Chapter 10 Demand Forecast

10.1 Socio-economic Framework for the Target Year

10.1.1 Population

(1) National Population

Censuses have been carried out four times since Ghana's independence, that is in 1960, 1970, 1984 and 2000. The results of the census in 2000 have not been published but provisional results have been obtained. Table 10.1.1 shows the population trend of Ghana based on the past censuses.

Table 10.1.1 Population Trend of Ghana

Region / Year	**1960**	**1970**	**1984**	**2000**
Western	626,155	770,087	1,157,807	1,842,878
Central	752,392	890,135	1,142,335	1,580,047
GT. Accra	541,933	851,614	1,431,099	2,909,643
Volta	777,285	947,268	1,211,907	1,612,299
Eastern	1,044,080	1,261,661	1,680,890	2,108,852
Ashianti	1,109,133	1,481,698	2,090,100	3,187,601
Brong Ahafo	587,920	766,509	1,206,608	1,824,822
Northern	532,573	727,618	1,164,583	1,854,994
Upper East	468,638	542,858	772,744	917,251
Upper West	288,706	319,865	438,008	573,860
All Regions	6,728,815	8,559,313	12,296,081	18,412,247
Annual growth rate		2.41%	2.59%	2.52%

Annual population growth rate decreased for the first time at census 2000. The target of Ghana Vision 2020 is to bring down the rate of natural increase from 3% pa at present to 2% pa by 2020.

Although decreasing the population growth rate will take a long time since a decline in the birth rate will also be accompanied by a decline in the infant mortality rate and an increase in life expectancy, it is important to pursue the target of Ghana Vision 2020 to increase living standards. In Ghana Vision 2020, the average annual growth rate from 2000 to 2010 is set at 2.4% and that of from 2010 to 2020 is set at 2.1%. Table 10.1.2 shows the projected population based on these annual growth rates.

Table 10.1.2 Projected Population

Year	2000	2010	2020
Population	18,412,247	23,317,513	28,788,268
Annual Growth Rate	—	2.4%	2.1%

(2) Regional Population

The future population of the regions has been projected using the ratio method adopted in the population projection study conducted by the Central Bureau of Statistics. The method is as follows;

- First, the percentage distribution of population by region in the three census years 1970, 1984 and 2000 has been calculated. And the distribution ration ratios in 2010 and 2020 have been projected based on these data.

- The rate of growth of the distribution ratios have been calculated for the two periods of 1970 – 2000 and 1984 – 2000, and a smaller rate has been selected as the initial rate of growth for the following period from 2000 to 2010 regardless of positive or negative trend. In the case of alternating trends (positive and negative), one half of the most recent growth rate has been selected.

- It has been assumed that the distribution ratio remains unchanged throughout the period of 2000-2020.

The percentage of distribution of population in 1970, 1984 and 2000 and the rates of intercensual growth are shown in Table 10.1.3 and result of the regional population projections are shown in Table 10.1.4.

Table 10.1.3 Percentage Distribution of Regional Population and Intercensal Rate of Growth and Assumed Initial Rate of Growth

	Regional Share of Population			Rate of Growth of Ratio		Initial Rate of Growth
	1970	1984	2000	1970/2000	1984/2000	
Western	9.0	9.4	10.0	0.00356	0.00382	0.00356
Central	10.4	9.3	8.6	-0.00638	-0.00495	-0.00495
GT. Accra	9.9	11.6	15.8	0.01554	0.01930	0.01554
Volta	11.1	9.9	8.8	-0.00778	-0.00736	-0.00736
Eastern	14.7	13.7	11.5	-0.00837	-0.01100	-0.00837
Ashianti	17.3	17.0	17.3	0.00000	0.00115	0.00000
Brong Ahafo	9.0	9.8	9.9	0.00339	0.00062	0.00062
Northern	8.5	9.5	10.1	0.00568	0.00387	0.00387
Upper East	6.3	6.3	5.0	-0.00802	-0.01441	-0.00802
Upper West	3.7	3.6	3.1	-0.00603	-0.00831	-0.00603

Table 10.1.4 Projected Distribution of Regional Population

Regions	2000 (Census)		2000 - 2010	2010		2020	
	Regional Share	Regional Population	Initial Rate of Growth	Regional Share	Regional Population	Regional Share	Regional Population
Western	10.0	1,842,878	0.003559	10.3	2,396,096	10.3	2,958,268
Central	8.6	1,580,047	-0.004947	8.1	1,886,724	8.1	2,329,387
GT. Accra	15.8	2,909,643	0.015541	18.3	4,259,847	18.3	5,259,293
Volta	8.8	1,612,299	-0.007365	8.1	1,878,976	8.1	2,319,821
Eastern	11.5	2,108,852	-0.008374	10.4	2,432,779	10.4	3,003,557
Ashianti	17.3	3,187,601	0.000003	17.2	3,999,945	17.2	4,938,413
Brong Ahafo	9.9	1,824,822	0.000621	9.9	2,304,066	9.9	2,844,646
Northern	10.1	1,854,994	0.003869	10.4	2,419,304	10.4	2,986,921
Upper East	5.0	917,251	-0.008016	4.6	1,061,967	4.6	1,311,125
Upper West	3.1	573,860	-0.006032	2.9	677,810	2.9	836,837
All Regions	100.0	18,412,247		100.0	23,317,513	100.0	28,788,268

10.1.2 Gross Domestic Product (GDP)

Ghanaian economy has been growing steadily for two decades. Average annual growth rates of GDP at constant price are 4.8% from 1986 to 1990, 4.3% from 1991 to 1995 and 4.5% from 1996 to 1999 (refer to Table 10.1.5). However, the growth rate of GDP in 2000 deteriorated owing to external factors such as increase of oil price and decrease of cocoa price and gold price in the world market. This shows that Ghanaian economy is still vulnerable to external factors and the efforts to enhance the strength of the Ghanaian economy need to be continued.

Table 10.1.5 GDP by Sector at Constant 1993 Prices

(billion of cedis)

	1986-1990	1991-1995	1994	1995	1996	1997	1998	1999
Agriculture			1,457	1,511	1,590	1,658	1,743	1,811
Growth rate(%)				3.7	5.2	4.3	5.1	3.9
Share(%)			40.8	40.7	40.8	40.3	40.4	40.2
Industry			995	1,035	1,084	1,153	1,190	1,248
Growth rate(%)				4.1	4.7	6.4	3.2	4.9
Share(%)			27.9	27.9	27.8	28.0	27.6	27.7
Service			1,119	1,171	1,220	1,300	1,379	1,448
Growth rate(%)				4.7	4.2	6.5	6.0	5.0
Share(%)			31.3	31.5	31.3	31.6	32.0	32.1
Sub-total			3,570	3,717	3,895	4,112	4,312	4,507
Indirect taxes			429	443	456	422	435	450
GDP in purchaser's value			3,999	4,160	4,351	4,534	4,747	4,957
Growth rate(%)	4.8	4.5	3.3	4.0	4.6	4.2	4.7	4.4
GDP at current prices			5,205	7,753	11,339	14,113	17,629	20,686

Source: Ghana Statiscal Service

Ghana Vision 2020 sets the target to achieve an average annual rate of economic growth of over 8% from 1995 to 2020. Although prospect of the Ghanaian economy is not clear, it might be take some years to escape from the unfavorable world economic conditions. The study team draws three scenarios of economic development, that is high growth case, low growth case and medium growth case. In the high growth case economic growth rate is set at 8% which is the target of Ghana Vision 2020. The low growth case means that 5% growth, the average of the 1990's, will

continue. The medium case is the middle of high case and low case. The economic growth rates of the three cases are shown in Table 10.1.6.

Table 10.1.6 Economic Growth Rate of Three Scenarios

	2000 -2010	2010 -2020
High growth case	8%	8%
Medium growth case	5%	8%
Low growth case	5%	5%

The study team has concluded that the medium growth case is the most realistic. Under this scenario, the Ghanaian economy will struggle with external factors in the half of this decade as efforts are made to change the economic structure while in the latter half of 2000's Ghanaian economy will grow more vigorously. In 2010's, the target growth rate will be achieved. The average annual growth rate of GDP during 2001 – 2010 is set at 5% and that of during 2011 – 2020 is set at 8% in the study. Table 10.1.7 shows the projected GDP at the target years.

