port of Davao, the major port operation of the port in the near future will be on container handling. The average load per loaded TEU in the past has not changed much from 17 metric tons in 1990 to 16.3 metric tons last 1997 for inward cargo. The inward domestic cargo traffic having the bigger volume is the controlling cargo flow in the determination of the volume of containers since whatever container boxes to be used by the controlling flow will be used by the other flow.

The number of containers will depend on the load per TEU with the projected containerized volume. On the other hand, the average load will depend on the maximum design load of boxes and the load factor. The design load of 40 footers is not twice that of the 20 footers, hence, as the size distribution of containers changes, the average maximum load will differ. There is a need then to determine first the distribution of container boxes.

The past trend in the use of the containers shows that there was a decreasing share of the 10 footers and increasing share of the 20 footers. It is expected then that the 10 footers will be decreasing also in the future and by 2009, there will be no more of the size. The 20 and 40 footers will continue also to increase from 74.60% share in 1997 to 88% share by 2010 for the former while the latter will increase from 5.50% in 1997 to 12% by 2010. The 40 footers will continue to increase by 2022 to 23% while the 20 footers will decrease to 77%.

Table 7-9  
PERCENTAGE SIZE DISTRIBUTION OF DOMESTIC BOXES

YEAR	CONTAINER SIZE (FT)			RATIO (TEU/Box)
	10	20	40	
1997	19.90	74.60	5.50	0.9555
1998	18.25	75.75	6.00	0.9688
1999	16.50	77.00	6.50	0.9825
2000	14.75	78.25	7.00	0.9962
2001	13.00	79.50	7.50	1.0100
2002	11.25	80.75	8.00	1.0238
2003	9.50	82.00	8.50	1.0375
2004	7.75	83.25	9.00	1.0512
2005	6.00	84.50	9.50	1.0650
2006	4.25	85.75	10.00	1.0788
2007	2.50	87.00	10.50	1.0925
2008	0.75	88.25	11.00	1.1062
2009	0.00	88.50	11.50	1.1150
2010	0.00	88.00	12.00	1.1200
2012	0.00	87.00	13.00	1.1300
2017	0.00	82.00	18.00	1.1800
2022	0.00	77.00	23.00	1.2300

The design load capacity of the 10 footers is 10.50 tons, the 20 footers is 21.00 tons while the 40 footers is 26.50 tons. At these design loads and the size distribution, the weighted average maximum load per box is determined by multiplying the load with the corresponding share in the distribution and the sum is the weighted average maximum load per containers box. Dividing this load by the ratio between the TEU and the box, the weighted average maximum load per TEU is determined. It is to be noted that as there are more 40 footers, the load is increasing per box but decreasing per TEU because the load of 40 footers is less than twice that of the 20 footers.

**Table 7-10**  
**WEIGHTED MAXIMUM LOAD OF CONTAINERS**  
 (in metric ton)

YEAR	CONTAINER SIZE (ft)			MAX. LOAD	
	10	20	40	BOX	TEU
1997	2.0895	15.6660	1.4575	19.21	20.10
1998	1.9162	15.9075	1.5900	19.41	20.04
1999	1.7325	16.1700	1.7225	19.63	19.98
2000	1.5488	16.4325	1.8550	19.84	19.92
2001	1.3650	16.6950	1.9875	20.05	19.85
2002	1.1812	16.9575	2.1200	20.26	19.79
2003	0.9975	17.2200	2.2525	20.47	19.73
2004	0.8138	17.4825	2.3850	20.68	19.67
2005	0.6300	17.7450	2.5175	20.89	19.62
2006	0.4462	18.0075	2.6500	21.10	19.56
2007	0.2625	18.2700	2.7825	21.32	19.51
2008	0.0788	18.5325	2.9150	21.53	19.46
2009	0.0000	18.5850	3.0475	21.63	19.40
2010	0.0000	18.4800	3.1800	21.26	19.34
2012	0.0000	18.2700	3.4450	21.72	19.22
2017	0.0000	17.2200	4.7700	21.99	18.64
2022	0.0000	16.1700	6.0950	22.27	18.11

The load factor for the controlling flow is normally higher than the load factor of the other flow specially when volume is already quite large. The average load per loaded TEU was 16.31 metric tons for the controlling inward flow and this is 81.14% load factor compared to the computed maximum load per TEU. This load factor appears to be on the high side and it is expected that this will go down to 75%. This factor will result to an average load of 13.58 metric tons by 2022. The volume of TEUs then for the inward flow is determined by dividing the containerized inward volume by the average load.

The volume of empty containers is dictated by the controlling inward cargo traffic. This volume was 15.62% of the loaded TEUs or 13.50% of the total TEUs in 1997. It was 18.14% of the loaded TEUs by 1998. The percentage of empties is based on the loaded TEUs as the latter are first to be determined. As more containers are used, the number of the empties of the controlling flow will increase but at decreasing percentage. The estimate then of empties by 1999 is 18% of the loaded containers and percentage will be decreasing by 0.25% a year and the percentage will be decreasing to 16% by 2007 and 13% of the loaded TEUs in 2022. The loaded and the empty TEUs comprise the total number of inward TEUs.

The average load of the outward TEUs was 17.10 metric tons in 1997 at load factor of 85.07%. The load factor is estimated to decrease when imbalance between the inward and outward containerized volume increase and it will go down to 70%. The average load then is 12.68 metric tons TEU by year 2022.

There is no evidence to show that containers are diverted to and from other ports by land. As such, the number of inward containers will be the same number as the outward containers. The total number of containers handled at the port therefore is twice the number of the inward containers. The number of empty containers for the outward flow then is the difference between the total inward and the loaded outward containers. The total number of containers in 1997 was 96,018 TEUs. The volume will increase to 210,740 TEUs in 2007 and will further increase to 563,820 TEUs or 458,390 boxes in year 2022.

Table 7-11  
PROJECTED VOLUME OF DOMESTIC TEU CONTAINERS

A. INWARD CONTAINERS

YEAR	LOAD FACTOR	AVE. LOAD	LOADED TEU	% EMPTY	EMPTY TEU	TOTAL TEU
1997	81.14	16.31	41,638	15.62	6,505	48,143
1998	83.83	16.80	36,000	18.14	6,530	42,530
1999	83.00	16.58	41,740	18.00	7,510	49,250
2000	82.00	16.33	48,320	17.75	8,580	56,900
2001	81.00	16.08	54,040	17.50	9,460	63,500
2002	80.00	15.83	59,130	17.25	10,200	69,330
2003	79.00	15.59	64,400	17.00	10,950	75,350
2004	78.00	15.34	70,270	16.75	11,770	82,040
2005	77.00	15.10	76,560	16.50	12,630	89,190
2006	76.00	14.87	83,390	16.25	13,550	96,940
2007	75.00	14.63	90,840	16.00	14,530	105,370
2008	75.00	14.60	97,600	15.75	15,370	112,970
2009	75.00	14.55	104,950	15.50	16,270	121,220
2010	75.00	14.51	112,890	15.25	17,220	130,110
2012	75.00	14.42	128,120	14.75	18,900	147,020
2017	75.00	13.98	180,470	13.75	24,810	205,280
2022	75.00	13.58	249,480	13.00	32,430	281,910

B. OUTWARD CONTAINERS

YEAR	LOAD FACTOR	AVE. LOAD	LOADED TEU	% EMPTY	EMPTY TEU	TOTAL TEU
1997	85.07	17.10	27,911	71.53	19,964	47,875
1998	82.58	16.55	29,030	57.01	16,550	45,580
1999	81.25	16.23	33,520	47.73	16,000	49,520
2000	80.00	15.94	39,960	42.39	16,940	56,900
2001	78.75	15.63	45,110	40.77	18,390	63,500
2002	77.50	15.33	49,770	39.30	19,560	69,330
2003	76.25	15.04	54,650	37.88	20,700	75,350
2004	75.00	14.75	60,070	36.57	21,970	82,040
2005	73.75	14.47	65,930	35.28	23,260	89,190
2006	72.50	14.18	72,430	33.84	24,510	96,940
2007	71.25	13.90	79,570	32.42	25,800	105,370
2008	70.00	13.62	87,440	29.20	25,530	112,970
2009	70.00	13.58	94,480	28.30	26,740	121,220
2010	70.00	13.54	102,000	27.56	28,110	130,110
2012	70.00	13.45	118,360	24.21	28,660	147,020
2017	70.00	13.05	170,420	20.46	34,860	205,280
2022	70.00	12.68	242,430	16.29	39,480	281,910

**Table 7-12**  
**VOLUME OF DOMESTIC CONTAINER BOXES**

YEAR	TOTAL		CONTAINER SIZE (FT)		
	TEUS	BOXES	10	20	40
1997	98,018	100,484	19,995	74,957	5,532
1998	88,110	90,950	16,600	68,890	5,460
1999	98,500	100,250	16,540	77,190	6,520
2000	113,800	114,230	16,850	89,380	8,000
2001	127,000	125,740	16,350	99,960	9,430
2002	138,660	135,440	15,240	109,370	10,830
2003	150,700	145,250	13,800	119,100	12,350
2004	164,080	156,090	12,100	129,940	14,050
2005	178,380	167,490	10,050	141,530	15,910
2006	193,880	179,720	7,640	154,110	17,970
2007	210,740	192,900	4,820	167,820	20,260
2008	225,940	204,250	1,530	180,250	22,470
2009	242,440	217,430	0	192,430	25,000
2010	260,220	232,340	0	204,460	27,880
2012	294,040	260,210	0	226,380	33,830
2017	410,560	347,930	0	285,300	62,630
2022	563,820	458,390	0	352,960	105,430

## 7.5 PROJECTION OF FOREIGN CARGO TRAFFIC

### 7.5.1 Total Foreign Cargo Volume of Davao Port Complex

The growth of the volume of foreign cargoes for both the import and export volume was very erratic. The exports have higher volume up to 1986 and thereafter imports became the dominant volume. The total volume appeared to stagnate in some years and continuously decreased in other periods of several years. These did not only fluctuate but showed reversal of trends.

While the trend of the import volume was increasing from only 69,398 metric tons in 1980 to 696,521 metric tons in 1997, the export volume on the other hand, was decreasing from 330,245 metric tons in 1980 to 15,973 metric tons in 1994 but went up afterwards to 324,142 metric tons in 1997. It would then be difficult to determine the trend of the foreign cargo volume which would take into consideration the different behavior of import and export cargo traffic. As such, the projection of the foreign cargo traffic is to be undertaken separately for the import and export cargoes.

The data of the traffic for 1998 was made available recently, hence, shall be used and the projection shall start for 1999. The total volume was 878,544 metric tons which was lower than the 1997 volume.

**Table 7-13**  
**1998 FOREIGN CARGO TRAFFIC AT THE DAVAO PORT COMPLEX**  
 (in metric ton)

ITEMS	PORTS		TOTAL VOLUME
	DAVAO	TEFASCO	
<b>A. AT BERTH</b>			
IMPORT			
1. Non-Containerized	189,432	155,151	344,583
2. Containerized	68,515	85	68,600
<b>Total</b>	<b>257,947</b>	<b>155,236</b>	<b>413,183</b>
EXPORT			
1. Non-Containerized	46,803	166,014	212,817
2. Containerized	166,096	187	166,283
<b>Total</b>	<b>212,899</b>	<b>166,201</b>	<b>379,100</b>
<b>TOTAL AT BERTH</b>	<b>470,846</b>	<b>321,437</b>	<b>792,283</b>
<b>B. AT ANCHORAGE</b>			
IMPORT	81,050	0	81,050
EXPORT	0	0	0
<b>TOTAL</b>	<b>81,050</b>	<b>0</b>	<b>81,050</b>
<b>C. TRANSIT CARGO</b>			
IMPORT	5,211	0	5,211
EXPORT	0	0	0
<b>TOTAL</b>	<b>5,211</b>	<b>0</b>	<b>5,211</b>
<b>TOTAL FOREIGN CARGO</b>	<b>557,107</b>	<b>321,437</b>	<b>878,544</b>

The growth rate of the import volume from 1980 to 1997 which was 14.53% is very high. It appears that the import traffic has started just prior to 1980 and the volume was still very small hence, the high growth rate is expected but unlikely to be reasonable to be used to project the future traffic based on a much bigger volume of 1997. An analysis of the yearly volume shows that the import was increasing at the decreasing rate. While this is normal, the trend does not appear to be a continuous pattern but the volume was almost level for five years then the volume increases and remain almost level again for the next five years and so on. The traffic data for the Port of Tefasco from 1982 to 1989 are not available however, the share of each are practically the same in 1997 and as in 1980 hence, the import traffic at the Port of Davao is used to analyze the trend of the growth of the volume.

The 1980 volume was 48,379 metric tons and was 32,839 metric tons in 1984 for an average of 41,875 metric tons from 1980 to 1984. The foreign import volume jumped to 144,958 metric tons in 1985 and was 176,664 metric tons in 1989, an average of 171,011 metric tons for 1985 to 1989. It jumped again to 248,986 metric tons in 1990 and by 1994 it was 273,484 metric tons for an average of 267,522 metric tons. The average for the next period from 1995 to 1998 is 361,968 metric tons but excluding the data for 1996 and 1997 due to the abnormal cargo volume. The growth rates of the average volume per period has been decreasing from 32.50% to 9.36% and to 6.23%.

PERIOD	AVE. VOL.	GROWTH RATE
1980 – 84	41,875	
1985 – 89	171,011	35.50%
1990 – 94	267,522	9.36%
1995 – 98	361,968	6.23%

The trend of the growth rate for each period can already give an indication of the likely growth rate to be used to project the foreign import volume. It is estimated to be 5% from 1999 up to 2007, then at 4.75% from 2008 to 2017 and at 4.50% from 2018 to 2022.

The major export commodities handled at the port in the past were forest products like plywood. Production of these commodities has decreased over time and export cargo traffic volume decreased from 330,245 metric tons in 1980 to 15,973 metric tons in 1994. However, fruits started to be handled at the port in 1995 and since then the export traffic volume has increased rapidly to 379,100 metric tons in 1998. The trend of the export volume from 1980 to 1997 is not appropriate to use to base whatever is the future growth rate because the products handled up to 1994 were different from the products handled from 1995 to the present. These rates are no longer represent the growth of the new commodities being exported and handled at the Port of Davao. The yearly growth rates were 176.13% in 1995, 341.38% in 1996, 66.5% in 1997 and 16.95% in 1998. Based then on the trend of the growth rates, it is estimated that the growth rates are 10% for 1999, 8% for 2000 and 6.5% by 2001. Starting 2002, the growth rate is 5% per year up to 2007 then to 4.75% from 2008 to 2017 and to 4.5% from 2018 to 2022.

Table 7-14  
PROJECTED FOREIGN CARGO TRAFFIC OF DAVAO PORT COMPLEX

YEAR	IMPORT		EXPORT		TOTAL VOLUME (mt)
	G.R. (%)	VOL. (mt)	G.R. (%)	VOL. (mt)	
1997		696,521		324,142	1,020,663
1998	-28.29	499,444	16.95	379,100	878,544
1999	5.00	524,000	10.00	417,000	941,000
2000	5.00	551,000	8.00	450,000	1,001,000
2001	5.00	578,000	6.50	480,000	1,058,000
2002	5.00	607,000	5.00	504,000	1,111,000
2003	5.00	637,000	5.00	529,000	1,166,000
2004	5.00	669,000	5.00	555,000	1,224,000
2005	5.00	703,000	5.00	583,000	1,286,000
2006	5.00	738,000	5.00	612,000	1,350,000
2007	5.00	775,000	5.00	643,000	1,418,000
2008	4.75	812,000	4.75	673,000	1,485,000
2009	4.75	850,000	4.75	705,000	1,555,000
2010	4.75	891,000	4.75	739,000	1,630,000
2012	4.75	977,000	4.75	811,000	1,788,000
2017	4.75	1,232,000	4.75	1,022,000	2,254,000
2022	4.75	1,536,000	4.50	1,274,000	2,810,000

The import traffic volume will increase to 775,000 metric tons by 2007 and to 1,53 metric tons by 2022. The average rate of growth from 1997 to 2022 is 3.21% per year and 4.79% from 1998. On the other hand, the export cargo volume increases to 643,000 metric tons by 2007 and to 1,274,000 metric tons by 2022. The average growth rate is 5.63% from 1997 to 2022 or 5.18% from 1998. The total foreign cargoes increase to 2,810,000 by 2022. The average growth rate for 1997 to 2022 is 4.13% per year or 4.96% from 1998 to 2022.

### 7.5.2 Share of Port of Davao

The share of the Port of Davao on the import cargo volume was 68.92% in 1998 and 56.16% for the export cargo volume for the same year. It is estimated that the share of the port will increase in the future. The future development of the Port of Tefasco greatly depends on the policy of PPA hence, it is most likely to happen that in the future the development of the Port of Davao will be more than the private port.