Table 10.1.7 Projected GDP at Target Years at Constant 1993 Prices

(Billion of cedis)

	1999	2010	2020
GDP	4,956.9	8,373.0	18076.7
Average annual growth rate		5.0%	8.0%

10.1.3 Future Socio-economic Frame by Industrial Fields in Ghana

(1) Future Socio-economic Frame forecasted by various organizations

Future Socio-economic frame by industrial fields has been forecasted by various organizations as under-mentioned.

(a) Ghana Vision 2020

According to Ghana Vision 2020, the target economic growth rates from 1995 to 2020 are as follows.

- Gross Domestic Product (GDP) 8% per annum
- Agricultural Sector 4% per annum
- Industrial Sector Over 12% per annum (Target share 37% of GDP)
- Service Sector Not mentioned

(b) Highway Network Master Plan (2001-2020) by Ghana Highway Authority

The growth rates in each industrial field based on Ghana Vision 2020 are shown in the above Master Plan.

Table 10.1.8 Growth Rates and Share based on Ghana Vision 2020

	1996	1997-2020
Agriculture	5.5%(40%)	4.4%(18%)
Industry	3.9%(14%)	12.5%(37%)
Service	5.1%(46%)	7.9%(45%)
Total	5.1%	8.0%

In addition, Highway Network Master Plan forecasted the growth rates and share of each industrial field, as shown in Table 10.1.9.

Table 10.1.9 Forecasted Growth Rates and Share

Sectors	Share of GDP 1999	2000-2010	2011-2020	Share of GDP 2020
Agriculture	40%	6%	5%	27.0%
Industry	14%	8%	12%	22.2%
Services	46%	8%	8%	50.7%
Overall GDP (Average)	100%	7.2% 7.5%	7.8% 7.5%	100%

(c) EIU Country Report 1999

The above report forecasted the growth rates from 1998 to 2001 in each industrial field as follows.

- Agricultural Sector 5.3 - 5.2% per annum
- Industrial Sector 2.5 - 6.7% per annum
- Service Sector 6.0 - 6.3% per annum

(d) Ministry of Food and Agriculture

The growth rates and share forecasted by the Ministry of Food and Agriculture are shown in Table 10.1.10

Table 10.1.10 Growth Rate and Share by the Ministry of Food and Agriculture

	Sectors	1996	1997-2006	2007-2020
Fast Growth of Agriculture (6% p.a.)	Agriculture	4.0%(39%)	6.0%(32%)	6.0%(23%)
	Industry	4.2%(14%)	11.0%(19%)	10.0%(25%)
	Service	6.3%(47%)	8.0%(49%)	8.5%(52%)
	Total	5.2%	7.5%	8.0%
Slow Growth of Agriculture (4% p.a.)	Agriculture	4.0%(39%)	4.0%(28%)	4.0%(16%)
	Industry	4.2%(14%)	13.0%(23%)	11.0%(33%)
	Service	6.5%(47%)	8.0%(49%)	8.5%(51%)
	Total	5.2%	7.5%	8.0%

(2) Decision of the Future Socio-economic Frame to be Forecasted in Ghana

The past trends of the Socio-economic frame in Ghana are as follows.

Table 10.1.11 Growth Rates in the Past 5 years in Ghana

(%)

	Average 1994-1999	1995	1996	1997	1998	1999
Agriculture	4.45	3.7	5.2	4.3	5.1	3.9
Industry	4.65	4.1	4.7	6.4	3.2	4.9
Services	5.29	4.7	4.2	6.5	6.0	5.0
Total	4.39	4.0	4.6	4.2	4.7	4.4

Table 10.1.12 GDP in the Past 5 years in Ghana（At Constant 1993 Prices）

(Billion Cedis)

	1994	1995	1996	1997	1998	1999
Agriculture	1,456.7	1,511.2	1,590.1	1,658.4	1,743.2	1,810.8
Industry	994.5	1,035.3	1,084.4	1,153.3	1,190.1	1,248.4
Services	1,118.6	1,170.8	1,220.3	1,300.2	1,378.7	1,447.8
N.I.T.＊	429.3	442.7	456.4	422.0	434.7	449.9
Total	3.999.1	4,160.0	4,351.2	4,533.9	4,746.7	4,956.9

＊Net Indirect Taxes

Based on the forecasts conducted by the various organizations and the past trends in Ghana, the future Socio-economic frame in Ghana will be determined by the Study Team as follows.

Table 10.1.13 Future Growth Rates in Each Industrial Field

(%)

	2000-2010	2011-2020
Agriculture	4.5	4.0
Industry	5.7	11.7
Services	5.0	8.0
Total	5.0	8.0

Following grounds have been taken into consideration in order to determine the above figures.

(1) The growth rates from 2000 to 2010 in the agricultural and service sector will follow the trend of the past 5 years. Reasons are as follows. a) Agricultural Sector ; There were a lot of problems in the past decade such as inclement weather, shortage of irrigation facilities and shortage of agricultural funds. A fall in the market price of cacao can be expected in the coming decade. And in addition to the above problems, however the development of the agricultural sector has been given priority by the new Government. Therefore, it is expected that the new Government will take action to ensure that the growth rate in the agricultural sector will be maintained in future. b) Service Sector ; It is expected that the infrastructure, and the poverty and education counterplans will not be developed with a high growth rate due to the depreciation of cedis and higher oil price. Therefore, the growth rate in the service sector will be maintained as well as the agricultural sector.

(2) In forecasting the growth rate of the industrial sector from 2000 to 2010, the average growth rate in the past 5 years plus 1% will be adopted. Slightly higher growth is expected because the Export Processing Zones (EPZ) and Free Zones Companies in the manufacturing field, which have the biggest share in the industrial sector, will be more active.

(3) A growth rate of 4% from 2011 to 2020 in the agricultural sector is forecasted. Reasons are as follows. a) The growth rate of agricultural products in Asian countries such as Indonesia, Malaysia and Thailand, which have been presently recognized as middle-income countries, fell from 4~5% in 1960's down to 2~4% in 1990's. Therefore, the growth rate between 2011 and 2020 in Ghana can also be expected to slow down compared with the rate between 2000 and 2010. b) Agro-processing products will grow together with the growth of the manufacturing field and compensate the decline in cacao product. Therefore, minimum falling rate (0.5%) has been assumed.

(4) The growth rate from 2011 to 2020 in the industrial sector will be forecasted with a higher figure on the assumption that the new Government will actively support the industrial sector. In particular, manufactured exports are expected to grow at a higher rate. In the past, Asian countries like Indonesia, Malaysia and Thailand achieved a high GDP growth rates led by high growth rate in the industrial sector. Growth rate of 9~13% per annum in the manufacturing field were recorded in these countries from 1970's to 1990's.

(5) The growth rate of 8%, which was recommended by the Highway Network Master Plan by Ghana Highway Authority, will be adopted from 2011 to 2020 in the service sector. It is expected that this rate will be achieved by the development of the infrastructure, education, welfare and the tourist industry, which the new Government has intends to promote. In addition, the growth rate in the service sector of middle-income countries in Asia ranged from 6~9% from 1970's to 1990's, therefore, a growth rate of 8% is reasonable.

Table 10.1.14 GDP(At Constant 1993 Prices)

Billion Cedis

	1999	2000	2010	2020
Agriculture	1,810.8	1,892.3	2,938.7	4,349.9
Industry	1,248.4	1,323.8	2,300.1	6,960.1
Services	1,447.8	1,520.2	2,476.2	5,346.0
N.I.T.	449.9	468.4	763.0	1,647.3
Total	4,956.9	5,204.7	8,478.0	18,303.3

Note) N.I.T.(Net Indirect Taxes) is assumed to be 9% of the total

Table 10.1.15 Share of Industrial sectors (At Constant 1993 Prices)

%

	1999	2010	2020
Agriculture	36.5	34.7	23.8
Industry	25.2	27.1	38.0
Services	29.2	29.2	29.2

10.2 Demand Forecast

10.2.1 Methodology

Two methods are used to forecast the cargo volume to be handled at the seaports in Ghana.

The first method is to forecast the total volume as a whole by statistical correlation between the cargo volume and socioeconomic indices of the hinterland or by the past cargo volume trend. (Hereinafter, this method is called the "total demand forecast")

The second method is a cumulative method, which forecasts the volume of each commodities. Cargoes are categorized into major commodity group and other commodity group. Major commodities are individually forecast and other commodities are comprehensively forecast. The volume of major commodities are estimated based upon the forecast of supply and demand in the hinterland or based upon analysis of the past cargo trend. On the other hand, other commodities are forecast statistically. The total cargo volume is then forecast by a summation of the forecast volume for each commodity. (Hereinafter, this method is called the "commodity-wise demand forecast")

In this study, both methods are used to forecast the local trade cargo (import/export), while only total demand forecast is applied to the transshipment cargo.

The forecast of cargo volume is prepared for the years 2020 and 2010, given that the target years of the master plan and the short-term development plan are, respectively, 2020 and 2010.

10.2.2 Premise

In this chapter the total demand for seaports in Ghana is forecast on the premise that sufficient port facilities will be provided at seaports with enough handling capacity, high efficiency and price competitiveness. It is assumed that the seaports in Ghana will be attractive to the port users and be competitive with the major ports in the West Africa after the extension and improvement of seaports in Ghana. Port traffic between each port will be allocated.

10.2.3 Functional Allotment of Ghana Sea Ports

The following functions are expected for the Ghana sea ports.

- Tema Port functions as a distribution center for its hinterland including Greater Accra.
- The development of Tema Port promotes the new industrial zones adding to the existing industries.
- Since Ghana relies on the imported goods largely, Takoradi Port functions possibly as a distribution center for its hinterland consisting of Western Region, part of Ashante Region, part of Brong Ahafo, part of Northern Region and Upper West Region. Distribution of the population at the hinterlands of Tema and Takoradi are assumed as 60% and 40% respectively.

- The development of Takoradi Port could materialize the cheap and mass transportation of mining resources, and contribute to establish the international competitive position of Ghana's mining.
- The development of Takoradi Port promotes the new industrial zone in the future.

Based on the above concepts, cargoes are allocated for both ports considering the existing trend and the future distribution of population. Table 10.2.1 shows the results of the allocation on the main cargo items by port.

Table 10.2.1 Planned Shares by Commodity, by Port

(Unit: %)

Commodity	Im./Ex.	2000		2010		2020	
		Tema	Takoradi	Tema	Takoradi	Tema	Takoradi
Alumina	Import	100	0	100	0	100	0
Bauxite	Export	0	100	0	100	0	100
Manganese	Export	0	100	0	100	0	100
Clinker, Gypsum	Import	59	41	56	44	56	44
Wheat	Import	59	41	60	40	60	40
Rice	Import	100	0	85	15	60	40
Grain (Corn)	Import	100	0	85	15	60	40
Other Grain	Import	100	0	85	15	60	40
Sugar	Import	100	0	85	15	60	40
Cocoa Beans	Export	47	53	30	70	30	70
Cocoa Products	Export	100	0	60	40	60	40
NTAP	Export			60	40	60	40
Fertilizer	Import	88	12	60	40	60	40
Wood Products	Export	1	99	0	100	0	100
Crude Oil, Petrol-Products	Import	100	0	100	0	100	0
Containerized Cargo	Import	94	6	80	20	70	30
Containerized Cargo	Export	58	42	50	50	60	40

10.3 Total Demand Forecast

The total demand forecast is conducted separately for import, export and transshipment cargoes.

10.3.1 Import Cargo

Table 10.3.1 Import Cargo Volume and GDP 1991-2000

(Unit: 1000ton)

Im/Ex	Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	GDP*	**3,517**	**3,653**	**3,835**	**3,982**	**4,160**	**4,351**	**4,534**	**4,741**	**5,004**	**5,155**
Import	Tema	3,069	3,118	3,529	3,462	3,930	4,191	4,427	4,716	5,404	4,635
	Takoradi	549	702	722	810	657	755	843	1,088	1,154	1,183
	Total	3,618	3,821	4,251	4,272	4,587	4,946	5,269	5,804	6,558	5,818
Share (%)	Tema	85	82	83	81	86	85	84	81	82	80
	Takoradi	15	18	17	19	14	15	16	19	18	20
	Total	100	100	100	100	100	100	100	100	100	100

** Cedi Billion*

The imports of a country are closely related to its socioeconomic indices, in particular gross domestic product (GDP). For the purpose of analyzing this correlation, GDP at constant price was used in order to remove the effects of price inflation.

The correlation between the total import and GDP for 1991 through 2000 can be expressed by the following equation.

$Y = 7065.6Ln(X) - 54153$ $(R^2=0.9334)$

Where, Y: Import volume of cargo (1000 ton)

X: GDP at 1993 constant price (Cedi Billion)

The estimated import volume is shown in the following table. (Table 10.3.2)

Figure 10.3.1 Correlation between Import Cargo Volume and GDP

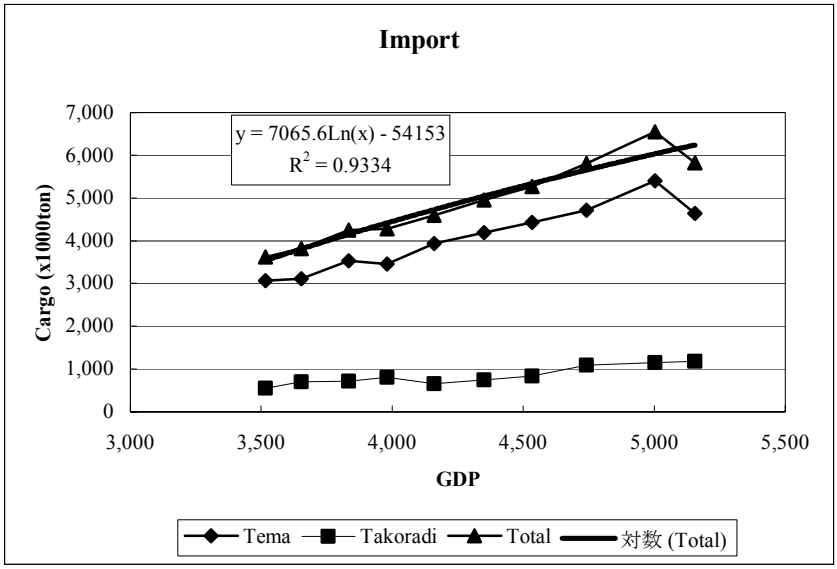


Table 10.3.2 Demand Forecast of Import Cargo

(Unit:MT)

Item	2000	2010	2020
GDP (Cedi Billion)*	5,155	8,397	18,129
Import Cargo	5,818,295	9,689,000	15,127,000

** 1993 constant price*

Shares of ports in the last 10 years are shown in the Table 10.3.1. Although small yearly deviation could be found, it is not likely that the share of each port will increase/decrease in the future. This means each port has its own hinterland. Assuming the shares of Tema Port and Takoradi Port as 83 % and 17 % respectively, we can estimate import volume by port as below.

Table 10.3.3 Demand Forecast of Import Cargo by Port

(Unit:MT)

Port	2000	2010	2020
Tema	4,536,088	8,041,870	12,555,410
Takoradi	1,183,207	1,647,130	2,571,590
Total	5,818,295	9,689,000	15,127,000

10.3.2 Export Cargo

Compared with imported cargo, the amount of export cargo has more fluctuated. For the purpose of analyzing the correlation between export cargo and GDP, GDP at constant price was used in order to remove the effects of price inflation.

Table 10.3.4 Export Cargo Volume and GDP 1991-2000

(Unit: 1000ton)

Im/Ex	Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	GDP*	**3,517**	**3,653**	**3,835**	**3,982**	**4,160**	**4,351**	**4,534**	**4,741**	**5,004**	**5,155**
Export	Tema	578	791	601	629	682	689	742	701	965	850
	Takoradi	1,090	1,100	1,401	1,504	1,200	1,044	1,305	1,161	1,468	1,868
	Total	1,668	1,892	2,002	2,133	1,882	1,733	2,047	1,862	2,433	2,718
Share (%)	Tema	35	42	30	29	36	40	36	38	40	31
	Takoradi	65	58	70	71	64	60	64	62	60	69
	Total	100	100	100	100	100	100	100	100	100	100

* *Cedi Billion*

The correlation between the total export and GDP for 1991 through 2000 can be expressed by the following equation.