The share of the port increased to 75% for the imports and 70% for the export cargo volume. With these shares, the port will handle 581,000 metric tons of import traffic volume and 450,000 metric tons of export traffic volume for a total of 1,031,000 metric tons by 2007. These volumes will increase to 1,152,000 metric tons of import volume and to 892,000 metric tons of export volume for a total of 2,044,000 metric tons by 2022. The average growth rates are 5.16% for imports, 6.15% for the exports, and 5.57% for the total from 1998 to 2022.

Table 7-15  
SHARE OF THE PORT OF DAVAO

YEAR	IMPORT		EXPORT		TOTAL VOLUME (mt)
	%	VOLUME (mt)	%	VOLUME (mt)	
1997	86.82	604,748	53.13	172,218	776,966
1998	68.92	344,208	56.16	212,899	557,107
1999	70.00	367,000	58.00	242,000	609,000
2000	71.00	391,000	60.00	270,000	661,000
2001	72.00	416,000	62.00	298,000	714,000
2002	73.00	443,000	64.00	323,000	766,000
2003	74.00	471,000	66.00	349,000	820,000
2004	75.00	502,000	68.00	377,000	879,000
2005	75.00	527,000	70.00	408,000	935,000
2006	75.00	554,000	70.00	428,000	982,000
2007	75.00	581,000	70.00	450,000	1,031,000
2008	75.00	609,000	70.00	471,000	1,080,000
2009	75.00	638,000	70.00	494,000	1,132,000
2010	75.00	668,000	70.00	517,000	1,185,000
2012	75.00	761,000	70.00	549,000	1,310,000
2017	75.00	951,000	70.00	692,000	1,653,000
2022	75.00	1,197,000	70.00	862,000	2,059,000

The imported logs were all handled at the anchorage with some few commodities. With the limited supply of local logs, it is expected that this commodity will continue to be imported and to be handled at the anchorage of the port in the future. There was no export cargo traffic handled at the anchorage in the last 11 years except in 1993 and it is expected then that there will be no export cargo to be handled at the anchorage in the future.

The logs then will be the only commodity to be handled at the anchorage in the future as import cargo traffic. The volume is estimated to increase as the local supply of logs will not be able to meet the demand. The share of logs was 21.72% of the total import volume in 1997 and jumped to 23.55% in 1998. While the volume will be increasing, the share is expected to decrease by 0.25% point per year. By 2010, the volume will be 123,000 metric tons equal to 21.25% share and by 2022, it will be 202,000 metric tons, 17.50% share of the total import cargo traffic.

Table 7-16  
FOREIGN CARGO HANDLED AT BERTH AND AT ANCHORAGE  
(in metric ton)

YEAR	% ANCHORAGE	INWARD ANCHORAGE	BERTH	OUTWARD BERTH ONLY	TOTAL AT BERTH
1997	21.72	131,331	473,417	172,218	645,635
1998	23.55	80,050	263,158	212,899	476,057
1999	23.25	85,000	282,000	242,000	524,000
2000	23.00	90,000	301,000	270,000	571,000
2001	22.75	95,000	321,000	298,000	619,000
2002	22.50	100,000	343,000	323,000	666,000
2003	22.25	105,000	366,000	349,000	715,000
2004	22.00	110,000	392,000	377,000	769,000
2005	21.75	115,000	412,000	408,000	820,000
2006	21.50	119,000	435,000	428,000	863,000
2007	21.25	123,000	458,000	450,000	908,000
2008	21.00	128,000	481,000	471,000	959,000
2009	20.75	132,000	506,000	494,000	1,000,000
2010	20.50	137,000	531,000	517,000	1,048,000
2012	20.00	147,000	586,000	568,000	1,154,000
2017	18.75	173,000	751,000	715,000	1,466,000
2022	17.50	202,000	950,000	892,000	1,842,000

### 7.5.3 Containerized Volume

The level of containerization for both the import and export flows as presented in Chapter 6 is based on the total traffic volume to include those handled at the anchorage. The level is higher if compared only to the cargo volume handled at the berth since no containerized cargo volume was handled at the anchorage. It is more appropriate to determine the share of the containerized volume from the cargo volume at berth since no containers will be handled at the anchorage and secondly, future growth rate of the volume at anchorage is different to the rate of the volume at berth. The import volume at berth in 1997 was 473,417 metric tons, hence, containerization level was 18.63% while the export volume was 58.83%. In 1998, the level of containerization increased to 26.56% for the import cargo volume and to 78.02% for the export volume.

The existing and the envisioned developments of the influence area of the Port of Davao are not expected to radically alter the types of raw materials needed and the products that will be manufactured or produced in the area. Hence, practically the same types of commodities and products are expected to be handled at the port as foreign cargo traffic.

The typical commodities handled at the port in 1997 are shown in Chapter 6. However, these commodities still included the abnormal cargoes which are not containerizable hence, affects the maximum level to be containerized. The commodities then of 1998 shall be used to determine the maximum level that can be containerized although the data available is only for the first nine months.

The evaluation of these commodities will show that the import volume could be containerized to the maximum level of 62%. On the other hand, the export volume could be containerized to the maximum level of 90%.

Table 7-17  
PROJECTED LEVEL OF CONTAINERIZED FOREIGN CARGO  
(in metric ton)

ITEMS	TOTAL VOLUME	1997 CONT.		MAX. CONT.	
		VOL.	%	VOL.	%
<b>A. IMPORT CARGO</b>					
1. Above 70%	34,535	30,635	88.70	34,635	100.00
2. 20 % to 70%	2,576	16,609	56.16	29,576	100.00
3. Below 20%	121,805	559	0.46	48,722	40.00
<b>TOTAL</b>	<b>185,916</b>	<b>47,803</b>	<b>25.71</b>	<b>112,933</b>	<b>60.74</b>
<b>B. EXPORT CARGO</b>					
1. Above 70%	124,498	116,445	93.53	124,498	100.00
2. 20 % to 70%	0	0	0.00	0	0.00
3. Below 20%	35,829	3,879	10.82	17,920	50.00
<b>TOTAL</b>	<b>160,327</b>	<b>120,324</b>	<b>75.05</b>	<b>142,418</b>	<b>88.83</b>

As previously mentioned, growth of containerized volume was erratic. There were years when the import volume dominated the flow of containerized cargo traffic. For the last two years, there were more containerized exports in spite of the smaller volume but are more suitable for containerization and will continue the flow of containerized traffic.

The level containerization of export cargo volume was very high already at 78.02% in 1998. It is then expected that it will increase by 2% points per year up to 2000 and then at 1% point per year from 2001 to 2007 when the 90% level is reached. The level of containerization for import cargo volume was still low at 26.56% in 1998, hence, the level will be increasing at a faster rate of 3% points per year from 1999 to 2005 and thereafter at 2% points per year to 2011.

Based on the above levels of containerization, there will be 405,000 metric tons of containerized export cargoes and there will be 238,000 metric tons of containerized import cargoes, a total foreign containerized volume of 643,000 metric tons by 2007. These volumes will increase to 803,000 metric tons of exports and 589,000 metric tons of imports for a total volume of 1.392 million metric tons by 2022.

Table 7-18  
PROJECTED CONTAINERIZED FOREIGN CARGO

YEAR	IMPORT (mt)			EXPORT (mt)		
	VOL.	% CONT.	CONT.	VOL.	% CONT.	CONT.
1997	473,417	18.63	89,183	172,218	58.83	101,320
1998	257,947	26.56	68,515	212,899	78.02	166,096
1999	282,000	30.00	85,000	242,000	80.00	194,000
2000	301,000	33.00	99,000	270,000	82.00	221,000
2001	321,000	36.00	116,000	298,000	84.00	250,000
2002	343,000	39.00	134,000	323,000	85.00	275,000
2003	366,000	42.00	154,000	349,000	86.00	300,000
2004	392,000	45.00	176,000	377,000	87.00	328,000
2005	412,000	48.00	198,000	408,000	88.00	359,000
2006	435,000	50.00	218,000	424,000	89.00	381,000
2007	458,000	52.00	238,000	450,000	90.00	405,000
2008	481,000	54.00	260,000	471,000	90.00	424,000
2009	506,000	56.00	283,000	494,000	90.00	445,000
2010	531,000	58.00	308,000	517,000	90.00	465,000
2012	586,000	62.00	363,000	568,000	90.00	511,000
2017	751,000	62.00	466,000	715,000	90.00	644,000
2022	950,000	62.00	589,000	892,000	90.00	803,000

Containerized foreign cargoes comprise 59.67% by 2007 and the non-containerized cargoes comprise 26.08% while the volume to be handled at the anchorage comprise 14.25% of total foreign cargo traffic. The share increases to 67.27%, 22.29% and to 10.44% by 2022 respectively.

Table 7-19  
DISTRIBUTION OF FOREIGN CARGO  
(in thousand metric ton)

YEAR	IMPORT			EXPORT		TOTAL		
	CONT.	NC.	ANC.	CONT.	NC.	CONT.	NC.	ANC.
1997	88	385	131	101	71	189	456	131
1998	69	194	81	166	47	235	241	81
1999	85	197	85	194	48	279	245	85
2000	99	202	90	221	49	320	251	90
2001	116	205	95	250	48	366	253	95
2002	134	209	100	275	48	409	257	100
2003	154	212	105	300	49	454	261	105
2004	176	216	110	328	49	504	265	110
2005	198	214	115	359	49	557	263	115
2006	217	217	119	381	47	598	264	119
2007	238	220	123	405	45	643	265	123
2008	260	221	128	424	47	684	268	128
2009	283	223	132	445	49	728	272	132
2010	308	223	137	465	52	773	275	137
2012	363	223	147	511	57	874	280	147
2017	466	285	173	644	71	1,110	356	173
2022	589	361	202	803	89	1,392	450	202

There were no LCL containerized cargo volume handled at the port from 1990 up to the present. It is estimated that the same will prevail in the future. The fruits are expected to be stuffed at the warehouses of the exporters rather than at the port.

There were very significant volume bulk cargoes handled at the berth. These are the fertilizers, mineral fuel and some the crude minerals with big volumes. Since most of those to be containerized are the breakbulk cargoes, then bulk cargoes will dominate the non-containerized cargo volume to be handled at the berth. The estimated inward bulk cargo is 85% of the inward non-containerized volume and 90% of the outward non-containerized cargo.

<b>A. CONTAINERIZED</b>	<b>FCL</b>	<b>LCL</b>
Inward	100%	0%
Outward	100%	0%
<b>B. NON-CONTAINERIZED</b>	<b>BULK</b>	<b>BREKKBULK</b>
Inward	85%	15%
Outward	90%	10%

#### 7.5.4 Container Volume

As already explained in the projection of the domestic cargo volume there is need first to determine the size distribution of the container boxes to be handled in the future. For the foreign containerized cargoes, only 20 and 40 footers were in used. The same container sizes are expected to be used also in the future. In 1997, the 20 footers comprised 29.66% of the total boxes and the 40 footers comprised 70.34%. It is estimated that more or less the same percentages will prevail in the future at 30% for the 20 footers and 70% for the 40 footers starting 1998 up to 2022. The ratio of the TEU to a box is 1.70.

The design load of 20 footers is 21 tons and the design load of 40 footers is 27 tons. Based on the size distribution, the maximum average load is 25.20 tons per box or 14.82 tons per TEU.

The average load per loaded TEU in the past has fluctuated in both the import and export containers. It ranged from 11.34 to 16.81 metric tons per loaded TEU for the imports and even went down to 10.98 metric tons per TEU in 1998. On the other hand, it ranged from 13.01 to 21.15 metric tons per TEU for the exports and went down to 11 metric tons in 1998.

The containerized exports were the controlling flow with the bigger containerized volume. The average load of the export volume was 11 metric tons by 1998 giving a load factor of 76.45% compared to the average maximum load of the container boxes. The load factor of 75% will continue up to year 2022 resulting to an average load of 11.12 metric tons per TEU.

On the other hand, load factor for the import cargoes will go down from 74.09% in 1998 to 70% which will be reached by year 2002. Since the imbalance between the containerized imports-exports is increasing, the lower volume tends to have a lower load factor, as the lower volume tends to have a lower volume and tends to have a lower load factor as there are more containers that it can be used.

The volume of empty containers was very high compared to the volume of the loaded containers in the past. The volume was 22.78% in 1997 be decreased to 19.33% in 1998 for the export containers and estimated to continue with the decrease in the future as there will be more loaded export containers. The percentage will decrease to 17.25% by year 2007 and will decrease further to 15% by year 2022.

The volume of the total export containers will increase from 18,020 TEUs of 1998 to 42,700 TEUs by year 2007 and will increase further to 83,040 TEUs by year 2022. The volume of the domestic containers will be doubled than that of the export containers since there will be the same number of import containers as that of the export containers. The total volume of containers then is 85,400 TEUs by 2007 and 166,080 TEUs by year 2022.

Table 7-20  
PROJECTED VOLUME OF FOREIGN TEU CONTAINERS

A. EXPORT CONTAINERS

YEAR	LOAD FACTOR	AVE. LOAD	LOADED TEU	% EMPTY	EMPTY TEU	TOTAL TEU
1997		14.78	6,853	22.78	1,561	8,414
1998	76.45	11.00	15,100	19.33	2,920	18,020
1999	75.00	11.12	17,450	19.25	3,360	20,810
2000	75.00	11.12	19,870	19.00	3,780	23,650
2001	75.00	11.12	22,480	18.75	4,210	26,690
2002	75.00	11.12	24,730	18.50	4,570	29,300
2003	75.00	11.12	26,980	18.25	4,920	31,900
2004	75.00	11.12	29,500	18.00	5,310	34,810
2005	75.00	11.12	32,280	17.75	5,730	38,010
2006	75.00	11.12	34,260	17.50	6,000	40,260
2007	75.00	11.12	36,420	17.25	6,280	42,700
2008	75.00	11.12	38,130	17.00	6,480	44,610
2009	75.00	11.12	40,020	16.75	6,700	46,720
2010	75.00	11.12	41,820	16.50	6,900	48,720
2012	75.00	11.12	45,950	16.00	7,350	53,300
2017	75.00	11.12	57,910	15.50	8,950	66,860
2022	75.00	11.12	72,210	15.00	10,830	83,040

B. IMPORT CONTAINERS

YEAR	LOAD FACTOR	AVE. LOAD	LOADED TEU	% EMPTY	EMPTY TEU	TOTAL TEU
1997		14.91	5,913	48.72	2,881	8,794
1998	74.08	10.98	6,240	183.01	11,420	17,660
1999	73.00	10.82	7,860	164.76	12,950	20,810
2000	72.00	10.67	9,280	154.85	14,370	23,650
2001	71.00	10.52	11,030	141.98	15,660	26,690
2002	70.00	10.37	12,920	126.78	16,380	29,300
2003	70.00	10.37	14,850	114.82	17,050	31,900
2004	70.00	10.37	16,970	105.13	17,840	34,810
2005	70.00	10.37	19,090	99.11	18,920	38,010
2006	70.00	10.37	21,020	91.53	19,240	40,260
2007	70.00	10.37	22,950	86.06	19,750	42,700
2008	70.00	10.37	25,070	77.94	19,540	44,610

YEAR	LOAD FACTOR	AVE. LOAD	LOADED TEU	% EMPTY	EMPTY TEU	TOTAL TEU
2009	70.00	10.37	27,290	71.20	19,430	46,720
2010	70.00	10.37	29,700	64.04	19,020	48,720
2012	70.00	10.37	35,000	52.29	18,300	53,300
2017	70.00	10.37	44,940	48.84	21,950	66,890
2022	70.00	10.37	56,800	46.20	26,240	83,040

In terms of boxes the 85,400 TEUs by 2007 is 50,240 boxes and the 166,080 TEUs by 2022 is 97,690 boxes. The volume of 20 footers is 15,070 boxes and the 40 footers are 35,170 boxes by 2007. These will increase to 29,310 boxes and 68,380 boxes in 2022 respectively.

Table 7-21  
VOLUME OF FOREIGN CONTAINER BOXES

YEAR	TOTAL		CONTAINER SIZES	
	TEUS	BOXES	20	40
1997	17,208	10,100	2,996	7,104
1998	35,680	20,990	6,300	14,690
1999	41,620	24,480	7,340	17,140
2000	47,300	27,820	8,350	19,470
2001	53,380	31,400	9,420	21,980
2002	58,600	34,470	10,340	24,130
2003	63,800	37,530	11,260	26,270
2004	69,620	40,950	12,290	28,660
2005	76,020	44,720	13,420	31,300
2006	80,520	47,360	14,210	33,150
2007	85,400	50,240	15,070	35,170
2008	89,220	52,480	15,740	36,740
2009	93,440	54,960	16,490	38,470
2010	97,440	57,320	17,200	40,120
2012	106,600	62,710	18,810	43,900
2017	133,780	78,690	23,610	55,080
2022	166,080	97,690	29,310	68,380

## 7.6 SUMMARY OF TOTAL CARGO TRAFFIC

The Port of Davao handled the total cargo volume of 2,411,278 metric tons in 1997, however, this cargo volume decreased to 2,154,362 metric tons by 1998. The volume will increase to 9,634,000 metric tons by 2022. The average growth rate from 1997 to 2022 is 5.70% per year. The volume handled at berth was 87% of the total cargo volume or 2,097,858 metric tons in 1997. It increases to 9,137,000 metric tons or 94.84% of the total volume by 2022. The average growth rate is 6.06% per year. On the other hand, the cargo traffic volume which was handled at the anchorage in 1997 was 313,420 metric tons. This volume increases to 497,000 metric tons by 2022.