$Y = 0.4079X + 285.6$ ($R^2=0.5064$)

Where, Y: Export volume of cargo (1000 ton)

X: GDP at 1993 constant price (Cedi Billion)

The estimated export volume is shown in the following table. (Table 10.3.5)

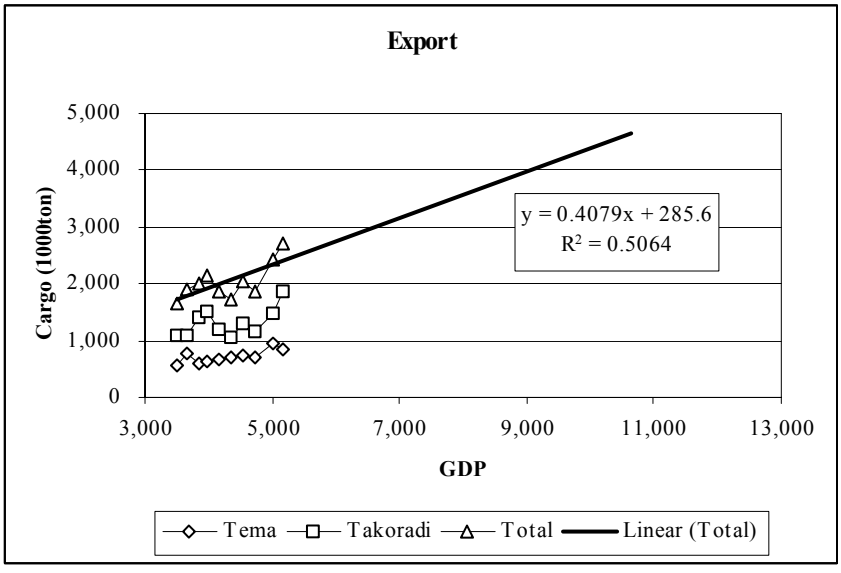


Figure 10.3.2 Correlation between Export Cargo Volume and GDP

Table 10.3.5 Demand Forecast of Export Cargo

(Unit:MT)

Item	2000	2010	2020
GDP (Cedi Billion)	5,155	8,397	18,129
Export Cargo*	2,717,948	3,711,000	7,680,000

** 1993 constant price*

Shares of ports in the last 10 years are shown in the Table 10.3.4. Although some yearly fluctuation could be found, it is not likely that the share of each port will increase/decrease in the future. Assuming the shares of Tema Port and Takoradi Port as 40 % and 60 % respectively, we can estimate export volume by port as below.

Table 10.3.6 Demand Forecast of Export Cargo by Port

(Unit:MT)

Port	2000	2010	2020
Tema	849,571	1,484,000	3,072,000
Takoradi	1,868,377	2,227,000	4,608,000
Total	2,717,948	3,711,000	7,680,000

10.3.3 Transshipment Cargo

(1) Transit Cargo

In the port cargo statistics of Ghana, “Transshipment Cargo” and “Transit Cargo” are defined as follows.

Transshipment Cargo: defined as the cargo received through the seaports of Ghana and shipped through the seaports of Ghana to their West African destinations.

Transit Cargo: defined as the cargo received through the seaports of Ghana and transported to their West African destinations by road.

In this study, we adopt the above definitions.

Although the seaports of Ghana locate at the shortest distance from the landlocked countries, they had never handle any transit cargo until 1996. It is said that this was due to the difference of traditions and languages etc. between Ghana and the landlocked countries. However, in the recent years, transit cargo increased sharply. This depends on the economical viewpoint. The trunk road from the seaports to northern national border has been improved excluding the some distances in the Northern Region. Furthermore, cargo inspection gates are only two points within Ghana, which are fewer than other countries along the coastal area such as Cote d’Ivoire, Togo, Benin and Nigeria. These conditions are advantageous for Ghana to connect with landlocked countries forming the transportation network.

Past performances of the transit cargo are shown in Table 10.3.7.These records are referred to the Tema Port statistics. Takoradi Port also handled the transit cargo, but its cargo volume

could not be confirmed by port statistics. Transit cargoes by commodity are shown in Table 10.3.8. Bagged cargo consisting of flour, rice and sugar shares 68 % of the total. These commodities are necessary for subsistence in the landlocked countries. At present, containerization rate is only 25 %, but it will increase in the future.

Table 10.3.7 Transit Cargo-Tema Port

(Unit: MT)

Year	1997	1998	1999	2000
Transit Cargo	8,580	30,769	64,700	145,763 *

* *Estimate*

According to the data of Ghana Shippers' Council, destinations of transit and transshipment cargo in 2000 are 9 countries. Transit cargo destined to the landlocked countries (B.Faso, Chad, Mali, Niger and Other) shares 80 % of the total. (See, Table 10.3.9) The transshipment cargo is recorded in GPHA Port Statistics to be 13 % of the transit cargo.

Table 10.3.8 Transit Cargo by Commodity -Tema Port

(Unit: MT)

Commodities	Code	2000												Total
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC*	
TEU NETWEIGHT	CT	2,321	1,247	4,578	3,329	4,905	3,071	3,037	4,760	2,833	1,445	2,816	3,122	37,464
Sub-total	CT	2,321	1,247	4,578	3,329	4,905	3,071	3,037	4,760	2,833	1,445	2,816	3,122	37,464
Flour	BC	1,582	3,398	-	5,294	2,689	-	1,490	2,294	2,222	2,854	1,489	2,119	25,431
Rice	BC	-	-	4,999	-	-	7,000	9,226	-	7,200	4,759	10,302	3,953	47,439
Sugar	BC	5,720	503	-	7,340	2,129	333	-	4,502	150	1,983	1,623	2,208	26,491
Sub-total	BC	7,302	3,901	4,999	12,634	4,818	7,333	10,716	6,796	9,572	9,596	13,414	8,280	99,361
Cars	GC	1	1	10	8	18	1	-	11	9	1	-	5	65
Mini Vehicles	GC	-	-	4	-	2	69	-	10	-	-	2	8	95
Vehicles	GC	-	-	-	27	110	-	20	146	198	28	74	55	658
Trailer Units	GC	17	-	1	71	54	-	17	11	29	-	15	20	235
Rods/Pipes	GC	815	-	-	-	-	280	-	-	80	51	-	111	1,337
Plates	GC	89	-	-	-	-	394	-	-	-	-	92	52	627
Steel Wire/Coils	GC	862	30	30	-	-	804	61	-	-	-	-	162	1,949
Chemicals	GC	-	-	1,500	-	-	-	-	-	-	-	997	227	2,724
Mach/Equipm	GC	-	-	-	-	-	-	-	-	241	36	4	26	307
General	GC	-	3	80	5	285	-	36	416	23	10	4	78	940
Sub-total	GC	1,784	34	1,625	111	469	1,548	134	594	580	126	1,188	745	8,938
Total		11,407	5,182	11,202	16,074	10,192	11,952	13,887	12,150	12,985	11,167	17,418	12,147	145,763
CONT. 20'FULL	Units	128	72	232	145	208	137	150	206	131	48	124	144	1,725
CONT.40'FULL	Units	16	14	58	50	69	40	35	89	37	28	34	43	513
TEU	Units	160	100	348	245	346	217	220	384	205	104	192	230	2,751
Cargo Vol./TEU	MT	14.5	12.5	13.2	13.6	14.2	14.2	13.8	12.4	13.8	13.9	14.7	13.6	13.6

** Estimate*

Table 10.3.9 Transit and Transshipment Cargo by Destination (2000)

Year 2000	Destinations										Total
	Benin	Cameroon	C.D'Ivoire	Nigeria	Togo	B.Faso	Chad	Mali	Niger	Other	
Cargo(ton)	1,944	1,052	12,744	3,686	11,962	35,902	772	156	86,216	362	154,796
Share(%)	1.3	0.7	8.2	2.4	7.7	23.2	0.5	0.1	55.7	0.2	100.0

Source: Ghana Shippers'Council

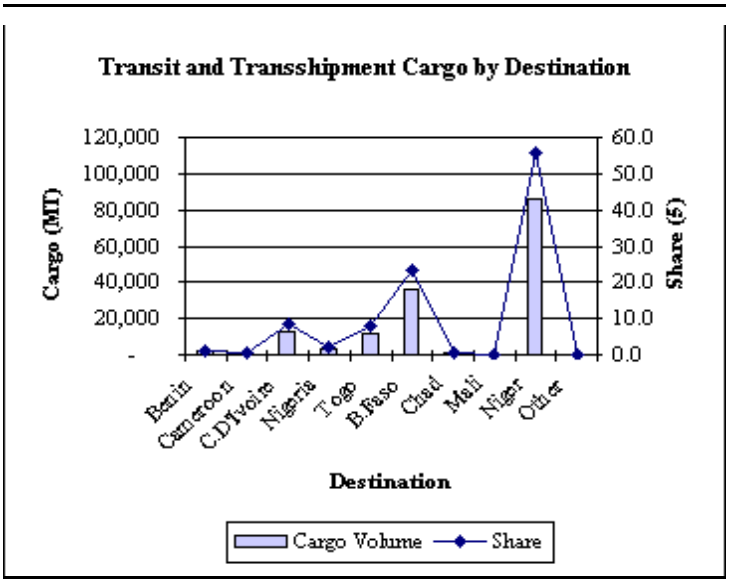


Figure 10.3.3 Transit and Transshipment Cargo by Destination

It is observed generally that the cargo volume increases sharply at the first stage and then the growth rate of cargo volume enters into the stable condition. Given that the same trend for the transit cargo will take place, the future cargo volume might increase by:

+ 5 % from 2000 to 2010
+ 3 % from 2010 to 2020

Transit cargoes depend on the GDP of the landlocked countries. 3 % is the provisional estimate of the GDP for those countries in the future. As a result, the transit cargo volume handled at seaports in Ghana is estimated as shown in Table 10.3.10.

Table 10.3.10 Demand Forecast of Transit Cargo

(Unit: MT)

Year	2000	2010	2020
Transit Cargo	145,763	237,432	319,089

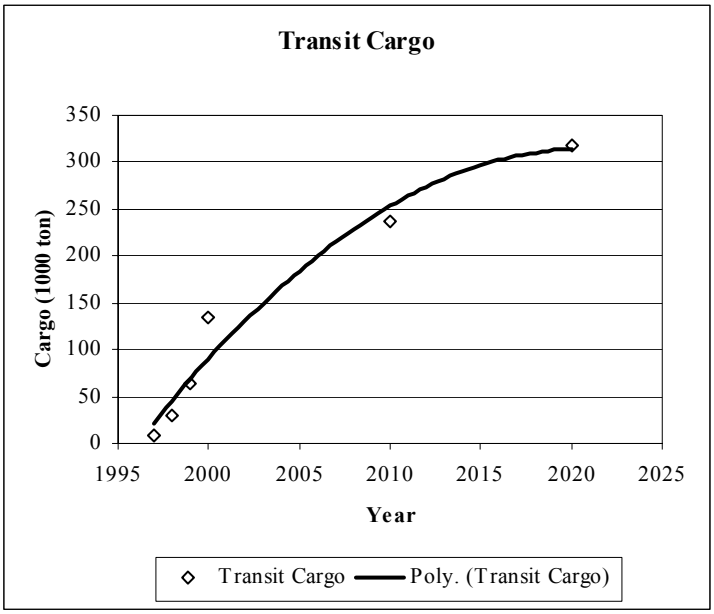


Figure 10.3.4 Demand Forecast of Transit Cargo

Table 10.3.11 Demand Forecast of Transit Cargo by Cargo Type, by Port

Year	2000	2010	2020
Transit Cargo Total (MT)	N.A	237,432	319,089
Tema	145,763	213,689	287,180
Takoradi	N.A	23,743	31,909
General Cargo (MT)	N.A	83,101	79,772
Tema	108,299	74,791	71,795
Takoradi	N.A	8,310	7,977
TEU NETWEIGHT (MT)	N.A	154,331	239,317
Tema	37,464	138,898	215,385
Takoradi	N.A	15,433	23,932
TEU	N.A	11,688	18,125
Tema	2,751	10,519	16,312
Takoradi	N.A	1,169	1,813

Note: Rates of containerization are 65 % at 2010 and 75 % at 2020 respectively. These rates are coincident with the import container rates of Tema. Ave. cargo volume per TEU is 13.6 ton based on the existing data. Empty container ratio is assumed to be 3%.

Above transit cargo is transported from the seaports in Ghana to landlocked countries by land. The distances by trunk road up to the northern national border via Kumasi from both ports are almost equivalent. Given that the same custom proceeding and the same port charges could be applied, the transportation cost does not change remarkably. Therefore, assuming the same calling ship size on average at both ports, transit cargo could be shared by each port proportionate to liner cargo volume.

As a result, transit cargo will be shared by Tema and Takoradi ports with 90 % and 10 % of the total respectively.

(2) Transshipment Cargo

Recently, transshipment cargo became to be handled at Tema Port. In 2000, transshipment cargoes at Tema were around 18,000 MT that were received by the port and were shipped through the port to their West African destinations based on the GPHA statistics. (See, Table 10.3.12) The cargo handling volume for the facility planning purpose should be counted by double. Cargoes consist of Containers, Ro/Ro cargoes and general cargoes, but are shared by containers mostly.

Container throughput in transshipment cargo is shown in Table 10.3.13. Based on this record, the average cargo volume in TEU is estimated to be 10.7 ton, and the ratio of empty containers could be assumed to be 8 %.

According to the data of Ghana shippers' council, destinations of transshipment cargo are 9 countries. (1st half 2000) Cote d'Ivoire accounted for the largest portion of 63.9 %. Benin (10.1 %) was followed by Togo and Cameroon by 6.7 % and 4.0 % respectively. (Table 10.3.14) The cargoes for Togo and Benin are shared by road (transit cargo) and by sea (transshipment cargo).

Table 10.3.14 Transshipment Cargo by Destination

Year 2000	Destinations									Total
	Benin	Cameroon	C.D'Ivoire	Guinea	Liberia	Nigeria	S.Leone	Togo	Other	
Cargo(ton)	203	81	1,286	23	13	78	15	135	178	2,012
Share(%)	10.1	4.0	63.9	1.1	0.6	3.9	0.7	6.7	8.8	100.0

Source: Ghana Shippers'Council

Although the transshipment cargo is only 13 % of the transit cargo in 2000, the transshipment cargo will be expected to increase in the future. The followings are advantages of the Ghana seaports.

- Ghana seaports locate at the center of the West African countries.
- Ghana seaports are linked with those countries by road as well as by sea.
- In 1990s, Ghana seaports handled TEUs with the annual growth rate of 14 % in average. The TEUs volume and growth rate are large next to Abidjan in West African ports. (See, Table 10.3 15, Figure 10.3.6)
- The two existing deep-water berths at Tema are being extended and dredged to 11.5m. This improvement makes the larger vessels' callings to Tema possible and strengthens the function as the transshipment hub port for the region.

Assuming that Ghana seaports will transship the container cargoes to Cotonou and Lome with 38 thousands TEUs and 32 thousands TEUs respectively in 2020, the transshipment cargo volume handled at Tema Port is estimated as shown in Table 10.3.16.

In this estimates, it is assumed that the growth rate of TEUs in Cotonou and Lome are 3 % each and Tema Port will transship one third of TEUs in each port.

Table 10.3.12 Transshipment Cargo by Commodity-Tema Port

(Unit MT)

Commodities	Code	2000												Total
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC*	
TEU NETWEIGHT	CT	494	5,157	1,511	756	1,434	618	644	2,741	333	2,022	900	1,510	18,120
Cars	GC	-	-	-	-	-	-	-	-	-	-	-	-	-
Mini Vehicles	GC	-	-	-	-	-	-	-	-	-	-	-	-	-
Vehicles	GC	-	19	-	-	-	-	-	-	-	-	-	-	-
Trailer Units	GC	-	12	-	-	-	-	-	-	-	-	-	-	-
General	GC	1	3	-	-	-	-	112	-	-	95	-	19	230
Total		495	5,191	1,511	756	1,434	618	756	2,741	333	2,117	900	1,532	18,384