Table 7-22  
TOTAL CARGO TRAFFIC OF PORT OF DAVAO (MT)

YEAR	DOMESTIC	FOREIGN	TOTAL
1997	1,634,312	776,966	2,411,278
1998	1,597,255	557,107	2,154,362
1999	1,712,000	609,000	2,321,000
2000	1,911,000	661,000	2,572,000
2001	2,090,000	714,000	2,804,000
2002	2,233,000	766,000	2,999,000
2003	2,377,000	820,000	3,197,000
2004	2,531,000	879,000	3,410,000
2005	2,693,000	935,000	3,628,000
2006	2,867,000	982,000	3,849,000
2007	3,051,000	1,031,000	4,082,000
2008	3,247,000	1,080,000	4,327,000
2009	3,456,000	1,132,000	4,588,000
2010	3,678,000	1,185,000	4,863,000
2012	4,164,000	1,301,000	5,465,000
2017	5,650,000	1,639,000	7,289,000
2022	7,590,000	2,044,000	9,634,000

Table 7-23  
TOTAL CARGO TRAFFIC AT BERTH (MT)

YEAR	DOMESTIC	FOREIGN	TOTAL
1997	1,452,223	645,635	2,097,858
1998	1,421,390	476,057	1,897,447
1999	1,529,000	524,000	2,053,000
2000	1,713,000	571,000	2,284,000
2001	1,880,000	619,000	2,499,000
2002	2,017,000	666,000	2,683,000
2003	2,155,000	715,000	2,870,000
2004	2,303,000	769,000	3,072,000
2005	2,460,000	820,000	3,280,000
2006	2,628,000	863,000	3,491,000
2007	2,807,000	908,000	3,715,000
2008	2,998,000	952,000	3,950,000
2009	3,202,000	1,000,000	4,202,000
2010	3,420,000	1,048,000	4,468,000
2012	3,898,000	1,154,000	5,052,000
2017	5,361,000	1,466,000	6,827,000
2022	7,295,000	1,842,000	9,137,000

**Table 7-24**  
**TOTAL CARGO TRAFFIC AT ANCHORAGE (MT)**

YEAR	DOMESTIC	FOREIGN	TOTAL
1997	182,089	131,331	313,420
1998	175,865	81,050	256,915
1999	184,000	85,000	269,000
2000	198,000	90,000	288,000
2001	210,000	95,000	305,000
2002	216,000	100,000	316,000
2003	222,000	105,000	327,000
2004	228,000	110,000	338,000
2005	233,000	115,000	348,000
2006	239,000	119,000	358,000
2007	244,000	123,000	367,000
2008	249,000	128,000	377,000
2009	254,000	132,000	386,000
2010	258,000	137,000	395,000
2012	266,000	147,000	413,000
2017	289,000	173,000	462,000
2022	295,000	202,000	497,000

The 1997 containerized cargo volume was 1,346,031 metric tons or 64.16% of the total volume at berth. It will increase to 7,854,000 metric tons by 2022 or 85.96% of the total volume. On the other hand, the cargo volume of the non-containerized volume at berth was 751,827 metric tons in 1997 and increase to 1,283,000 metric tons by 2022. The container volume in 1997 was 113,226 TEUs or 110,584 boxes. It will increase to 729,930 TEUs or 556,080 boxes by 2022.

**Table 7-25**  
**TOTAL CONTAINERIZED CARGO TRAFFIC (MT)**

YEAR	DOMESTIC	FOREIGN	TOTAL
1997	1,156,528	189,503	1,346,031
1998	1,085,303	234,611	1,319,914
1999	1,236,000	279,000	1,515,000
2000	1,426,000	320,000	1,746,000
2001	1,574,000	366,000	1,940,000
2002	1,699,000	409,000	2,108,000
2003	1,826,000	454,000	2,280,000
2004	1,964,000	504,000	2,468,000
2005	2,110,000	557,000	2,667,000
2006	2,267,000	599,000	2,866,000
2007	2,435,000	643,000	3,078,000
2008	2,616,000	684,000	3,300,000
2009	2,810,000	728,000	3,538,000
2010	3,019,000	773,000	3,792,000
2012	3,451,000	874,000	4,325,000
2017	4,747,000	1,110,000	5,857,000
2022	6,462,000	1,392,000	7,854,000

**Table 7-26**  
**TOTAL CONTAINERS**

YEAR	DOMESTIC		FOREIGN		TOTAL	
	TEUS	BOXES	TEUS	BOXES	TEUS	BOXES
1997	96,018	100,484	17,208	10,100	113,226	110,584
1998	88,110	90,950	35,680	20,990	123,790	111,940
1999	98,500	100,250	41,620	24,480	140,120	124,730
2000	113,800	114,230	47,300	27,820	161,100	142,050
2001	127,000	125,740	53,380	31,400	180,380	157,140
2002	138,660	135,440	58,600	34,470	197,260	169,910
2003	150,700	145,250	63,800	37,530	214,500	182,780
2004	164,080	156,090	69,620	40,950	233,700	197,040
2005	178,380	167,490	76,020	44,720	254,400	212,210
2006	193,880	179,720	80,520	47,360	274,400	227,080
2007	210,740	192,900	85,400	50,240	296,140	243,140
2008	225,940	204,250	89,220	52,480	315,160	256,730
2009	242,440	217,430	93,440	54,960	335,880	272,390
2010	260,220	232,340	97,440	57,320	357,660	289,660
2012	294,040	260,210	106,600	62,710	400,640	322,920
2017	410,560	347,930	133,780	78,690	544,340	426,620
2022	563,820	458,390	166,080	97,690	729,900	556,080

**Table 7-27**  
**TOTAL NON-CONTAINERIZED CARGO TRAFFIC**

YEAR	DOMESTIC	FOREIGN	TOTAL
1997	295,695	456,132	751,827
1998	336,087	241,446	577,533
1999	293,000	245,000	538,000
2000	287,000	251,000	538,000
2001	306,000	253,000	559,000
2002	318,000	257,000	575,000
2003	329,000	261,000	590,000
2004	339,000	265,000	604,000
2005	350,000	263,000	613,000
2006	361,000	264,000	625,000
2007	372,000	265,000	637,000
2008	382,000	268,000	650,000
2009	392,000	272,000	664,000
2010	401,000	275,000	676,000
2012	447,000	280,000	727,000
2017	614,000	356,000	970,000
2022	833,000	450,000	1,283,000

## 7.7 PROJECTED PASSENGER TRAFFIC

### 7.7.1 Passenger Traffic of Davao Port Complex

As shown in Chapter 1, the Port of Davao and the Port of Sta. Ana comprised the Davao Port Complex as far as passengers for Davao area are concerned. The volume of passengers at Port of Sta. Ana suddenly increased in 1997 from 285,289 people in 1996 to 805,274 passengers in 1997, while the Port of Davao in 1996 handled 154,213 passengers and in 1997 the port handled 148,015 passengers. The Port of Sta. Ana handled 1,029,770 passengers and the Port of Davao handled 193,808 passenger in 1998. The total volume then for the Davao Port Complex was 439,502 passengers in 1996, 953,289 passengers in 1997 and 1,223,578 passengers in 1998.

#### 1998 PASSENGER TRAFFIC OF DAVAO PORT COMPLEX

FLOW	DAVAO	STA. ANA	TOTAL
INWARD	105,392	516,505	621,897
OUTWARD	88,416	513,265	601,681
TOTAL	193,808	1,029,770	1,223,578

The increase in the volume of the passengers handled in 1997 and 1998 at the Port of Sta. Ana was very high at the growth rates of 182.27% and 27.88% respectively. It is due to the tourists using the Port of Sta. Ana in going to Samal Island resorts. The passenger traffic then of the port is composed of tourist and non-tourist passengers for 1997 and 1998.

The passengers traffic at the Port of Davao are non-tourists. In order then not to distort the projected passengers traffic of the Port of Davao, the passenger traffic of the Davao Port Complex should include only the non-tourist passenger of the Port of Sta. Ana. The total volume of passengers in 1996 of the Davao Port Complex was 439,502 passengers. This volume appears to be all non-tourists passengers. The increase then of the passenger traffic from 1980 to 1996 could be used to determine the future non-tourist passengers for the Davao Port Complex. The average growth rate was 5.63% per year.

It is estimated then that non-tourist passengers of the Davao Port Complex will increase at the rate of 5.50% per year from 1997 and then at 5% per year up to 2012 and at 4.50% per year up to 2022. By 2007 there will be 773,400 non-tourist passengers and 1,533,000 passengers by 2022. The average growth rate is 4.92% a year from 1996 to 2022.

Table 7-28  
PROJECTED PASSENGER TRAFFIC  
OF DAVAO PORT COMPLEX

YEAR	GROWTH RATE	VOLUME
1996		439,502
1997	5.50	463,700
1998	5.50	489,200
1999	5.50	516,100
2000	5.50	544,500
2001	5.50	574,400
2002	5.50	606,000
2003	5.50	636,300
2004	5.50	668,100
2005	5.50	701,500
2006	5.50	736,600
2007	5.50	773,400
2008	5.50	812,100
2009	5.50	852,700
2010	5.50	895,300
2012	5.50	987,100
2017	5.50	1,230,100
2022	5.50	1,533,000

#### 7.7.2. Share of the Port of Davao

The share of the Port of Davao in 1996 was 35.09% and it went down to 31.92% in 1997 but increased to 39.62% in 1998 out of the total non-tourist passengers. The share of the Port of Davao in the past from 1982 to 1998 was on the average of about 36%. The share of the inward passengers in the past was around 54%. It is estimated that this will be the future share of the port out of the total passenger volume and the share of the incoming passengers.

The volume of passengers to be handled at the Port of Davao is 278,400 passengers in 2007 and increases to 552,000 people by 2022. The average growth rate is 5.41% a year from 1997 to 2022 or 5.03% per year from 1996.

**Table 7-29**  
**PASSENGER SHARE OF THE PORT OF DAVAO**

YEAR	DAVAO		STA. ANA	
	%	VOL.	%	VOL.
1996	35.09	154,213	64.91	285,289
1997	31.92	148,015	68.08	315,685
1998	39.62	193,808	60.38	295,392
1999	39.00	201,300	61.00	314,800
2000	38.00	206,900	62.00	337,600
2001	37.00	218,300	63.00	361,900
2002	36.00	224,200	64.00	387,800
2003	36.00	229,100	64.00	407,200
2004	36.00	240,500	64.00	427,600
2005	36.00	252,500	64.00	449,000
2006	36.00	265,200	64.00	471,400
2007	36.00	278,400	64.00	495,000
2008	36.00	292,400	64.00	519,700
2009	36.00	307,000	64.00	545,700
2010	36.00	322,300	64.00	573,000
2012	36.00	355,400	64.00	631,700
2017	36.00	442,800	64.00	787,300
2022	36.00	552,000	64.00	981,000

**Table 7-30**  
**PASSENGER FLOW OF TRAFFIC OF PORT OF DAVAO**

YEAR	INCOMING	OUTGOING	TOTAL
1997	80,590	67,425	148,015
1998	105,392	88,416	193,808
1999	109,700	92,100	201,800
2000	111,700	95,200	206,900
2001	114,700	97,800	212,500
2002	117,800	100,400	218,200
2003	123,700	105,400	229,100
2004	129,900	110,600	240,500
2005	136,400	116,100	252,500
2006	143,200	122,000	265,200
2007	150,300	128,100	278,400
2008	157,900	134,500	292,400
2009	165,800	141,200	307,000
2010	174,000	148,300	322,300
2012	191,900	163,500	355,400
2017	239,100	203,700	442,800
2022	298,000	254,000	552,000

## 7.8 PROJECTED SHIP CALLS

### 7.8.1 Domestic Ship Calls

The projection of the number of domestic vessels for the Port of Davao is undertaken separately for the ship calls at berth from those at the anchorage as the particulars were different as shown in Chapter 6. Secondly, the vessels at berth are liner vessels while the vessels calling at the anchorage are on chartered basis.

Like in the containers, the number of ship calls is dependent on the controlling flow. The inward domestic cargo traffic volume handled at the berth in the past was the controlling flow being with the bigger volume. The controlling flow of the projected domestic cargo traffic is also the inward flow. The number of ship calls then will depend on the inward cargo volume and the average load per vessel.

The growth rate of the average load per vessel at berth based on the inward domestic volume was 4.30% per year from 1980 to 1997. It was 604 metric tons in 1980 and increased to 1,238 in 1997. The average load has practically remained the same at around 1,200 metric tons per vessel from 1990 to 1997, and this is due to the low growth rate of domestic volume during this period at 2.20% per year only. The domestic volume to be handled at berth will increase at the rate of 6.33% a year in the future hence, the load per vessel is expected to increase. The estimated growth rate then is 4.30% per year up to year 2022, which is the same rate as in the past.

However, the average load in 1998 was only 1,083 metric tons per vessel. This decrease can be attributed to the decrease in the inward volume. The projected inward volume for 1999 is higher than the 1997 volume, hence, it is expected that the average load for 1999 will increase and to the level of 1997 at 1,200 metric tons per vessel. This average load of 1999 is the base figure where the growth rate of 4.30% per year is to be applied until 2022. There were 675 ship calls in 1997 at berth and will increase to 931 ship calls by 2007 and will further increase to 1,240 ship calls by 2022.

The ratio between the average load and the vessel tonnage is the load factor which has to be defined first in order to determine the vessel tonnage. This ratio is similar to that of the containers which is the ratio between the average load and maximum design load of containers. The ratio used to be more than 30% in the previous years but decreased to only 17.54% in 1998.

Since 1990, the vessel tonnage has a higher growth rate than the growth rate of the average load. As mentioned above the growth rate of the average load will be increasing at higher rate in view of the higher growth rate of the domestic volume which will be higher than the rate of increase of the vessel tonnage. It follows that the load factor will be increasing but there is a limit to this load factor because the vessels will be calling also at other ports to load. Load factor of 1999 is expected also to increase and be at the level of 1997 at 20%. Thereafter, it will be increasing at 0.50% point per year and will reach 31.50% by 2022. The number of ship calls in 1997 was 675 vessel and will increase to 931 vessels by 2007 and to 1,240 vessels by 2022. The vessel tonnage is increasing to 7,000 GRT with the length of 123.50 meters by 2007 and further increases to 10,030 GRT with the length of 138 meters by 2022.

**Table 7-31**  
**PROJECTED DOMESTIC SHIP CALLS AT BERTH**

YEAR	G.R	AVE. LOAD (mt)	INWARD VOLUME (mt)	SHIP CALLS	LOAD FACTOR	AVE. GRT. (mt)	AVE. LOA (m)
1997		1,238	835,974	675	20.45	6,054	118.80
1998		1,083	794,709	734	17.54	6,176	117.95
1999		1,200	865,000	721	20.00	6,000	118.50
2000	4.30	1,250	968,000	774	20.50	6,100	119.00
2001	4.30	1,310	1,060,000	809	21.00	6,240	119.60
2002	4.30	1,360	1,135,000	835	21.50	6,330	120.20
2003	4.30	1,420	1,210,000	852	22.00	6,450	120.80
2004	4.30	1,480	1,291,000	872	22.50	6,580	121.40
2005	4.30	1,540	1,376,000	894	23.00	6,700	122.00
2006	4.30	1,610	1,467,000	911	23.50	6,850	122.75
2007	4.30	1,680	1,564,000	931	24.00	7,000	123.50
2008	4.30	1,750	1,667,000	953	24.50	7,140	124.25
2009	4.30	1,830	1,776,000	970	25.00	7,320	125.00
2010	4.30	1,910	1,894,000	992	25.50	7,490	126.00
2012	4.30	2,070	2,149,000	1,038	26.50	7,810	127.50
2017	4.30	2,560	2,917,000	1,139	29.00	8,830	132.50
2022	4.30	3,160	3,917,000	1,240	31.50	10,030	138.00

The growth rate of the average load per vessel at anchorage was 1.70% per year from 1980 to 1997. However, there was the sudden increase in the vessel tonnage and with about the same load factor, the average load increased from 1,063 to 1,684 metric tons in 1998 even when the cargo volume decreased.

The shippers have opted for bigger vessels to charter and it is then expected that the same bigger vessels will be used in the future. However, the growth rate of the average load will be increasing at a very low rate as practically the same vessels used in 1998 will be hired in the coming years. The average growth rate is expected at 0.50% per year. The load factor will be at 95% about the same as in the past. The number of ship calls will actually decrease from the volume of 1997 and will only be 155 vessels by 2022 with a tonnage of 2,000 GRT and a length of 77.50 meters.

**Table 7-32**  
**PROJECTED DOMESTIC SHIP CALLS AT ANCHORAGE**

YEAR	G.R	AVE. LOAD (mt)	CARGO VOLUME (mt)	SHIP CALLS	LOAD FACTOR	AVE. GRT. (mt)	AVE. LOA (m)
1997		1,065	182,089	171	88.00	1,134	63.59
1998		1,684	175,087	104	98.59	1,703	72.70
1999		1,692	184,000	109	98.00	1,730	73.00
2000	0.50	1,700	198,000	116	97.50	1,740	73.20
2001	0.50	1,709	210,000	123	97.00	1,760	73.50
2002	0.50	1,718	216,000	126	96.50	1,780	73.80
2003	0.50	1,727	222,000	129	96.00	1,800	74.10
2004	0.50	1,735	228,000	131	95.50	1,820	74.40
2005	0.50	1,744	233,000	134	95.00	1,840	74.70
2006	0.50	1,753	239,000	136	95.00	1,845	74.80
2007	0.50	1,761	244,000	139	95.00	1,855	75.00
2008	0.50	1,770	249,000	141	95.00	1,865	75.20
2009	0.50	1,779	254,000	143	95.00	1,870	75.30
2010	0.50	1,788	258,000	144	95.00	1,880	75.50
2012	0.50	1,806	266,000	147	95.00	1,900	75.80
2017	0.50	1,851	289,000	156	95.00	1,950	76.60
2022	0.50	1,898	295,000	155	95.00	2,000	77.50

There were 846 domestic ship calls in 1997 and will increase to 1,070 ship calls by 2007 and to 1,395 ship calls by 2022. The average load per vessel will increase from 1,932 tons in 1997 to 2,850 tons by 2007 and 5,440 tons by 2022. Their average tonnage will be increasing from 5,060 GRT in 1997 and an average length of 107.64 meters. These particulars will increase to an average tonnage of 9,140 GRT and to an average length of 131.20 meters by 2022.

**Table 7-33**  
**TOTAL DOMESTIC SHIP CALLS**

YEAR	BERTH		ANCHORAGE		TOTAL	
	S.C	LOAD (mt)	S.C	LOAD (mt)	S.C	LOAD (mt)
1997	675	2,151	171	1,065	846	1,932
1998	734	1,931	104	1,684	838	1,906
1999	721	2,121	109	1,692	830	2,060
2000	774	2,210	116	1,700	896	2,150
2001	809	2,320	123	1,709	932	2,240
2002	835	2,420	126	1,718	961	2,320
YEAR	BERTH		ANCHORAGE		TOTAL	
	S.C.	LOAD (mt)	S.C	LOAD (mt)	S.C	LOAD (mt)
2003	852	2,530	126	1,727	978	2,420
2004	872	2,640	131	1,735	1,003	2,520
2005	894	2,750	134	1,744	1,028	2,620
2006	911	2,880	136	1,753	1,047	2,740
2007	931	3,010	139	1,761	1,070	2,850
2008	953	3,150	141	1,770	1,094	2,920
2009	970	3,300	143	1,779	1,113	3,100
2010	992	3,450	144	1,788	1,136	3,240
2012	1,038	3,760	147	1,806	1,185	3,510
2017	1,139	4,710	156	1,851	1,295	4,360
2022	1,240	5,880	155	1,898	1,395	5,440

**Table 7-34**  
**TOTAL AND AVERAGE DOMESTIC VESSEL TONNAGE (GRT)**

YEAR	BERTH	ANCHORAGE	TOTAL	AVERAGE
1997	4,086,450	193,914	4,280,364	5,060
1998	4,533,073	177,645	4,710,718	5,620
1999	4,326,000	189,000	4,515,000	5,440
2000	4,271,000	202,000	4,923,000	5,530
2001	5,048,000	216,000	5,264,000	5,650
2002	5,286,000	224,000	5,510,000	5,730
2003	5,495,000	232,000	5,727,000	5,840
2004	5,738,000	238,000	5,976,000	5,960
2005	5,990,000	247,000	6,237,000	6,070
2006	6,240,000	251,000	6,491,000	6,200
2007	6,517,000	258,000	6,775,000	6,330
2008	6,804,000	263,000	7,067,000	6,460
2009	7,100,000	267,000	7,367,000	6,620
2010	7,430,000	271,000	7,701,000	6,780
2012	8,107,000	276,000	8,386,000	7,080
2017	10,057,000	304,000	10,361,000	8,000
2022	12,437,000	310,000	12,747,000	9,140

**Table 7-35**  
**TOTAL AND AVERAGE DOMESTIC VESSEL LENGTH (M)**

YEAR	BERTH	ANCHORAGE	TOTAL	AVERAGE
1997	80,190	10,874	91,064	107.64
1998	86,575	7,561	94,136	112.30
1999	85,440	7,960	93,400	112.50
2000	92,110	8,490	100,600	113.00
2001	96,760	9,040	105,800	113.50
2002	100,370	9,300	109,670	114.10
2003	102,920	9,560	112,480	114.70
2004	105,860	9,750	115,610	115.30
2005	109,070	10,010	119,080	115.80
2006	111,830	10,170	122,000	116.50
2007	114,980	10,430	125,410	117.20
2008	118,410	10,600	129,010	117.90
2009	121,250	10,770	132,020	118.60
2010	124,990	10,870	135,860	119.60
2012	132,350	11,140	143,490	121.10
2017	150,920	11,950	162,870	125.80
2022	171,120	12,010	183,130	131.30

### 7.8.2 Foreign Ship Calls

The projection of the number of foreign vessels for the Port of Davao is undertaken separately for the ship calls at berth from those at the anchorage as the particulars were different as shown in Chapter 6, the same as for the domestic vessels.

The controlling flow was the import cargo traffic but started only 1987. Up to 1989, the average load was around 2,000 metric tons using around 10,000 GRT vessels. For the period from 1990 to 1994 the average load ranged from 3,100 to 3,700 metric tons by using 7,000 GRT vessels which means while the load increased, the vessel size decreased. In 1995 and 1996 the average load dropped to only 1,800 metric tons but vessel size decreased to less than 5,000 GRT. The vessel size went back to 7,500 GRT in 1998 but the average load continued the decrease and dived to 978 metric tons per vessel. There was no semblance of a smooth trend. Hence, it would be hard to define the growth rate of the average load of foreign vessels at berth. The growth rate just the same only 0.70% per year from 1987 to 1997.

The import cargo volume is projected to be increasing and it is expected then that the average load will also increase and the increase will be such that when the inward volume will be already the same as in 1997, the average load will be around the same also as in 1997. The projection of foreign traffic shows that such inward volume will be reached in 2007. This condition can be met if the average load should be increasing at very high rates initially up to 2001 and there after will be increasing at 2% per year. The result is a decreasing number of ship calls up to 2001 and then will increase there after. There will be 232 ship calls by 2022.

The load factor was very high up to 1995 but it went down to 27.78% in 1997 and to only 13.88% in 1998. As cargo volume increases, it is expected that load factor will be increasing to reach the 30% level by 2022. The vessel tonnage then increases to 8,470 GRT by 2007 and to 9,700 GRT by 2022. The vessel length increases to 130.30 meters by 2007 and by 2022, the length is 137.00 meters.

On the other hand, the average load of vessels at anchorage before 1994 was around 3,000 metric tons using only less than 5,000 GRT vessels thus resulting to a very high load factor. After 1994, the average load increased to around 4,200 metric tons but using much larger vessels to reach even 15,505 GRT. The average growth rate of average load when the average load was more than 4,000 tons per vessel was 1.70% per year.

In 1998, the cargo volume handled at the anchorage went down to 81,050 metric tons from 131,331 metric tons in 1997. The vessels size decreased to 11,957 GRT and the average load per vessel decreased to 3,684 tons from 4,378 tons in 1997. The growth rate then of the average load to be used is 1.50% per year which is a little lower than the rate in the past. The average load per vessel then increases from 4,378 metric tons in 1997 to 5,020 metric tons by 2007 and 5,830 metric tons by 2022. The number of ship calls by 2007 is 29 vessels and 38 vessels by 2022.

The load factor was 28.24% in 1997 and 30.81% in 1998. The load is expected to increase by 0.50% point per year to 2012 and 0.40% per year thereafter. The resulting vessel tonnage is about the same as in 1998 at 11,860 GRT by 2007 and 12,550 GRT by 2022. The length of vessels is 148.00 meters by 2007 and 151.50 meters by 2022.

**Table 7-36**  
**PROJECTED FOREIGN SHIP CALLS AT ANCHORAGE**

YEAR	GROWTH RATE	AVE. LOAD (mt)	INWARD VOLUME (mt)	SHIP CALLS	LOAD FACTOR	AVE. GRT (mt)	AVE. LOA (m)
1997		4,378	131,331	30	28.24	15,505	160.87
1998		3,684	81,050	22	30.81	11,957	148.59
1999	1.50	3,470	85,000	23	31.40	11,910	148.50
2000	1.50	3,800	90,000	24	32.00	11,880	148.25
2001	1.50	3,850	95,000	25	32.50	11,850	148.00
2002	1.50	3,910	100,000	26	33.00	11,850	148.00
2003	1.50	3,970	105,000	27	33.50	11,850	148.00
2004	1.50	4,030	110,000	28	34.00	11,850	148.00
2005	1.50	4,090	115,000	29	34.50	11,850	148.00
2006	1.50	4,150	119,000	29	35.00	11,860	148.00
2007	1.50	4,210	123,000	29	35.50	11,860	148.00
2008	1.50	4,280	128,000	30	36.00	11,890	148.25
2009	1.50	4,340	132,000	30	36.50	11,890	148.25
2010	1.50	4,400	137,000	31	37.00	11,890	148.25
2012	1.50	4,540	147,000	32	38.00	11,950	148.50
2017	1.50	4,890	173,000	35	40.00	12,230	150.00
2022	1.50	5,270	202,000	38	42.00	12,550	151.00

**Table 7-37**  
**PROJECTED FOREIGN SHIP CALLS AT BERTH**

YEAR	GROWTH RATE	AVE. LOAD (mt)	CARGO VOLUME (mt)	SHIP CALLS	LOAD FACTOR	AVE. GRT (mt)	AVE. LOA (m)
1997		2,123	473,417	223	27.78	7,642	117.52
1998		978	263,158	269	13.88	7,044	118.76
1999		1,400	282,000	201	18.00	7,770	127.00
2000		1,700	301,000	173	22.00	7,910	128.00
2001		1,920	321,000	167	24.00	8,000	128.30
2002	2.00	1,960	343,000	175	24.25	8,080	128.65
2003	2.00	2,000	366,000	183	24.50	8,160	129.00
2004	2.00	2,040	392,000	192	24.75	8,240	129.30
2005	2.00	2,080	412,000	198	25.00	8,320	129.65
2006	2.00	2,120	435,000	205	25.25	8,400	130.00
2007	2.00	2,160	458,000	212	25.50	8,470	130.30
2008	2.00	2,200	481,000	219	25.75	8,540	130.65
2009	2.00	2,250	506,000	225	26.00	8,650	131.00
2010	2.00	2,290	531,000	232	26.25	8,720	131.30
2012	2.00	2,380	586,000	246	26.75	8,900	132.00
2017	2.00	2,630	751,000	286	28.25	9,310	135.00
2022	2.00	2,910	950,000	326	30.00	9,700	137.00

The foreign ship calls actually will be decreasing from 253 vessels in 1997 to 186 ship calls by 2001 and then increase to 241 ship calls by 2007 and will further increase to 378 ship calls by 2022. The vessel tonnage will increase from 8,574 GRT in 1997 to 10,000 GRT by 2022 and the length from 122.66 meters in 1997 to 138.50 meters by 2022.

Table 7-38  
TOTAL FOREIGN SHIP CALLS

YEAR	BERTH		ANCHORAGE		TOTAL	
	SHIP CALLS	LOAD (mt)	SHIP CALLS	LOAD (mt)	SHIP CALLS	LOAD (mt)
1997	223	2,875	30	4,378	253	3,070
1998	269	1,770	22	3,684	291	1,914
1999	201	2,610	23	3,470	224	2,720
2000	173	3,300	24	3,800	197	3,360
2001	167	3,710	25	3,850	192	3,720
2002	175	3,810	26	3,910	201	3,810
2003	183	3,910	27	3,970	210	3,920
2004	192	4,010	28	4,030	220	4,010
2005	198	4,140	29	4,090	227	4,140
2006	205	4,210	29	4,150	234	4,200
2007	212	4,280	29	4,210	241	4,280
2008	219	4,350	30	4,280	249	4,340
2009	225	4,440	30	4,340	255	4,440
2010	232	4,520	31	4,400	263	4,510
2012	246	4,690	32	4,540	278	4,680
2017	286	5,130	35	4,890	321	5,110
2022	326	5,650	38	5,270	364	5,620

Table 7-39  
TOTAL AVERAGE FOREIGN VESSEL TONNAGE

YEAR	BERTH	ANCHORAGE	TOTAL	AVERAGE
1997	1,704,166	465,100	2,169,266	8,574
1998	1,894,752	263,064	2,157,816	7,415
1999	1,562,000	274,000	1,836,000	8,200
2000	1,368,000	285,000	1,653,000	8,390
2001	1,336,000	296,000	1,632,000	8,500
2002	1,414,000	308,000	1,722,000	8,570
2003	1,493,000	308,000	1,801,000	8,620
2004	1,582,000	320,000	1,902,000	8,680
2005	1,647,000	332,000	1,979,000	8,760
2006	1,722,000	344,000	2,066,000	8,830
2007	1,796,000	344,000	2,140,000	8,880
2008	1,870,000	357,000	2,227,000	8,940
2009	1,946,000	357,000	2,303,000	9,030
2010	2,023,000	369,000	2,392,000	9,100
2012	2,189,000	382,000	2,571,000	9,250
2017	2,663,000	428,000	3,091,000	9,630
2022	3,162,000	477,000	3,639,000	10,000

**Table 7-40**  
**TOTAL AND AVERAGE FOREIGN VESSEL LENGTH**

YEAR	BERTH	ANCHORAGE	TOTAL	AVERAGE
1997	26,207	4,826	31,033	122.66
1998	31,946	3,269	35,215	121.02
1999	25,530	3,420	28,950	129.20
2000	22,140	3,560	25,700	130.50
2001	21,430	3,700	25,130	130.90
2002	22,510	3,850	26,360	131.10
2003	23,610	3,850	27,460	131.40
2004	24,830	4,000	28,830	131.60
2005	25,670	4,140	29,810	131.90
2006	26,650	4,290	30,940	132.20
2007	27,620	4,290	31,910	132.40
2008	28,610	4,450	33,060	132.80
2009	29,480	4,450	33,930	133.10
2010	30,460	4,600	35,060	133.30
2012	32,470	4,750	37,220	133.90
2017	38,610	5,250	43,860	136.30
2022	44,660	5,760	50,420	138.50

### 7.8.3 Total Ship Calls at the Port of Davao

The total ship calls at the Port of Davao will be increasing from 1,099 vessels in 1997 to 1,311 vessels by 2007 and will increase further to 1,759 vessel by 2022. There will be 168 ship calls at the anchorage and 1,143 ship calls at berth by 2007 and 193 ship calls at anchorage and 1,566 ship calls at berth by 2022. The growth rate is 1.90% per year for total ship calls and 2.25% per year for ship calls at the berth and negative 0.16% per year for ship calls at anchorage.

**Table 7-41**  
**TOTAL SHIP CALLS**

YEAR	DOMESTIC		FOREIGN		TOTAL		
	BERTH	ANCH.	BERTH	ANCH.	BERTH	ANCH.	TOTAL
1997	675	171	223	30	898	201	1,099
1998	734	104	269	22	1,003	126	1,129
1999	721	109	201	23	922	132	1,054
2000	774	116	173	24	947	140	1,087
2001	809	123	167	25	976	148	1,124
2002	835	126	175	26	1,010	152	1,162
2003	852	126	183	27	1,035	153	1,188
2004	872	131	192	28	1,064	159	1,223
2005	894	134	198	29	1,092	163	1,255
2006	911	136	205	29	1,116	165	1,281
2007	931	139	212	29	1,143	168	1,311
2008	953	141	219	30	1,172	171	1,343
2009	970	143	225	30	1,195	173	1,368
2010	992	144	232	31	1,224	175	1,399
2012	1,038	147	246	32	1,284	179	1,463
2017	1,139	156	286	35	1,425	191	1,616
2022	1,240	155	326	38	1,566	193	1,759

The average vessel tonnage of all ship calls is 6,800 GRT per ship which 7,270 GRT is for vessels at berth and 3,580 GRT is for vessels at anchorage for 2007. The tonnage increases to 9,320 GRT by 2022 with 9,960 GRT for vessels at berth and 4,080 GRT for vessels at anchorage.