** Estimate*

Table 10.3.13 Container Throughput in Transshipment Cargo-Tema Port

Containers		2000												Total
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC*	
CONT. 20'FULL	Units	33	381	91	42	53	29	36	125	17	91	48	86	1,032
	MT	352	3,432	1,251	737	911	433	430	1,962	196	1,132	761	1,054	12,651
CONT.20'EMPTY	Units	-	112	12	-	-	-	-	-	1	-	-	11	136
	MT	-	-	-	-	-	-	-	-	-	-	-	-	-
CONT.40'FULL	Units	9	125	12	1	19	13	17	41	9	51	6	28	331
	MT	142	1,725	260	19	523	185	214	779	137	890	139	456	5,469
CONT.40'EMPTY	Units	-	1	-	-	-	-	-	-	-	-	-	-	1
	MT	-	-	-	-	-	-	-	-	-	-	-	-	-
TEU. Full	Units	51	631	115	44	91	55	70	207	35	193	60	141	1,693
	MT	494	5,157	1,511	756	1,434	618	644	2,741	333	2,022	900	1,510	18,120
TEU.EMPTY	Units	-	114	12	-	-	-	-	-	1	-	-	11	138
	MT	-	-	-	-	-	-	-	-	-	-	-	-	-

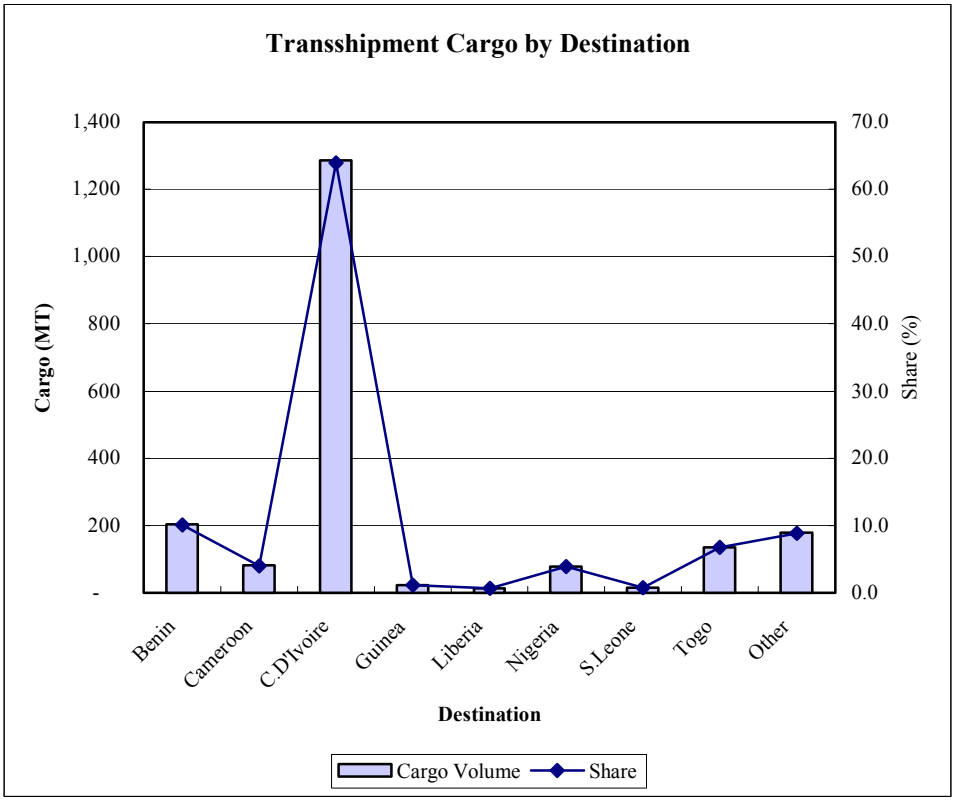


Figure 10.3.5 Transshipment Cargo by Destination

Source: Ghana Shippers' Council

Table 10.3.15 Container Handling Volume-TEUs

(Unit: 1000TEU)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ghana		93.0	103.9	105.3	123.3	148.7	169.4	199.0	235.7	201.5
Abidjan	179.5	188.7	238.8	247.5	261.3	309.7	416.1	468.7		
Lagos	124.9	147.9	118.7	96.7	110.0	100.0	90.0	115.0		
Cotonou	25.6	28.2	36.4	43.1	48.2	54.5	54.3	59.6		
Lome	40.0	40.0	36.0	35.0	32.3	33.0	46.7	50.0		
S.Leone	12.7	14.3	15.6	15.2	12.1	15.1	18.7	19.0		
Douala	76.3	82.4	75.5	81.5	96.6	106.2	116.0	120.0		

Source: Ocean Shipping Consultants Ltd.

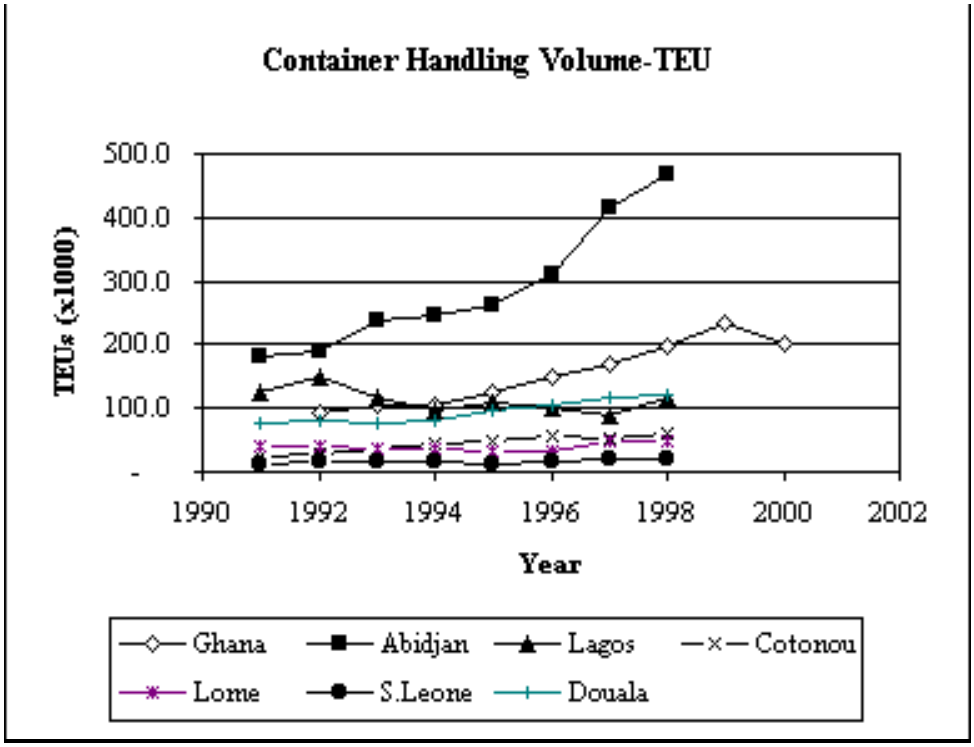


Figure 10.3.6 TEUs in West African Port

Table 10.3.16 Demand Forecast of Transshipment Cargo

(Unit:TEU)

Year	2000	2010	2020
TEU Total*	1,858	58,749	78,952
TEU Loaded	1,718	54,397	73,104
TEU Empty	140	4,352	5,848

** Equivalent to TEU*

Note: Empty container ratio is assumed to be 8 %.

10.3.4 Passenger

In an effort to boost earnings from tourism trade, the Ministry of Tourism continued with the strategy of exposing and advertising the tourism potentials of Ghana in the year under review. The Ministry in conjunction with the Ghana Tourist Board also continued with its standards monitoring programme to guarantee the quality of tourism facilities and performance. The Ministry also facilitated the efforts of others who wanted to invest in new hotels and upgrade other facilities to international standards.

There has been a consistent increase (averaging about 6.7 %) in the number of arrivals although the increase in receipt was not as consistent as the increase in the arrivals. Following table shows “Arrivals and Receipt for Tourism Trade, 1994-1998”. Almost all tourist visited Ghana by air. Target in 2004 is the tourist of 1 million.

In the circular tour between Europe and USA, cruisers call at Cape Town regularly and Dakar exceptionally. Until now, passenger ships came to Ghana seaports few times in a year. Tourism agents are planning the regular call to Ghana seaports attracting tourists to tour spots in Ghana. It is said that Takoradi Port is more convenient for passenger ships considering the tour spots in Ghana.

In this project, we don't plan any port facilities for passenger ships exclusively because the existing port facilities could be accommodated for passenger ships.