The growth rate of the total tonnage is 1.89% per year while the tonnage for those at the berth is 1.75% per year and the tonnage for those at anchorage is 0.88% per year.

**Table 7-42**  
**TOTAL AND AVERAGE VESSEL TONNAGE (GRT)**

YEAR	BERTH		ANCHORAGE		TOTAL	
	TOTAL	AVE.	TOTAL	AVE.	TOTAL	AVE.
1997	5,790,616	6,450	659,014	3,280	6,449,630	5,870
1998	6,427,825	6,410	440,709	3,500	6,868,534	6,080
1999	5,888,000	6,390	463,000	3,500	6,351,000	6,030
2000	6,089,000	6,430	487,000	3,480	6,576,000	6,050
2001	6,384,000	6,540	511,000	3,480	1,145,000	6,140
2002	6,700,000	6,630	532,000	3,500	7,232,000	6,220
2003	6,988,000	6,780	540,000	3,480	7,528,000	6,320
2004	7,320,000	6,880	558,000	3,530	7,878,000	6,450
2005	7,637,000	6,990	579,000	3,570	8,216,000	6,550
2006	7,962,000	7,130	595,000	3,610	8,557,000	6,680
2007	8,313,000	7,270	602,000	3,580	8,915,000	6,800
2008	8,674,000	7,400	620,000	3,630	9,294,000	6,920
2009	9,046,000	7,570	624,000	3,610	9,670,000	7,070
2010	9,453,000	7,720	640,000	3,660	10,093,000	7,210
2012	10,296,000	8,020	661,000	3,690	10,957,000	7,490
2017	12,720,000	8,930	732,000	3,830	13,452,000	8,320
2022	15,559,000	9,960	787,000	4,080	16,346,000	9,320

The corresponding length of vessels increases to 120 meters for all vessels by 2007 while the length of those vessels at berth is 124.80 meters and those vessels at the anchorage at 87.60 meters. The length will increase to 132.80 meters by 2022 and to 137.80 meters and 92.10 meters respectively.

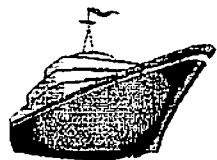
The growth rate of the vessel length is 0.70% a year for all the vessels from 1997 to 2022, 0.61% per year for the vessels at berth and 0.66% per year for vessels at anchorage.

**Table 7-43**  
**TOTAL AND AVERAGE VESSEL LENGTH (M)**

YEAR	BERTH		ANCHORAGE		TOTAL	
	TOTAL	AVE.	TOTAL	AVE.	TOTAL	AVE.
1997	106,397	118.48	15,700	78.10	122,097	111.10
1998	118,521	118.17	10,830	85.95	129,351	114.57
1999	110,970	120.40	11,380	86.20	122,350	116.10
2000	114,250	120.60	12,050	86.10	126,300	116.20
2001	118,190	121.10	12,670	86.20	130,860	116.50
2002	122,880	121.70	13,150	86.50	136,030	117.10
2003	126,530	122.20	13,410	86.50	139,940	117.60
2004	130,690	122.80	13,750	87.00	144,440	118.20
2005	134,740	123.40	14,150	87.00	148,890	118.70
2006	138,480	124.10	14,460	87.60	152,940	119.40
2007	142,600	124.80	14,720	87.60	157,320	120.00
2008	147,020	125.40	15,050	88.00	162,070	120.70
2009	150,730	126.10	15,220	88.00	165,950	121.30
2010	155,450	127.00	15,470	88.40	170,920	122.20
2012	164,820	128.40	15,890	88.80	180,710	123.50
2017	189,530	133.00	17,200	90.10	206,730	127.90
2022	215,780	137.80	17,770	92.10	233,550	132.80

The projection of the cargo, passenger and vessel traffic to be handled at the Port of Davao shows an increasing trend in the future. The port will continue to handle cargo traffic both at berth and at anchorage for both domestic and foreign cargo volume. It is likely that there will be enough port facilities to be provided by the private sector in the future to handle refined petroleum products which is handled at the anchorage at the present. This development if any, will not affect the projected cargo volume, the containers and then number of ship calls at berth.

The number of containers will already reach a volume that may warrant the use of containerships. Since containerships are non self-sustaining vessels, these require land-based equipment to load and unload their cargoes. The future development of the major ports of the country should be geared towards this direction otherwise the shipping line owners will not provide the non self-sustaining containerships.



# *Chapter* 8

## *Port Productivity and Capacity*

## Chapter 8

# PORT PRODUCTIVITY AND CAPACITY

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### 8.1 CONCEPTS FOR PRODUCTIVITY

#### 8.1.1 Benefits of Productivity

Port productivity is the measure of the level of efficiency by which the cargo traffic volume are handled at the port per unit of time. It is measured in terms of metric tons of the cargo handled per hour. The productivity can be either per unit of equipment/ gear or per unit of port physical facility like per berth. Where there are more than one equipment or gears working per berth the productivity per berth is the sum of the productivity of the equipment/gears.

The increase in the productivity has been and will always be the primary strategy behind the attainment of an objective of efficient and economical undertaking. The productivity level to a great extent determines the costs of the undertaking. As the productivity level increases, the costs tend to decrease down to an optimum productivity level.

The same strategy is adopted to attain efficiency in port operations. One of the beneficiaries is the shipping lines owners. The attainment of the objective behind the strategy will result to the faster turn around time of vessels in port for the same volume of cargo traffic. The service time does not only decrease because of higher productivity but decrease the waiting time. With the lesser time in the port, vessels can make more trips and can carry more cargo volume for the same period of time. The result is higher utilization of vessels which is reflected in the postponement of investment of additional vessels which are supposed to carry the increased cargo volume anticipated in the future.

The other beneficiaries are the port owners that provided the port facilities. With faster service time of vessels, there will be more vessels to be serviced at the port which means that more cargo volume can be handled using the same facilities. There will be higher utilization level of the port facilities which the port owner would like to see. The result is also the postponement of the investment for the expansion of the port facilities as well as the corresponding operating costs of the additional facilities for annual repair and maintenance costs.

The benefits gained from the higher productivity are the same in both the direct beneficiaries which is the postponement in investment that will result to the savings in the opportunity cost of capital. Shippers and consignees will benefit also from increased productivity. The benefits are in the form of lower inventory costs, insurance costs and storage costs.

The indirect beneficiaries are the people that comprise the consuming public as these benefits results to the reduction of the transport cost of commodities hence, the reduction in the costs or the prices of the commodities. It is necessary then that higher productivity should always be the focus in any Port development activity or undertaking.

### 8.1.2 Factors Affecting Productivity

There are three main sub-systems in port operations; these are the ship operations, transfer systems operations, and the delivery systems operations. There are port facilities and equipment to be provided in each sub-system which defines the level of productivity. The aim is for each of these sub-systems to have the same capacity to avoid bottlenecks. Any sub-system which fails to attain the level of the capacity of the other sub-systems in view of poor productivity define or control the total level of efficiency in the port and the result would be the under utilization of the other sub-systems.

There are three main factors that will affect the level of productivity. These are the technology, natural and physical environment, and the type of port management and operational systems. Packaging of cargo traffic and the type of the equipment used to handle cargo traffic are examples of technology which tend to increase productivity. Ports in areas affected with adverse natural conditions tend to have a lower productivity than ports not affected by the same. The level of how the ports are being managed and operated and the systems in used will affect the level of productivity in handling cargo traffic.

The actual level of productivity at a port is not necessarily affected only by above-mentioned factors but by a combination of these factors or interactions of these factors.

### 8.1.3 Measurement of Productivity

The design of the equipment or the gears to be used to unload and load cargo traffic or the skill of the work crew based on a certain cycle time gives an indication of the productivity level which is called the net productivity. This net productivity can be sustained provided that there is a continuous and uninterrupted handling operations. However, it is impossible to attain continuous and uninterrupted operations. There are always interruptions like equipment/gear breakdown, heavy rainfall, mealtime, loss time in shifting of operators, certain details that and non-working nighttime. These affect the productivity. Hence, there are loss time that tends to decrease the productivity and the result is called the gross productivity.

Basically, the gross operating time of a port is 24 hours per day and 365 days per year. After deducting all the loss time due to the interruptions, the remaining time is the net time in port operations. There is then the need to determine net working hours per day and net working days per year.

The ship operations is first determined and used as the basis in determining of landslide facilities. The productivity of the ship operations to be analyzed is called berth productivity. It is the measure of the level of efficiency in ship operations for the loading and unloading of cargo and passenger traffic volume at berth.

The Philippine Ports Authority gathers and compiles several statistical data relative to port operations. The data which are needed to determine the productivity are the volume of the cargo handled at berth and the service time of vessels at berth. This service time will account for all delays and losses hence, the result is gross productivity.

$$\text{Gross Productivity} = \frac{\text{Total Traffic Handled}}{\text{Total Service Time}}$$

The above formula measures the existing efficiency level but may not necessarily be used to determine the additional berth spaces required based on the projected cargo traffic volume. There are at least two cases when present level cannot be used to measure the future level of efficiency.

1. When the present level is low or it is unacceptable and a new system or technology has to be introduced (e.g. conveyors or container cranes).
2. The present level is acceptable but the containerization level of the cargo will change.

In such cases, the determination of gross productivity has to be derived by determining first the net productivity. The net productivity is to be derived from the design of the equipment to be used or installed based on certain cycle time and load per cycle. The gross productivity is determined by multiplying the net productivity by the percentage of the net working hours per day (NWH/D) and percentage of the net working days per year (NWD/Y). Where there are more than one equipment or gears are used per berth, the gross productivity shall be the sum of the productivity per equipment/gear. However, while the net productivity for each equipment are the same, their gross productivity may differ since their working time per service time (WT/ST) are not the same.

$$\text{Net Productivity per Equipment (NPE)} = \frac{\text{Load/Cycle} \times 60 \text{ min.}}{\text{Time (min.)}/\text{Cycle}}$$

$$\text{Net Productivity per Berth (NPB)} = \text{No. of Gears} \times \text{NPE} \times \text{WT/ST}$$

$$\text{Gross Productivity per Berth (GPB)} = \text{NPB} \times \text{NWH/D} \times \text{NWD/Y}$$

The second situation occurs because containers and breakbulk cargoes are carried by the same vessel and the service time is for both types of cargo traffic. The gross productivity shall be the weighted average productivity based on the percentage for each type of cargo volume. Since the containerization level increases, then the percentage will change and the weighted average productivity increases. The formula to be used is the same as shown above but instead the cycle time and load per cycle are to be determined based on the past or present gross productivity. The derived cycle time and load per cycle will be used to determine the future productivity by using the future percentage share for each type of cargo traffic volume.

It is to be noted that net productivity per berth will depend also on the number of gears or working points for each berth and the percentage of the working time per gear or working point during the ship operations time.

It is obvious that as length of vessels increases, the number of the working points or gears also increases. However, it is not necessary that available working points or gears will all be used because this would depend on the loading of the vessels. The cargo volume to be loaded and unloaded may only be on selected hatches.

The cargo volume to be loaded and unloaded is not necessarily distributed evenly in the vessel. Hence, there are working points or gears that will stop working before the ship time ends. The first working point/gear will work for 100% of the ship time, the second working point/gears for 85% and the third working point or gear at 75%. Hence, the average percentage of one working point/gear is naturally 100%. The average of two working points/gears is  $(100+85)/2=92.5\%$ . The average for three working point/gears is 85%  $(100+85+70)/3=85\%$ .

The following factors are adopted in the determination of the net productivity concerning the number of the working points or gears and percentage of working time. The determination of a value between the values stated below is determined by interpolation of the said values based on the average length of the vessel.

	Average LOA	Number of W.P./Gear	Percentage of Working Time	Product
1.	60 meters and below	1.0	100.00	100.000
2.	87 meters	1.5	96.25	144.375
3.	113 meters	2.0	92.50	185.000
4.	139 meters	2.5	88.75	221.875
5.	165 meters	3.0	85.00	255.000

The above figures show that the vessel with two gears working will have a net productivity of 1.85 times that of the vessel with one gear working.

## 8.2 CONCEPTS IN DETERMINING OF CAPACITY AND NUMBER OF BERTHS

### 8.2.1 Berth Utilization Rate

The attainment of the objective on the level of the efficiency by means of better productivity in port operations will benefit both the shipping line owners and the port owner. The means then is acceptable and favorable to both parties.

However, the means by which higher efficiency in the utilization of port facilities by one party may not be acceptable to the other party. The shipping line owners desire that every time their vessel arrives at the port, there is always an available berth for the vessel to dock in order to avoid queuing. Queuing means longer time in port and lesser utilization of their vessels. On the other hand, the port owners desire that berths will always be occupied to attain high utilization of berth facilities.

The only situation when their conflicting desires can be attained at the same time is when there is a constant number of vessels arriving at the port at constant interval with constant service time. The interval of arrival must correspond to the service time. The number of arriving vessels would have the same number of berths. Under this situation, there will always be berth upon arrival and the berth are always occupied hence, there is no queuing of vessels or underutilized berths.

However, this situation is purely academic and impossible to occur. While each shipping line has their vessel schedules they may not be necessarily jibe with the schedules of the other vessels because the cargo traffic volume is not evenly distributed throughout the year. Secondly, the service time is not the same in all the vessels because their load volume is different and their productivity is different. So, the real situation is random arrival to the port and random service time patterns of the vessels.

Random arrival means that the number of arriving vessels are not the same for each day and random service time means that the berths could not be made available all at the same time. There may even be days without any arriving vessels. Hence, depending on the number of berths at the port and the degree of randomness, either that some vessels will have to queue for available berth. A lesser number of berth tends to result to the first situation where vessels have to wait. More number of berths tends to result to the second situation where berths are underutilized. The shipping line owners do not like the first situation but the port owners prefer the same because it will lead to higher utilization. On the other hand, the shipping line owners want the second situation because of frequent availability of berths when their vessels arrive but port owners do not like the same since it leads to low berth utilization.

A compromise or trade off has to be made where there would be some tolerable waiting time and tolerable underutilization of berths. From the economic stand point, the trade off should result to the situation where the total cost of waiting time and the provision of berthing spaces will be the lowest cost. An additional berth should be provided as long as the value of the reduction in waiting time (benefit) is more than the value of the additional berth (cost). The value of the reduction in the waiting time decreases when additional berths are provided hence, this will come to a point when benefit will be the same or less than the cost. At this point, the provision of an additional berth should already stop and the berth occupancy at this point is the optimum one. Either approach do not only determine the optimum berth occupancy but the required number of berths as well.

Waiting time is determined by using the UNCTAD matrix showing the ratio of the waiting time and the service time given the number of berths and the berth occupancy. The service time is computed by dividing the volume of cargo traffic by the gross productivity based on the formula shown above. Berth occupancy is derived using the formula as shown below.

Berth occupancy is the measure of the utilization level of berths. It is expressed in terms of the ratio between the actual meter-hours and the maximum meter-hours per year. The actual meter-hours is the product of the number of ship calls, the average service time, and the average vessel length while the latter is the product of the effective berth length multiplied by 8,760 hours per year.

$$\text{Berth Occupancy} = \frac{\text{Ship Calls} \times \text{Ave. Service Time} \times \text{Ave. Length of Vessels} \times \text{Spacing Factor}}{\text{Effective Total Berth Length} \times 8,760}$$

Number of ship calls multiplied by the average service time gives the total service time while the effective berth length divided by the average vessel length and spacing factor gives the number of berths. Hence, the above equation for berth occupancy can be transformed to an equation based on the ratio of the actual service time and the maximum berth time.

$$\text{Berth Occupancy} = \frac{\text{Total Service Time}}{\text{Number of Berths} \times 8,760}$$

UNCTAD also issued the Manual on Port Development where they suggested economically acceptable optimum berth occupancy at different number of berths based on random arrival and random service time of vessels. The rates approximate the optimum berth occupancy rate derived by the marginal analysis, as follows:

No. of Berths	Berth Occupancy
2	47%
3	53%
4	58%
5	62%
6	65%
7	67%
8	69%
9 and up	70%

### 8.2.2 Allowable Berth Time and Berth Capacity

The allowable berth time is dependent on the optimum or the allowable berth occupancy. A 100% berth occupancy will give the theoretical berth time. The optimum or allowable berth occupancy multiplied by 8,760 hours per year is the allowable berth time. In turn the berth occupancy is the product of the allowable berth time and the gross productivity.

$$\text{Allowable Berth Time (ABT)} = \frac{\text{Optimum/Allowable Berth Occupancy}}{\times 8,760 \text{ hours/year}}$$

$$\text{Capacity/Berth (C/B)} = \text{ABT} \times \text{Gross Productivity}$$

$$\text{Total Berth Capacity} = \text{C/B} \times \text{No. of Berths}$$

Based on marginal analysis the capacity per berth is also equal to the quotient of the design traffic and the number of berths. It is the same as the capacity derived from the above formula because the number of berths is determined from the gross productivity.

### 8.3 PAST PRODUCTIVITY

The volume of cargo traffic handled at berth of the Port of Davao was 484,711 metric tons in 1980 and has increased to 1,421,390 metric tons in 1998. The average growth rate was 6.16% per year. On the other hand, the service time of the vessels increased from 22,670 hours in 1980 to 24,128 hours in 1998. The average growth rate was 0.35% per year.

Since the growth rate of the cargo volume was higher than the growth rate of the service time, it follows that the level of the gross productivity was increasing. It was 21.38 metric tons per hour in 1980 and increased to 58.91 metric tons per hour in 1998. Actually based on the records of PPA the 1998 service time was higher to give a productivity of only 48 metric tons per hour that was low compared to productivity in last four years which ranged from 61.60 to 76.12 metric tons per hour. It was found out that the average service time of vessels in May 1998 was more than 123 hours per vessel as compared to only 33 hours for the rest of the ship calls in 1998. Hence, the adjusted service time is 24,128 hours and the gross productivity is 58.91 metric tons per hour for 1998. This productivity would appear to be more acceptable since it ranged from 60 to 76 metric tons an hour in the last 5 years.

Table 8-1  
BERTH GROSS PRODUCTIVITY OF DOMESTIC CARGO

YEAR	VOLUME (mt)	SERVICE TIME (hr)	PRODUCTIVITY (mt/hr)
1980	484,711	22,670	21.38
1981	415,728	23,350	17.80
1982	606,726	31,712	19.13
1983	797,846	34,438	23.17
1984	1,019,926	44,654	22.84
1985	844,694	28,370	29.78
1986	817,589	23,149	35.32
1987	1,089,852	37,388	29.15
1988	1,280,205	42,211	30.33
1989	1,269,150	44,197	28.72
1990	1,269,890	30,431	41.73
1991	1,095,972	20,070	54.61
1992	994,888	18,788	52.95
1993	1,121,853	26,721	41.98
1994	1,288,155	20,912	61.60
1995	1,419,102	20,056	70.76
1996	1,263,444	19,930	63.39
1997	1,452,223	19,079	76.12
1998	1,421,390	24,128	58.91

The foreign cargo traffic volume handled at the berth in 1980 was 126,880 metric tons and increased to 476,057 metric tons in 1998 for an average growth rate of 7.62% per year. The service time of vessels was 7,110 hours in 1980 and increased to 9,741 hours in 1998 for an average growth rate of 1.76% a year. As in the case of the domestic cargo traffic volume, the growth rate of the foreign cargo volume was higher than the growth rate of the service time hence, gross productivity was increasing it was 17.85 metric tons per hour in 1980 and increased to 48.87 metric tons in 1998. There were even years in the past when the gross productivity increased to 50 or more metric tons an hour in handling foreign cargo traffic.

**Table 8-2**  
**BERTH GROSS PRODUCTIVITY OF FOREIGN CARGO**

YEAR	VOLUME (mt)	SERVICE TIME (hr)	PRODUCTIVITY (mt/hr)
1980	126,880	7,110	17.85
1981	74,131	3,332	22.25
1982	116,910	4,282	27.26
1983	144,070	9,022	15.97
1984	122,616	5,856	20.94
1985	407,197	9,409	43.28
1986	256,474	9,792	26.19
1987	376,935	12,954	29.10
1988	395,720	13,012	30.41
1989	233,684	13,568	17.22
1990	238,933	7,408	32.25
1991	223,970	4,419	50.68
1992	294,579	5,577	52.82
1993	275,098	6,529	42.13
1994	221,997	6,433	34.51
1995	306,181	13,230	23.14
1996	864,733	53,715	16.10
1997	645,635	14,173	45.55
1998	476,057	9,741	48.87

The total cargo traffic volume handled by the Port of Davao at berth was 611,591 metric tons in 1980 and increased to 1,897,447 metric tons in 1998. The average growth rate was 6.49% per year. The combined service time of vessels was 29,780 hours in 1980 and increased to 33,869 hours in 1998 an average growth rate of 0.72% per year. This means that the gross productivity was increasing from 20.54 metric tons in 1980 to 56.02 metric tons in 1998.

**Table 8-3**  
**BERTH GROSS PRODUCTIVITY OF TOTAL CARGO**

YEAR	VOLUME (mt)	SERVICE TIME (hr)	PRODUCTIVITY
1980	611,591	29,780	20.54
1981	489,859	26,682	18.36
1982	723,636	36,000	20.10
1983	941,916	43,460	21.67
1984	1,142,542	50,510	22.62
1985	1,252,161	37,779	33.14
1986	1,074,063	32,941	32.61
1987	1,466,787	50,342	29.14
1988	1,675,925	55,223	30.35
1989	1,502,834	57,765	26.02
1990	1,508,823	37,839	39.87
1991	1,319,942	24,489	53.90
1992	1,289,467	24,365	52.92
1993	1,396,951	33,250	42.01
1994	1,510,152	27,345	55.23
1995	1,725,283	33,286	51.83
1996	2,128,177	73,645	28.90
1997	2,097,858	33,252	63.09
1998	1,897,447	33,869	56.02

While the increase in productivity can be attributed to one or a combination of the factors mentioned above, it is to be noted that the average vessel length is different. It was only 77.84 meters in 1980 while it was 118.17 meters in 1998. Perhaps this is because there were less working points or gears for the smaller vessels. The 77.84 meters vessels may have only an average of 1.5 working points/gears and the 118.17 meters vessels may have 2 working points/gears. The productivity per gear maybe the same but the productivity per berth will be higher for those with more working gears per berth.

#### 8.4 PAST BERTH OCCUPANCY AND CAPACITY

The total berthing length space of Sasa Wharf is 920 meters. The original length was 515 meters and the new quay was 405 meters. For several years the back up area was not developed and it was only in 1993 that the area was developed as the container yard under transfer crane operations.

The average vessel length of all vessels handled at the berth has increased from 77.84 meters in 1980 to 118.17 meters in 1998. With a spacing factor of 7.5% of the average vessel length, the average length per berth was 84 meters in 1980 to 127 meters in 1998. Hence, based on the 920 meters berth length there were around 11 berths in years 1980 to 1984, 10 berths in years 1985 to 1990, 8 berths in 1991 to 1995 and 7 berths in the last two years, 1997 and 1998.

Table 8-4  
NUMBER OF BERTHS

YEAR	AVERAGE LOA	LENGTH PER BERTH	NO. OF BERTHS
1980	77.84	84.00	11
1981	71.56	67.00	14
1982	69.85	75.00	12
1983	78.06	84.00	11
1984	80.82	87.00	11
1985	83.94	90.00	10
1986	94.54	102.00	9
1987	75.06	81.00	11
1988	84.99	91.00	10
1989	89.42	96.00	10
1990	90.28	97.00	10
1991	103.82	112.00	8
1992	104.52	112.00	8
1993	101.96	110.00	8
1994	108.22	116.00	8
1995	108.22	116.00	8
1996	89.94	97.00	10
1997	118.49	127.00	7
1998	118.17	127.00	7

The maximum berth time is 8,760 hours per berth. The total berth time is equal to the number of berth multiplied by the number of hours per berth. Since the number of berths in a year differs, then the total maximum berth time differs also per year. This range from 122,640 hours in 1981 to 61,320 hours in 1998. The berth occupancy is determined by dividing the service time of the vessels by the maximum berth time. The berth occupancy was 30.9% in 1980 to 55.23% in 1998. The lowest berth occupancy rate was in 1981 when it was only 21.76% and the highest was 84.07% in 1996. The occupancy rate in year 1998 is not yet critical but the time involved in the provision of additional facilities should be considered.

Table 8-5  
BERTH OCCUPANCY

YEAR	SERVICE TIME	MAX. BERTH TIME	BERTH OCCUPANCY
1980	29,780	96,360	30.90
1981	26,682	122,640	21.76
1982	36,000	105,120	24.25
1983	43,460	96,360	45.10
1984	50,510	96,360	52.42
1985	37,779	87,600	43.13
1986	32,941	78,840	41.78
1987	50,342	96,360	52.24
1988	55,223	87,600	63.04
1989	57,765	87,600	65.94
1990	37,839	87,600	43.20
1991	24,489	70,080	34.94
1992	24,365	70,080	34.77
1993	33,250	70,080	47.45
1994	27,345	70,080	39.02
1995	33,286	70,080	47.50
1996	73,645	87,600	84.07
1997	33,252	61,320	54.23
1998	33,869	61,320	55.23

As derived earlier, the number of berths for the same total berth length varies depending on the average vessel length. There were 7 to 10 berths since 1990 to 1998. The allowable berth time is the product of the allowable berth occupancy and 8,760 hours per year. It ranged from 5,870 hours ( $0.67 \times 8,760$  hours) to 6,130 hours ( $0.70 \times 8,760$  hours) per berth.

The capacity per berth in 1990 was 244,500 metric tons and has been increasing to 328,800 metric tons in 1998 but it decreased to 177,210 metric tons in 1996 due to the decrease in gross productivity in the handling of foreign cargo at 16.10 metric tons per hour. In spite of the differences in the capacity per berth, the total capacity of the port was more or less the same except in 1996. The total capacity is around 2,500,000 metric tons per year.

**Table 8-6**  
**PORT CAPACITY**

YEAR	CAPACITY PER BERTH				TOTAL CAPACITY	
	ALLOW B.O.	MAX TIME (hr)	ALLOW TIME (hr)	CAPACITY (mt)	NO. OF BERTHS	TOTAL CAPACITY (mt)
1990	0.70	8,760	6,132	244,500	10	2,445,000
1991	0.69	8,760	6,045	325,800	8	2,606,400
1992	0.69	8,760	6,045	319,900	8	2,559,200
1993	0.69	8,760	6,045	254,000	8	2,032,000
1994	0.69	8,760	6,045	333,900	8	2,671,200
1995	0.69	8,760	6,045	313,300	8	2,506,400
1996	0.70	8,760	6,132	177,200	10	1,772,000
1997	0.67	8,760	5,870	370,300	7	2,595,100
1998	0.67	8,760	5,870	328,800	7	2,301,600

### 8.5 FUTURE PRODUCTIVITY AND CAPACITY

As analyzed in Sections 8.3 and 8.4 of this Chapter, the capacity of the Sasa Wharf based on the gross productivity of 1998 is 2,301,900 metric tons per year. This total capacity will be reached by 2001 based on the projected cargo volume to be handled at berth.

It is expected that the gross productivity of the port will increase in the future but there is the need to determine the factors that will cause the increase. It is unlikely that the increase will be due to an improved management and port operations. This cannot also be attributed to physical and natural environment.

The probable source of the increase of productivity is technology. But even with this factor, the source will be limited to the increasing share of containerization. It is unlikely that landslide equipment be provided with shore cranes to unload and load containers. The present types of vessels are not suited to such equipment unless container ships will be used in the transport of the containers. If this occurs then there will be separate specialized container terminal with different productivity and capacity.

However, even if the port will be developed in the future to provide such facilities and equipment, if the other major ports in the country will have no capability to handle the same, the shipping line owners will not procure container ships. Under such circumstances, the study assumed that the vessels in the future will still be the same type as what is being used at present combo vessels. Hence, development will still be for multi-purpose port.

The increase in the level of containerization will change the mixture of the cargo. Since productivity in the handling of containers is much higher than non-containerized cargo volume, the weighted gross productivity will increase and therefore the port capacity will increase also. Vessel length will also increase which may allow more working points per berth hence, will also alter the productivity and capacity per berth. The load per container box will also increase so the load per cycle will increase and for the same number of cycles per hour, the net productivity will increase. There is the need then to determine the future productivity.

Unfortunately, the past data on service time is the total for the loading and unloading of all the cargo traffic. Service time for the handling of containers and non-containerized cargo are not separated and most likely will not be separated since operations are simultaneously done sometimes. The changing values of the factors could not directly be applied into the present gross productivity to define the future gross productivity.

### 8.5.1 Productivity and Capacity in 1998

The values of the factors in 1998 and the gross productivity were as follows:

ITEMS	DOMESTIC	FOREIGN	TOTAL
1. Total Vol. at Berth (mt)	1,421,390	476,057	1,897,447
2. Share	74.91%	25.09%	100%
3. Containerized Vol. (mt)	1,085,303	234,611	1,319,914
4. Percent Containerized	76.36%	49.28%	69.56%
5. Non-cont. Vol. (mt)	336,087	241,446	577,533
6. Percent Non-cont.	23.64%	50.72%	30.44%
7. Containers			
a. Loaded TEUs	65,030	21,340	
b. Empty TEUs	23,080	14,340	
Total	88,110	35,680	
c. Loaded Box	67,130	12,550	
d. Empty Box	23,820	8,440	
Total	90,950	20,990	
8. Load Per Box (mt)	11.98	11.18	
9. Gross Productivity (mt/hr)	58.91	48.87	

The cycle time for the loading and unloading of containers is 10 minutes or 6 cycles per hour. With one box per cycle the net productivity is six boxes per hour per gear. The cycle time for the non-containerized cargo handling is 4 minutes or 15 cycles per hour. To satisfy the gross productivity, the load per cycle is 1.5 metric tons for the domestic cargoes and 1.85 metric tons for foreign cargoes. The net productivities per gear are 22.5 metric tons per hour and 27.75 metric tons per hour respectively, which are attainable. Number of gears and the working time per gear are based on the interpolation of the data shown earlier. These factors determine the net productivity per berth.

The net working time per day and year shall be determined also to define gross productivity. The time losses in a day are the meal time of three hours and another three hours for miscellaneous losses for a total of six hours loss giving 18 hours net working time per day or 75% of the operating berth time.

On the other hand, the loses per year are three days for non-working holidays and around 47 non-workable days per year due to bad weather or gear downtime, etc., for a total of 50 non-working days per year. The net working time is 315 days or 86.3% of the year.

**Table 8-7**  
**NET WORKING HOURS PER DAY**

ITEMS	HOURS
1. Gross Working Hours/Day (GWH/D)	24
2. Losses	
a. Meal Time	3
b. Other Losses	3
Total Losses	<u>6</u>
3. Net Working Hours/Day (NWH/D)	18
4. Percent (NWH/GWH)	75%

**Table 8-8**  
**NET WORKING DAYS PER YEAR**

ITEMS	DAYS
1. Gross Working Days/Year (GWD/Y)	365
2. Losses	
a. Holidays	3
b. Unworkable Days	47
Total	<u>50</u>
3. Net Working Days/Year (NWD/Y)	315
4. Percent (NWD/GWD)	86.3%

The weighted gross productivity of the domestic and foreign cargo volumes are derived based on the formula where the gross productivity is equal to the cargo volume divided by service time of the vessels. Conversely, the service time is equal to the volume divided by the gross productivity. The volume is the percentage of the domestic and foreign cargo volume to the total cargo volume. The resulting value is the time to load or unload one metric ton of cargo. The reciprocal is volume per hour, which is the weighted gross productivity.

**A. DOMESTIC CARGO**

**1. Net Productivity (mt/hr/berth)**

- a. Containers =  $2.09 \times 6.0 \times 11.93 \times 0.9180 = 137.33$   
b. Non-cont. =  $2.09 \times 15.0 \times 1.513 \times 0.9180 = 43.54$

## 2. Gross Productivity (mt/hr/berth)

- a. Containers =  $137.33 \times 0.75 \times 0.863 = 88.89$   
 b. Non-cont. =  $43.54 \times 0.75 \times 0.863 = 28.18$

## 3. Weighted Gross Productivity

- a. Containers =  $0.7636/88.89 = 0.0085903926$   
 b. Non-cont. =  $0.2364/28.18 = 0.0083889283$   
                   =  $0.0169793209 \text{ hr./mt}$   
                   =  $58.90 \text{ metric tons/hour}$

## B. FOREIGN CARGO

## 1. Net Productivity (mt/hr/berth)

- a. Containers =  $2.11 \times 6.0 \times 11.18 \times 0.9170 = 129.79$   
 b. Non-cont. =  $2.11 \times 15.0 \times 1.85 \times 0.9170 = 53.69$

## 2. Gross Productivity (mt/hr/berth)

- a. Containers =  $129.79 \times 0.75 \times 0.863 = 84.01$   
 b. Non-cont. =  $53.69 \times 0.75 \times 0.863 = 34.75$

## 3. Weighted Gross Productivity

- a. Containers =  $0.4928/84.01 = 0.0058659683$   
 b. Non-cont. =  $0.5072/34.75 = 0.0145956835$   
                   =  $0.0204616518 \text{ hr./mt}$   
                   =  $48.87 \text{ metric tons/hour}$

## C. OVERALL WEIGHTED GROSS PRODUCTIVITY

- a. Domestic =  $0.7491/58.90 = 0.0127181664$   
 b. Foreign =  $0.2509/48.87 = 0.0051340291$   
                   =  $0.0178521955 \text{ hr./mt}$   
                   =  $56.02 \text{ metric tons/hour}$

The number of cycles then to be used to determine the future productivity is 6 cycles of 6 boxes an hour for the handling of both domestic and foreign containers and 22.50 metric tons an hour ( $15 \times 1.50$ ) for domestic non-containerized volume and 27.75 metric tons per hour ( $15 \times 1.85$ ) for non-containerized foreign volume. The factors which will change based on the projection are the average load per container box, the number of working points or gears and the percentage of working time of gears per service time of the vessels at berth. The net working time per day and the net working time per year remain the same in the determination of the gross productivity.