Table 10.3.17 Arrivals and Receipts from Tourism Trade, 1994-1999

Year	Arrivals		Receipts	
	Nos.	Increase Rate(%)	Amount (US$'M)	Increase Rate(%)
1994	271,310		227.60	
1995	286,000	5.41	233.20	2.46
1996	304,860	6.59	248.80	6.69
1997	325,438	6.75	265.59	6.75
1998*	347,952	6.92	301.44	13.50
1999*	372,000	6.91	304.12	0.89

Source: Ghana Tourist Board

** : Provisional Estimates*

10.4 Commodity-wise Demand Forecast

10.4.1 Major Commodities

The major commodity group includes the following commodities:

- Alumina, other input imports and aluminum export
- Bauxite
- Manganese
- Clinker
- Wheat
- Rice
- Grain (Corn)
- Other Grain
- Sugar
- Traditional Agro-Product
- Non-Traditional Agro-Product
- Fertilizer
- Wood Products
- Crude Oil and Petrol Products

(1) Alumina, other input imports and aluminium export

(a) Outlook

Ghana produces bauxite and has exported these materials to Europe and Canada. While, Ghana has imported alumina from Jamaica, refined alumina into alumi ingots and then exported them. The refinery is done by Valco factory in Tema. Volta Aluminium Co. (Valco) manages these activities.

If Ghana can produce alumina by processing bauxite instead of imported alumina, then Ghana will complete the continuous processing from bauxite to aluminium products. In order to materialize the continuous processing in Ghana, following conditions have to be cleared assuming the usage of existing Valco factory in Tema,.

- Bauxite should be mined sufficiently in the hinterland of Tema:
  There is a bauxite mine in Kibi located 100 km from Tema. Bauxite could be processed into alumina on the site and the products could be carried by train to the Valco factory in Tema.

- The cheaper and stable power supply should be assured:
  Aluminium industry needs the big amount of power. In the last 5 years, Ghana imported alumina of 370,000 ton/year and produced alumi ingot of 162,800 ton/year on average. In this instance, Volta consumes around 2.4 billion kwh power. This power consumption is almost equivalent to one thirds of the power generation in Ghana.

Power generation is mostly owned by hydro-electric power plants Akosombo and Kpong that use the water of Volta. (See, Table 10.4.1) The drought has sometimes limited the water volume in Akosombo Lake and the power plants are not be able to provide all the needs of the country. By these conditions, the aluminium industry was affected and their production had to be reduced. It is unlikely that additional energy will be provided by the way of imports from Ivory Coast or by use of the diesel plant located at Tema sufficiently. These solutions are costly to Ghana and lose the international markets of power consumed products such as alumiium.

It is concluded that the new alumina production largely depends on the cheaper and stable power supply. However, such a power supply is difficult. In this demand forecast, we estimate the future expansion of the power generation corresponding to the increased demand for aluminium but not consider the alumina production domestically.

Table 10.4.1 Power Generation and Consumption

(Unit: Million Kwh)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Generation									
Akosombo				5,077	5,094	5,520	5,711	3,166	4,289
Kpong				1,001	1,021	1,105	1,140	664	880
Tema Diesel				28	19	2	12	37	1
Takoradi Thermal							22	1146	755
Imports (Cote d'Ivore)				61	320	228	660	573	1,032
Total				6,167	6,454	6,855	7,545	5,586	6,956
Consumption									
Valco	2,795	2,854	2,822	2,275	2,198	2,212	2,467	927	1,928
Electricity Co.	1,753	2,021	2,219	2,466	2,693	3,089	3,387	3,024	3,493
Mines	408	418	469	590	654	718	748	713	696
Exports	808	894	395	418	285	348	422	460	326
Others	148	194	219	225	247	291	317	313	362
Total	5,912	6,381	6,196	5,974	6,077	6,658	7,341	5,437	6,804

Source: Volta River Authority (VRA), Annual Report 1999 (Bank of Ghana)

(b) Past performances

Table 10.4.2 Import/Export Volume for Aluminium Industry

(Unit: ton)

Commodities	Import/Export	1997	1998	1999
Aluminium	Export	88,395	50,215	132,608
Alumina	Import	323,285	84,963	186,972
Coke	Import	61,078	32,641	76,871
Pitch	Import	18,017	11,152	12,089
General Cargo	Import	27,813	23,651	17,076

The processing implies alumina and other additional inputs: coke and pitch respectively imported from the USA and Germany. Moreover, the maintenance and improvement of the factory results in importation of spare parts, equipment and various commodities. These cargo means "General Cargo" in above table. This volume is unloaded at GPHA berth and the

remaining commodities are handled through the Valco berth.

For the last three years (1997-1999), the cargo volume of imported alumina varied from 84,963 to 323,285 ton per year, depending on the aluminium production targets.

Correlatively with aluminium production schema, the imported volume of coke and pitch also varied from 32,641 to 76,871 ton and from 11,152 to 18,017 ton per year respectively.

(c) Future import/export

The aluminium exports are changeable depending on both the international markets and the power supply. The following table represents the past performance of aluminium export. This shows fluctuation caused by the international market. And, we have to consider the situation also that the production was reduced due to the shortage of power supply in this period.

Table 10.4.3 Aluminium Export Volume 1991-2000

(Unit: ton)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Export Vol.	177,369	73,119	147,542	94,351	111,499	111,051	88,395	50,215	132,608	156,776

Although Valco has 5 cellar lines and the capacity of 200,000 ton in aluminium production, the workable lines are limited to 4 lines with the capacity of 160,000 ton due to the shortage of power supply. However, the power developer in USA is currently planning to construct the offshore pipeline from Nigeria to Ghana through Benin and Togo and to build the power plants in these countries by using the natural gas from Nigeria. It is scheduled that the power plants complete at 2004 and one of the power plants will be constructed at Tema. Valco could use the power supply from this plant.

So, assuming the market is developing gradually and the power shortage is solved, the aluminium export might increase by:

+5% from 2000 to 2020

Above growth rate coincides with the actual growth rate of manufacturing sector in the last 5 years. (1995~1999) However, the existing capacity of aluminium production by Valco is 200,000 tons per year so that we project the production volume is 200,000 ton at 2010. We assume the capacity will increase after 2010.
The future volume of input imports will depend on the aluminium production; so the same traffic growth rate will be adopted for the input import volume as well as aluminium export.
The following table gives the demand forecast on aluminium industry.

Table 10.4.4 Demand Forecast on Aluminium Industry

(Unit: ton)

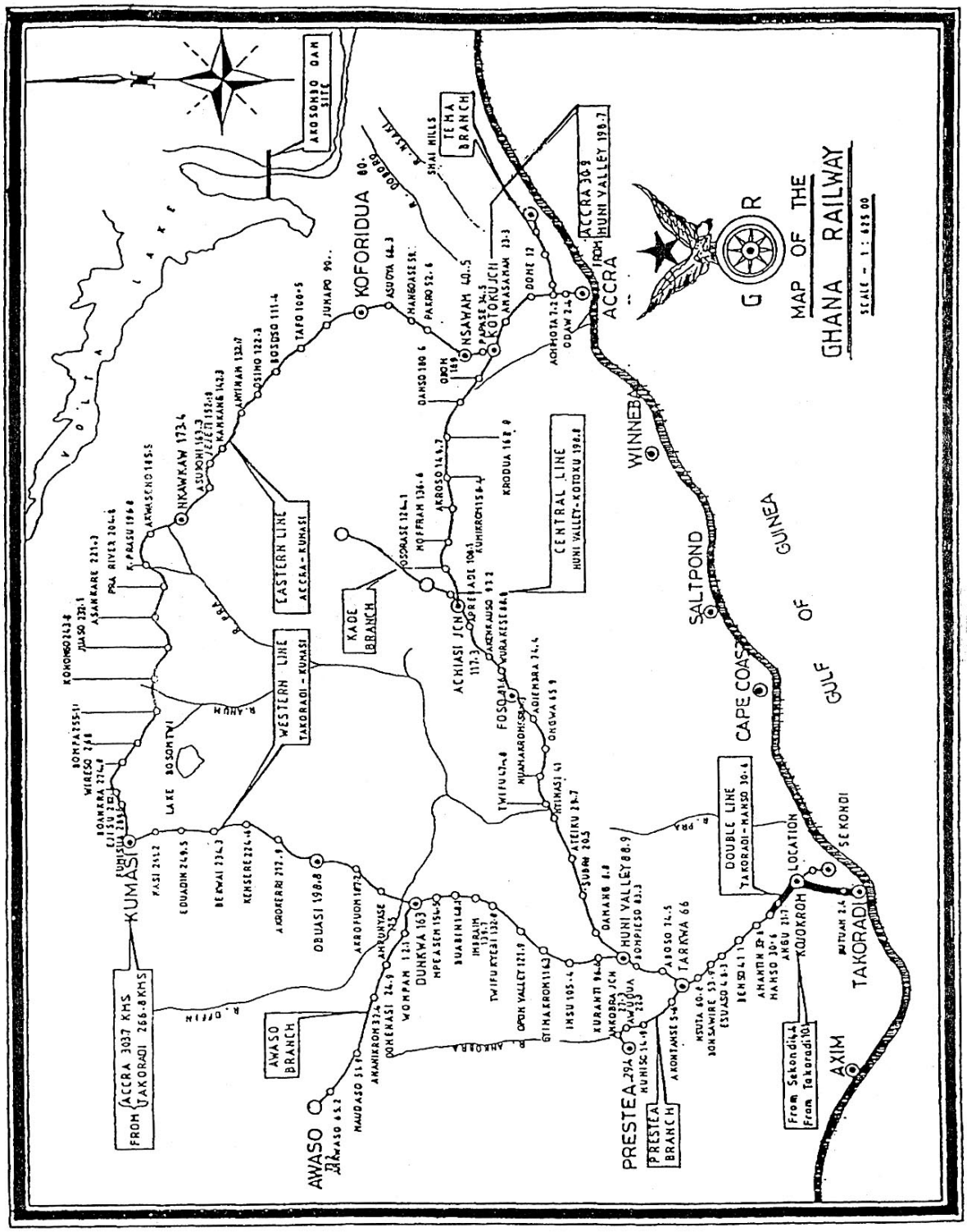
Commodities	Import/Export	2000	2010	2020
Aluminium	Export	156,776	200,000	415,973
Alumina	Import	301,755	384,950	800,645
Coke	Import	73,409	93,648	194,776
Pitch	Import	16,036	20,450	42,532
General cargo	Import	27,740	35,388	73,602