### 8.5.2 Productivity and Capacity from 1999 to 2006

As determined earlier, the total capacity of the port in 1998 based on the gross productivity of 56.02 metric tons per hour is 2,301,600 metric tons. This capacity is higher than the cargo traffic volume at berth for the same year which is 1,897,447 metric tons. This means that the port was able to handle the cargo traffic volume economically in 1998 and so will be able to handle the same productivity in the next few years to come.

There is the need to determine as to when the traffic will be more than the capacity as this will define timing of additional port facilities. The share of the containerized volume is increasing and it is expected that productivity will be increasing also. The capacity then of the port will increase to handle more cargo volume in the future. In view thereof, the productivity and capacity per year after 1998 should be determined to compare with the corresponding projected cargo traffic volume.

The average length of vessels was 118.17 meters in 1998 and will increase to 124.80 meters in year 2007. The lengths per berth based on these vessel lengths ranged from 127 to 134 meters. There will be seven berths available from year 1998 to 2007 of the present total berth length of 920 meters. The allowable berth occupancy rate then will be the same each year at 67% and allowable berth time of 5,870 hour per year per berth.

The share of the domestic cargo volume at the berth is 74.91% in 1998 and increasing to 75.56% by 2007. The containerized domestic cargo volume will be increasing from 76.36% in 1998 to 87.75% by 2007 while the foreign containerized volume will be increasing from 49.28% in 1998 to 70.81% by 2007.

Table 8-9  
DATA FOR THE DETERMINATION OF THE PRODUCTIVITY AND CAPACITY

YEAR	PERCENT SHARE		PERCENT CONT.		LOAD/BOX (MT)	
	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN	DOMESTIC	FOREIGN
1998	74.91	25.09	76.36	49.28	11.98	11.18
1999	74.48	25.52	80.84	53.24	12.33	11.40
2000	75.00	25.00	83.25	56.04	12.48	11.50
2001	75.23	24.77	83.72	59.13	12.52	11.66
2002	75.18	24.82	84.23	61.41	12.54	11.87
2003	75.09	24.91	84.73	63.50	12.57	12.10
2004	74.97	25.03	85.28	65.54	12.58	12.31
2005	75.00	25.00	85.77	67.93	12.60	12.46
2006	75.28	24.72	86.26	69.41	12.61	12.65
2007	75.56	24.44	86.75	70.81	12.62	12.80

#### A. 1999 PRODUCTIVITY

##### 1. DOMESTIC CARGO

Net Productivity (mt/hr/berth)

- a. Containers =  $2.10 \times 6.0 \times 12.33 \times 0.9175 = 142.54$
- b. Non-cont. =  $2.10 \times 15.0 \times 1.50 \times 0.9175 = 43.35$

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$142.54 \times 0.75 \times 0.863$	= 92.26
b. Non-cont.	=	$43.35 \times 0.75 \times 0.863$	= 28.06

**Weighted Gross Productivity**

a. Containers	=	$0.8084/92.26$	= 0.0087621938
b. Non-cont.	=	$0.1916/28.06$	= <u>0.0068282252</u>
			= 0.0155904190 hr./mt
			= 64.14 metric tons/hour

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

a. Containers	=	$2.27 \times 6.0 \times 11.40 \times 0.9050$	= 140.52
b. Non-cont.	=	$2.27 \times 15.0 \times 1.85 \times 0.9050$	= 57.01

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$140.52 \times 0.75 \times 0.863$	= 90.95
b. Non-cont.	=	$57.01 \times 0.75 \times 0.863$	= 36.90

**Weighted Gross Productivity**

a. Containers	=	$0.5324/90.95$	= 0.0058537658
b. Non-cont.	=	$0.4676/36.90$	= <u>0.0126720867</u>
			= 0.0185258525 hr./mt
			= 53.98 metric tons/hour

**3. OVERALL WEIGHTED GROSS PRODUCTIVITY**

a. Domestic	=	$0.7448/64.14$	= 0.0116120985
b. Foreign	=	$0.2552/53.98$	= <u>0.0047276769</u>
			= 0.0163397754 hr./mt
			= 61.20 metric tons/hour

**B. 2000 PRODUCTIVITY****1. DOMESTIC CARGO****Net Productivity (mt/hr/berth)**

a. Containers	=	$2.11 \times 6.0 \times 12.48 \times 0.9175$	= 144.96
b. Non-cont.	=	$2.11 \times 15.0 \times 1.50 \times 0.9175$	= 43.56

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$144.96 \times 0.75 \times 0.863$	= 93.83
b. Non-cont.	=	$43.56 \times 0.75 \times 0.863$	= 28.19

**Weighted Gross Productivity**

a. Containers	=	$0.8325/93.83$	= 0.0088724289
b. Non-cont.	=	$0.1675/28.19$	= <u>0.0059418233</u>
			= 0.0148142522 hr./mt
			= 67.50 metric tons/hour

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

- a. Containers =  $2.29 \times 6.0 \times 11.50 \times 0.9035 = 142.76$   
 b. Non-cont. =  $2.29 \times 15.0 \times 1.85 \times 0.9035 = 57.42$

**Gross Productivity (mt/hr/berth)**

- a. Containers =  $142.76 \times 0.75 \times 0.863 = 92.40$   
 b. Non-cont. =  $57.42 \times 0.75 \times 0.863 = 37.17$

**Weighted Gross Productivity**

- a. Containers =  $0.5604/92.40 = 0.0060649351$   
 b. Non-cont. =  $0.4396/37.17 = 0.0118267420$   
 =  $0.0178916771 \text{ hr./mt}$   
 =  $55.89 \text{ metric tons/hour}$

**3. OVERALL WEIGHTED GROSS PRODUCTIVITY**

- a. Domestic =  $0.7500/67.70 = 0.0111111111$   
 b. Foreign =  $0.2500/55.89 = 0.0044730721$   
 =  $0.0155841832 \text{ hr./mt}$   
 =  $64.17 \text{ metric tons/hour}$

**C. 2001 PRODUCTIVITY****1. DOMESTIC CARGO****Net Productivity (mt/hr/berth)**

- a. Containers =  $2.12 \times 6.0 \times 12.52 \times 0.9160 = 145.88$   
 b. Non-cont. =  $2.12 \times 15.0 \times 1.50 \times 0.9160 = 43.69$

**Gross Productivity (mt/hr/berth)**

- a. Containers =  $145.88 \times 0.75 \times 0.863 = 94.42$   
 b. Non-cont. =  $43.69 \times 0.75 \times 0.863 = 28.28$

**Weighted Gross Productivity**

- a. Containers =  $0.8372/94.42 = 0.0088667655$   
 b. Non-cont. =  $0.1628/28.28 = 0.0057567185$   
 =  $0.0146234840 \text{ hr./mt}$   
 =  $68.38 \text{ metric tons/hour}$

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

- a. Containers =  $2.29 \times 6.0 \times 11.66 \times 0.9035 = 144.75$   
 b. Non-cont. =  $2.29 \times 15.0 \times 1.85 \times 0.9035 = 57.42$

**Gross Productivity (mt/hr/berth)**

- a. Containers =  $144.75 \times 0.75 \times 0.863 = 93.69$   
 b. Non-cont. =  $57.42 \times 0.75 \times 0.863 = 37.17$

## Weighted Gross Productivity

a.	Containers	=	0.5913/93.69	=	0.0063112392
b.	Non-cont.	=	0.4087/37.17	=	<u>0.0109954264</u>
				=	0.0173066656 hr./mt
				=	57.78 metric tons/hour

## 3. OVERALL WEIGHTED GROSS PRODUCTIVITY

a.	Domestic	=	0.7523/68.38	=	0.0110017549
b.	Foreign	=	0.2477/55.93	=	<u>0.0042869505</u>
				=	0.0152887054 hr./mt
				=	65.41 metric tons/hour

## D. 2002 PRODUCTIVITY

## 1. DOMESTIC CARGO

## Net Productivity (mt/hr/berth)

a.	Containers	=	2.13 x 6.0 x 12.54 x 0.9150	=	146.64
b.	Non-cont.	=	2.13 x 15.0 x 1.50 x 0.9150	=	43.85

## Gross Productivity (mt/hr/berth)

a.	Containers	=	146.64 x 0.75 x 0.863	=	94.91
b.	Non-cont.	=	43.85 x 0.75 x 0.863	=	28.38

## Weighted Gross Productivity

a.	Containers	=	0.8423/94.91	=	0.0088747234
b.	Non-cont.	=	0.1577/28.38	=	<u>0.0055567301</u>
				=	0.0144314535 hr./mt
				=	69.29 metric tons/hour

## 2. FOREIGN CARGO

## Net Productivity (mt/hr/berth)

a.	Containers	=	2.30 x 6.0 x 11.87 x 0.9025	=	147.83
b.	Non-cont.	=	2.30 x 15.0 x 1.85 x 0.9025	=	57.60

## Gross Productivity (mt/hr/berth)

a.	Containers	=	147.83 x 0.75 x 0.863	=	95.68
b.	Non-cont.	=	57.60 x 0.75 x 0.863	=	37.28

## Weighted Gross Productivity

a.	Containers	=	0.6141/95.68	=	0.0064182692
b.	Non-cont.	=	0.3859/37.28	=	<u>0.0103513948</u>
				=	0.0167696640 hr./mt
				=	59.63 metric tons/hour

## 3. OVERALL WEIGHTED GROSS PRODUCTIVITY

a.	Domestic	=	0.7518/69.29	=	0.0108500505
b.	Foreign	=	0.2482/59.63	=	<u>0.0041623344</u>
				=	0.0150123849 hr./mt
				=	66.61 metric tons/hour

**E. 2003 PRODUCTIVITY****1. DOMESTIC CARGO**

## Net Productivity (mt/hr/berth)

a. Containers	=	$2.14 \times 6.0 \times 12.57 \times 0.9140 = 147.52$
b. Non-cont.	=	$2.14 \times 15.0 \times 1.50 \times 0.9140 = 44.01$

## Gross Productivity (mt/hr/berth)

a. Containers	=	$147.52 \times 0.75 \times 0.863 = 95.48$
b. Non-cont.	=	$44.01 \times 0.75 \times 0.863 = 28.49$

## Weighted Gross Productivity

a. Containers	=	$0.8473/95.48 = 0.0088741098$
b. Non-cont.	=	$0.1527/28.49 = 0.0053597754$
		$= 0.0142338852 \text{ hr./mt}$
		$= 70.25 \text{ metric tons/hour}$

**2. FOREIGN CARGO**

## Net Productivity (mt/hr/berth)

a. Containers	=	$2.30 \times 6.0 \times 12.10 \times 0.9025 = 150.70$
b. Non-cont.	=	$2.30 \times 15.0 \times 1.85 \times 0.9025 = 57.60$

## Gross Productivity (mt/hr/berth)

a. Containers	=	$150.70 \times 0.75 \times 0.863 = 97.54$
b. Non-cont.	=	$57.60 \times 0.75 \times 0.863 = 37.28$

## Weighted Gross Productivity

a. Containers	=	$0.6350/97.54 = 0.0065101497$
b. Non-cont.	=	$0.3650/37.58 = 0.0097907725$
		$= 0.0163009222 \text{ hr./mt}$
		$= 61.35 \text{ metric tons/hour}$

**3. OVERALL WEIGHTED GROSS PRODUCTIVITY**

a. Domestic	=	$0.7509/70.25 = 0.0106889680$
b. Foreign	=	$0.2491/61.35 = 0.0040603097$
		$= 0.0147492777 \text{ hr./mt}$
		$= 67.80 \text{ metric tons/hour}$

**F. 2004 PRODUCTIVITY****1. DOMESTIC CARGO**

## Net Productivity (mt/hr/berth)

a. Containers	=	$2.16 \times 6.0 \times 12.58 \times 0.9130 = 148.85$
b. Non-cont.	=	$2.16 \times 15.0 \times 1.50 \times 0.9130 = 44.37$

## Gross Productivity (mt/hr/berth)

a. Containers	=	$148.85 \times 0.75 \times 0.863 = 96.34$
b. Non-cont.	=	$44.37 \times 0.75 \times 0.863 = 28.72$

**Weighted Gross Productivity**

a.	Containers	=	0.8528/96.34	=	0.0088519826
b.	Non-cont.	=	0.1472/28.72	=	<u>0.0051253482</u>
				=	0.0139773308 hr./mt
				=	71.54 metric tons/hour

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

a.	Containers	=	2.31 x 6.0 x 12.31 x 0.9015	=	153.81
b.	Non-cont.	=	2.31 x 15.0 x 1.85 x 0.9015	=	57.79

**Gross Productivity (mt/hr/berth)**

a.	Containers	=	153.81 x 0.75 x 0.863	=	99.55
b.	Non-cont.	=	57.79 x 0.75 x 0.863	=	37.40

**Weighted Gross Productivity**

a.	Containers	=	0.6554/99.55	=	0.0065836263
b.	Non-cont.	=	0.3446/37.40	=	<u>0.0092139037</u>
				=	0.0157975300 hr./mt
				=	63.30 metric tons/hour

**3. OVERALL WEIGHTED GROSS PRODUCTIVITY**

a.	Domestic	=	0.7497/71.54	=	0.0104794521
b.	Foreign	=	0.2503/63.30	=	<u>0.0039541864</u>
				=	0.0144336385 hr./mt
				=	69.28 metric tons/hour

**G. 2005 PRODUCTIVITY****1. DOMESTIC CARGO****Net Productivity (mt/hr/berth)**

a.	Containers	=	2.17 x 6.0 x 12.60 x 0.9125	=	149.70
b.	Non-cont.	=	2.17 x 15.0 x 1.50 x 0.9125	=	44.55

**Gross Productivity (mt/hr/berth)**

a.	Containers	=	149.70 x 0.75 x 0.863	=	96.89
b.	Non-cont.	=	44.55 x 0.75 x 0.863	=	28.83

**Weighted Gross Productivity**

a.	Containers	=	0.8577/96.89	=	0.0088523067
b.	Non-cont.	=	0.1423/28.83	=	<u>0.0049358307</u>
				=	0.0137881374 hr./mt
				=	72.53 metric tons/hour

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

a.	Containers	=	2.32 x 6.0 x 12.46 x 0.910	=	156.27
b.	Non-cont.	=	2.32 x 15.0 x 1.85 x 0.901	=	58.01

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$156.27 \times 0.75 \times 0.863 = 101.15$
b. Non-cont.	=	$58.01 \times 0.75 \times 0.863 = 37.55$

**Weighted Gross Productivity**

a. Containers	=	$0.6793/101.15 = 0.0067157687$
b. Non-cont.	=	$0.3207/37.55 = 0.0085406125$
		$= 0.0152563812 \text{ hr./mt}$
		$= 65.55 \text{ metric tons/hour}$

**3. OVERALL WEIGHTED GROSS PRODUCTIVITY**

a. Domestic	=	$0.7500/72.53 = 0.0103405487$
b. Foreign	=	$0.2500/65.55 = 0.0038138825$
		$= 0.0141544312 \text{ hr./mt}$
		$= 70.65 \text{ metric tons/hour}$

**H. 2006 PRODUCTIVITY****1. DOMESTIC CARGO****Net Productivity (mt/hr/berth)**

a. Containers	=	$2.18 \times 6.0 \times 12.61 \times 0.9115 = 150.34$
b. Non-cont.	=	$2.18 \times 15.0 \times 1.50 \times 0.9115 = 44.71$

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$150.34 \times 0.75 \times 0.863 = 97.31$
b. Non-cont.	=	$44.71 \times 0.75 \times 0.863 = 28.94$

**Weighted Gross Productivity**

a. Containers	=	$0.8626/97.31 = 0.0088644538$
b. Non-cont.	=	$0.1374/28.94 = 0.0047477540$
		$= 0.0136122078 \text{ hr./mt}$
		$= 73.46 \text{ metric tons/hour}$

**2. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

a. Containers	=	$2.32 \times 6.0 \times 12.65 \times 0.9010 = 158.66$
b. Non-cont.	=	$2.32 \times 15.0 \times 1.85 \times 0.9010 = 58.01$

**Gross Productivity (mt/hr/berth)**

a. Containers	=	$158.66 \times 0.75 \times 0.863 = 102.69$
b. Non-cont.	=	$58.01 \times 0.75 \times 0.863 = 37.55$

**Weighted Gross Productivity**

a. Containers	=	$0.6941/102.69 = 0.0067591781$
b. Non-cont.	=	$0.3059/37.55 = 0.0081464714$
		$= 0.0149056495 \text{ hr./mt}$
		$= 67.09 \text{ metric tons/hour}$

### 3. OVERALL WEIGHTED GROSS PRODUCTIVITY

$$\begin{aligned}
 \text{a. Domestic} &= 0.7528/73.46 = 0.0102477539 \\
 \text{b. Foreign} &= 0.2472/67.09 = \underline{0.0036846028} \\
 &= 0.0139323567 \text{ hr./mt} \\
 &= 71.78 \text{ metric tons/hour}
 \end{aligned}$$

As calculated above, the allowable berth time is 5,870 hours per year per berth. The weighted gross productivity in 1998 was 56.02 metric tons per hour per berth and will go up to 71.78 metric tons per hour per berth by 2006. The capacity in 1998 was 328,800 metric tons per berth a year and will be increasing to 421,300 metric tons per berth a year by 2006, an increase of 3.15% per year.

The capacity of the total berthing space is 2,380,500 metric tons per year in 1998 and will increase to 2,907,000 metric tons by 2006.

**Table 8-10**  
**CAPACITY OF EXISTING BERTHING SPACE**

YEAR	ALLOWABLE BERTH TIME (hr)	GROSS PROD. (mt/hr)	CAPACITY PER BERTH (mt)	NO. OF BERTHS	TOTAL CAPACITY (mt)
1998	5,870	56.02	328,800	7.24	2,380,500
1999	5,870	61.20	359,200	7.11	2,553,900
2000	5,870	64.17	376,700	7.10	2,674,600
2001	5,870	65.41	384,000	7.07	2,714,900
2002	5,870	66.01	391,000	7.03	2,748,700
2003	5,870	67.80	398,000	7.00	2,786,000
2004	5,870	69.28	406,700	6.97	2,834,700
2005	5,870	70.65	414,700	6.94	2,878,000
2006	5,870	71.78	421,300	6.90	2,907,000

#### 8.5.3 Productivity and Capacity for 2007

The design traffic of the first phase development of the port may be the cargo volume of year 2007. The data to determine the net and gross productivities and capacities are as follows:

ITEMS	DOMESTIC	FOREIGN	TOTAL
1. Total Vol. At Berth (mt)	2,807,000	908,000	3,715,000
2. Share	75.56%	24.44%	100.00%
3. Containerized Volume (mt)	2,435,000	643,000	3,078,000
4. Percent Containerized (mt)	86.75%	70.81%	82.85%
5. Non-cont. volume (mt)	372,000	265,000	637,000
6. Percent Non-Cont.	13.25%	29.19%	17.15%
7. Containers			
a. Loaded TEUs	170,410	59,370	
b. Empty TEUs	40,330	26,030	
Total	210,740	85,400	
c. Loaded Box	155,980	34,930	
d. Empty Box	36,920	15,310	
Total	192,900	50,240	
8. Load per Box (mt)	12.62	12.80	

The average vessel lengths for the domestic and foreign ships by year 2007 are 123.50 and 130.30 meters, respectively. Average number of gears and percentage of working time are estimated based on the relationship of the length of the vessel and the factors as shown earlier in this chapter.

The average load per box for the domestic containers is 12.62 metric tons and with six boxes per hour, the net productivity per gear is 75.72 metric tons per hour. The foreign traffic will have an average load of 12.80 metric tons per box with a net productivity of 76.80 metric tons per hour. For the non-containerized cargo volume, net productivity is 22.50 metric tons for domestic cargo volume and 27.75 metric tons for the foreign cargo traffic.

### 1. DOMESTIC CARGO

#### Net Productivity (mt/hr/berth)

a.	Containers	=	$2.2 \times 6.0 \times 12.62 \times 0.9100 = 151.59$
b.	Non-containers	=	$2.2 \times 15.0 \times 1.50 \times 0.9100 = 45.05$

#### Gross Productivity (mt/hr/berth)

a.	Containers	=	$151.59 \times 0.75 \times 0.863 = 98.12$
b.	Non-containers	=	$45.05 \times 0.75 \times 0.863 = 29.16$

#### Weighted Gross Productivity

a.	Containers	=	$0.8675/98.12 = 0.0088412148$
b.	Non-containers	=	$0.1325/29.16 = 0.0045438957$
			$= 0.0133851105 \text{ hr./mt}$
			$= 74.71 \text{ metric tons/hour}$

### 2. FOREIGN CARGO

#### Net Productivity (mt/hr/berth)

a.	Containers	=	$2.33 \times 6.0 \times 12.80 \times 0.9000 = 161.05$
b.	Non-containers	=	$2.33 \times 15.0 \times 1.85 \times 0.9000 = 58.19$

#### Gross Productivity (mt/hr/berth)

a.	Containers	=	$161.05 \times 0.75 \times 0.863 = 104.24$
b.	Non-containers	=	$58.19 \times 0.75 \times 0.863 = 37.66$

#### Weighted Gross Productivity

a.	Containers	=	$0.7081/104.24 = 0.0067929777$
b.	Non-containers	=	$0.2919/37.66 = 0.0077509294$
			$= 0.0145439071 \text{ hr./mt}$
			$= 68.76 \text{ metric tons/hour}$

### 3. OVERALL WEIGHTED GROSS PRODUCTIVITY

a.	Domestic	=	$0.7556/74.71 = 0.0101137733$
b.	Foreign	=	$0.2444/68.76 = 0.0035543921$
			$= 0.0136681654 \text{ hr./mt}$
			$= 73.16 \text{ metric tons/hour}$

As computed above, the weighted gross productivity by year 2007 is 73.16 metric tons per hour. There are about seven berths in the present total berth length of 920 meters. The allowable berth occupancy is 67% and will provide an allowable berth time of 5,870 hours per year per berth ( $0.67 \times 8,760$  hours). The capacity per berth by year 2007 is as follows:

$$\text{Capacity/Berth} = 73.81 \times 5,870 = 429,400 \text{ metric tons per year.}$$

However, if additional berths will be provided before 2007, the allowable berth occupancy rate will increase to 70% and the allowable berth time will increase to 6,132 hours a year per berth. The capacity per berth is as follows:

$$\text{Capacity/Berth} = 73.16 \times 6,132 = 448,600 \text{ metric tons per year.}$$

The gross productivity for years 2008, 2009 and 2010 are 74.95, 76.55 and 78.16 metric tons per hour, respectively.

#### 8.5.4 Productivity and Capacity for 2012

The probable second phase of the development is based on the cargo traffic of 2012, five years after the initial phase of development. The information needed in the determination of the productivity and capacity are as follows:

ITEMS	DOMESTIC	FOREIGN	TOTAL
1. Total Vol. At Berth (mt)	3,898,000	1,154,000	5,052,000
2. Share	77.16%	22.84%	100.00%
3. Containerized Volume (mt)	3,451,000	874,000	4,325,000
4. Percent Containerized (mt)	88.53%	75.74%	85.61%
5. Non-cont. Volume (mt)	447,000	280,000	727,000
6. Percent Non-Cont.	11.47%	24.26%	14.39%
7. Containers			
a. Loaded TEUs	246,000	80,950	
b. Empty TEUs	48,000	25,650	
Total	294,000	106,600	
c. Loaded Box	217,730	47,620	
d. Empty Box	42,480	15,090	
Total	260,210	62,710	
8. Load per Box (mt)	13.26	13.94	

The average vessel lengths for the domestic and foreign ships by year 2012 are 127.5 and 132 meters, respectively. Average number of gears and percentage of working time are estimated based on the relationship of the length of the vessel and the factors as shown earlier in this chapter.

The number of cycles per hour for the containers is the same as used in the other years to include the volume handled per hour for the non-containerized cargo traffic.

##### A. DOMESTIC CARGO

Net Productivity (mt/hr/berth)

- a. Containers =  $2.28 \times 6.0 \times 13.26 \times 0.9045 = 164.07$
- b. Non-containers =  $2.28 \times 15.0 \times 1.50 \times 0.9045 = 46.40$

**Gross Productivity (mt/hr/berth)**

a.	Containers	=	$164.07 \times 0.75 \times 0.863 = 106.19$
b.	Non-containers	=	$46.40 \times 0.75 \times 0.863 = 30.03$

**Weighted Gross Productivity**

a.	Containers	=	$0.8853/106.19 = 0.0083369432$
b.	Non-containers	=	$0.1147/30.03 = 0.0038195138$ = 0.0121564570 hr./mt = 82.26 metric tons/hour

**B. FOREIGN CARGO****Net Productivity (mt/hr/berth)**

a.	Containers	=	$2.36 \times 6.0 \times 13.94 \times 0.8980 = 177.26$
b.	Non-containers	=	$2.36 \times 15.0 \times 1.85 \times 0.8980 = 58.81$

**Gross Productivity (mt/hr/berth)**

a.	Containers	=	$177.26 \times 0.75 \times 0.863 = 114.73$
b.	Non-containers	=	$58.81 \times 0.75 \times 0.863 = 38.06$

**Weighted Gross Productivity**

a.	Containers	=	$0.7574/114.73 = 0.0066015863$
b.	Non-containers	=	$0.2426/38.06 = 0.0063741461$ = 0.0129757324 hr./mt = 77.07 metric tons/hour

**C. OVERALL WEIGHTED GROSS PRODUCTIVITY**

a.	Domestic	=	$0.7716/82.26 = 0.0093800146$
b.	Foreign	=	$0.2284/77.07 = 0.0029635396$ = 0.0123435542 = 81.01 metric tons/hour

It is to be expected that by year 2012, there will already be more than 8 berths as expansion should have been undertaken, hence the allowable berth occupancy rate is 70% and the allowable berth time per year is 6,132 hours (70% of 8,760) per berth. The capacity then is as follows:

$$\text{Capacity/Berth} = 81.01 \times 6,132 = 496,800 \text{ metric tons per year.}$$

**8.5.5 Productivity and Capacity for 2017**

The probable third phase of the development is based on the cargo traffic of year 2017. It is five years after the second phase of development in 2012. The information required to determine productivity and capacity are as follows which includes the percentage containerized volume, the average load per box and the share of the domestic cargo volume to the total volume.

ITEMS	DOMESTIC	FOREIGN	TOTAL
1. Total Vol. At Berth (mt)	5,361,000	1,466,000	6,827,000
2. Share	78.53%	21.47%	100.00%
3. Containerized Volume (mt)	4,747,000	1,110,000	5,857,000
4. Percent Containerized (mt)	88.55%	75.72%	85.79%
5. Non-cont. Volume (mt)	614,000	356,000	970,000
6. Percent Non-Cont.	11.45%	24.28%	14.21%
7. Containers			
a. Loaded TEUs	348,670	102,850	
b. Empty TEUs	61,890	30,930	
Total	410,560	133,780	
c. Loaded Box	295,480	60,500	
d. Empty Box	52,450	18,190	
Total	347,930	78,690	
8. Load per Box (mt)	13.64	14.11	

The average vessel lengths of the domestic and foreign ships in year 2017 are 132.5 and 135 meters, respectively. Average number of gears and percentage of working time are estimated based on the relationship of the length of the vessel and the factors as shown earlier in this chapter.

The number of cycles per hour for the containers are the same as used in the other years to include the volume handled per hour for the non-containerized cargo traffic.

#### A. DOMESTIC CARGO

Net Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 2.37 \times 6.0 \times 13.64 \times 0.8970 = 173.98 \\ \text{b. Non-cont.} &= 2.37 \times 15.0 \times 1.50 \times 0.8970 = 47.83 \end{aligned}$$

Gross Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 173.98 \times 0.75 \times 0.863 = 112.61 \\ \text{b. Non-cont.} &= 47.83 \times 0.75 \times 0.863 = 30.96 \end{aligned}$$

Weighted Gross Productivity

$$\begin{aligned} \text{a. Containers} &= 0.8855/112.61 = 0.0078634224 \\ \text{b. Non-cont.} &= 0.1145/30.96 = 0.0036983204 \\ &= 0.0115617428 \text{ hr./mt} \\ &= 86.49 \text{ metric tons/hour} \end{aligned}$$

#### B. FOREIGN CARGO

Net Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 2.42 \times 6.0 \times 14.11 \times 0.8930 = 182.96 \\ \text{b. Non-cont.} &= 2.42 \times 15.0 \times 1.85 \times 0.8930 = 59.97 \end{aligned}$$

Gross Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 182.96 \times 0.75 \times 0.863 = 118.42 \\ \text{b. Non-cont.} &= 59.97 \times 0.75 \times 0.863 = 38.82 \end{aligned}$$

## Weighted Gross Productivity

a. Containers	=	0.7572/118.42	=	0.0063941902
b. Non-cont.	=	0.2428/ 38.82	=	<u>0.0062545080</u>
			=	0.0126486982 hr./mt
			=	79.06 metric tons/hour

## C. OVERALL WEIGHTED GROSS PRODUCTIVITY

Domestic	=	0.7853/86.49	=	0.0090796624
Foreign	=	0.2147/79.06	=	<u>0.0027156590</u>
			=	0.0117953214 hr/mt
			=	84.78 metric tons/hour

The allowable berth occupancy rate is 70% hence the allowable berth time is 6,132 hours per year per berth. The capacity per berth then is as follows:

$$\text{Capacity/Berth} = 84.78 \times 6,132 = 519,900 \text{ metric tons per year.}$$

## 8.5.6 Productivity and Capacity for 2022

The productivity and capacity for year 2022 are the parameters in the determination of the port facilities for the master plan of the Port of Davao. The information needed to determine the same are as follows:

ITEMS	DOMESTIC	FOREIGN	TOTAL
1. Total Vol. At Berth (mt)	7,295,000	1,842,000	9,137,000
2. Share	79.84%	20.16%	100.00%
3. Containerized Volume (mt)	6,462,000	1,392,000	7,854,000
4. Percent Containerized (mt)	88.58%	75.57%	85.96%
5. Non-cont. Volume (mt)	833,000	450,000	1,283,000
6. Percent Non-Cont.	11.42%	24.43%	14.04%
7. Containers			
a. Loaded TEUs	487,650	129,010	
b. Empty TEUs	76,170	37,070	
Total	563,820	166,080	
c. Loaded Box	396,460	75,890	
d. Empty Box	61,930	21,800	
Total	468,390	97,690	
8. Load per Box (mt)	14.10	14.25	

The average vessel lengths for the domestic and foreign ships by year 2022 are 138 and 137 meters, respectively. Average number of gears and percentage of working time are estimated based on the relationship of the length of the vessel and the factors as shown earlier in this chapter.

The number of cycles for the containers are the same as used in the other years to include the volume handled per hour for the non-containerized cargo traffic.

**A. DOMESTIC CARGO**

## Net Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 2.48 \times 6.0 \times 14.10 \times 0.8890 = 186.52 \\ \text{b. Non-cont.} &= 2.48 \times 15.0 \times 1.50 \times 0.8890 = 49.61 \end{aligned}$$

## Gross Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 186.52 \times 0.75 \times 0.863 = 120.73 \\ \text{b. Non-cont.} &= 49.61 \times 0.75 \times 0.863 = 32.11 \end{aligned}$$

## Weighted Gross Productivity

$$\begin{aligned} \text{a. Containers} &= 0.8858/120.73 = 0.0073370330 \\ \text{b. Non-cont.} &= 0.1142/32.11 = 0.0035565244 \\ &= 0.0108935574 \text{ hr./mt} \\ &= 91.80 \text{ metric tons/hour} \end{aligned}$$

**B. FOREIGN CARGO**

## Net Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 2.47 \times 6.0 \times 14.25 \times 0.8900 = 187.95 \\ \text{b. Non-cont.} &= 2.47 \times 15.0 \times 1.85 \times 0.8900 = 61.00 \end{aligned}$$

## Gross Productivity (mt/hr/berth)

$$\begin{aligned} \text{a. Containers} &= 187.95 \times 0.75 \times 0.863 = 121.65 \\ \text{b. Non-cont.} &= 61.00 \times 0.75 \times 0.863 = 39.48 \end{aligned}$$

## Weighted Gross Productivity

$$\begin{aligned} \text{a. Containers} &= 0.7557/121.65 = 0.0062120838 \\ \text{b. Non-cont.} &= 0.2443/39.48 = 0.0061879433 \\ &= 0.0124000271 \text{ hr./mt} \\ &= 80.64 \text{ metric tons/hour} \end{aligned}$$

**C. OVERALL WEIGHTED GROSS PRODUCTIVITY**

$$\begin{aligned} \text{a. Domestic} &= 0.7984/91.80 = 0.0086971678 \\ \text{b. Foreign} &= 0.2016/80.64 = 0.0025000000 \\ &= 0.0111971678 \text{ hr/mt} \\ &= 89.31 \text{ metric tons/hour} \end{aligned}$$

The allowable berth occupancy rate is 70% hence the allowable berth time is 6,132 hours per year per berth. The capacity is as follows:

$$\text{Capacity/Berth} = 89.31 \times 6,132 = 547,600 \text{ metric tons per year.}$$

This capacity will be the basis for the determination of the port facilities to be provided under the master plan.