(2) Bauxite

(a) Outlook

There is one bauxite mine at Awaso in Western Region. The mining is operated by Ghana Bauxite Co. Ltd. (GBCL), that is shared 80 % by Alcan Alminium of Canada and 20 % by the Government of Ghana. GBCL relies on rail transport to deliver ore to their ship loading facilities in Takoradi and uses rolling stock of Ghana Railway Corporation (GRC). GBCL uses the Western Line section between Takoradi and Dunkawa (via Nsuta) and its Dunkawa-Awaso Branch. The rail distance from Awaso to Takoradi is 240 km.

Freight rate is high ($9/ton from Awaso to Takoradi) and road transport is found to be more reliable despite of a slight cost disadvantage. However, this alternative is short lived considering the intense wear of road surfaces due to heavy trucking. Ultimately, the railway line must be upgraded to allow the mine to increase their production in response to the lowering commodity price.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TAKORADI - KUMASI
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CENTRAL LINE
HUNI VALLEY - KOTOKU 198.8
ACHIASI JCN
DOUBLE LINE
TAKORADI - MANSO 30.4
AWASO BRANCH
AWASO
PRESTEA
PRESTEA BRANCH
HUNI VALLEY 88.9
TAKORADI
LOCATION
KOJOKROM
AXIM
From Sekondi
From Takoradi
SEKONDI
AKOSOMBO DAM SITE
VOLTA LAKE
LAKE BOSOMTWI

The mine production reached a record of 536,722 ton in 1997 but declined to 353,255 tons in 1999, due to the shortage of railway transportation capacity from the site to the port in Takoradi. The reduction in output, coupled with weak bauxite prices, has made the whole operation uneconomic.

GBCL has plan to increase production from current level of about 360,000 tons to 1,500,000 tons per year. This plan calls for more than doubling of the railway and the corresponding port handling capacities. GBCL already purchased the new wagons, so that the transportation capacity of railway will be 1,120,000 ton per year from 2002.

At Present, ore reserves of bauxite of 25 million ton are proven at the Awaso site and another reserves of 40 million ton are possible at the same area. Therefore, rehabilitation and expansion of the Western line and Takoradi Port facilities are worthwhile project for the country.

(b) Past performances

Table 10.4.5 Export Volume of Bauxite

(Unit: ton)

Commodity	Import/Export	1997	1998	1999
Bauxite	Export	536,722	341,119	355,255

For the last three years (1997-1999), the exported volume of bauxite were changed between 341,119 and 536,722 ton per year and handled in Takoradi Port.

(c) Future export demand

The bauxite production fluctuated in 1990s as shown in the following table.

Table 10.4.6 Yearly Production and Export Volume of Bauxite

(Unit: 1000 ton)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production	382	485	498	417	500	426	383	506	443	353	N.A
Export Vol.	N.A	324	399	365	452	531	380	537	341	355	440

Source: GPHA, Statistical Service, Quarterly Digest of Statistics

Aluminium markets became buoyant and an agreement between GBCL and GRC has been reached, whereby GBCL purchased necessary wagons and started the investment for railway truck rehabilitation. The break-even production is roughly estimated to be more than 600,000 ton per year and GBCL plans to produce 1.0-1.2 million and 1.5 million at the year 2010 and 2020 respectively. Expecting the rehabilitation of railways and port facility development, we estimate the export volume of bauxite as shown in Table 4-1-7.

Table 10.4.7 Demand Forecast of Bauxite

(Unit: ton)

Commodity	Import/Export	2000	2010	2020
Bauxite	Export	439,813	1,000,000	1,500,000

(2) Manganese

(a) Outlook

Manganese occurrences are common in Ghana but uneconomic except for the Nsuta deposit, which is located near Tarkwa in Western Region. The Nsuta mine is now operated by Ghana Manganese Co. Ltd. (GMC), which is 90 % owned by Ghana International Manganese Co. Ltd., and 10 % owned by the Government of Ghana. GMC relies on rail transport to deliver ore to their ship loading facilities in Takoradi and uses rolling stock of Ghana Railway Corporation (GRC) same as GBCL. GMC uses the Western Line section between Takoradi and Nsuta. The rail distance from Nsuta to Takoradi is 66 km, while road distace is 85 km.

The production of manganese relies on the international markets and the capacity of the transportation between the Nsuta mine and the port of Takoradi. At present, the transportation depends on railways and the road is alternative one. GMC claims that they could export up to 1 million ton if the infrastructure could manage it. Since the resources and the markets are positive, the larger mine output would allow the Ghanaian manganese to be more competitive. Ore reserves of manganese at Nsuta of around 20 million tons are proven excepting other possible development sites. An improved loading facility at the port would lower the cost and could yield a competitive price product by eliminating the double cargo handling.

(b) Past performances

Table 10.4.8 Export Volume of Manganese

(Unit: ton)

Commodity	Import/Export	1997	1998	1999
Manganese	Export	340,180	382,226	656,684

For the last three years (1997-1999), the exported volume of manganese increased from 340,180 to 656,684 ton per year and handled in Takoradi Port.

(c) Future export demand

The manganese production and export fluctuated in 1990s as shown in the following table.

Table 10.4.9 Yearly Production and Export Volume of Manganese

(Unit: 1000 ton)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production	364	415	448	286	187	269	266	437	537	541	N.A
Export Vol.	N.A	320	284	305	245	167	269	340	382	657	936

Source: GPHA Statistical Service, Quarterly Digest of Statistics

While bauxite showed slower growth, the manganese market was quite robust in contrast. Growth in the global demand for manganese was buoyant, with sales increasing by over 56 %.

However, the increase in sales volume was met by a draw-down in the stocks of inventory. The production bottlenecks should be taken out in order to meet future increased demand.
In this study, we assume the export volume will be 1 million tons per year at the target years 2010 and 2020 moderately due to the uncertainty of the ore resources. As a result, the export volume of manganese is estimated as shown in Table 10.4.10.

Table 10.4.10 Demand Forecast of Manganese

(Unit: ton)

Commodity	Import/Export	2000	2010	2020
Manganese	Export	935,608	1,000,000	1,000,000

(3) Clinker

(a) Outlook

There are two cement factories in Ghana: one in Tema and the other in Takoradi, both are located close to the ports. These cement factories are operated by the Ghana Cement Co. Ltd., that is shared 94.5 % by Scancem Co. Ltd., and 4.5 % by GOG. Scancem is a subsidiary of Hiderberg Co. in Germany. Until 1999, Ghacem has produced almost all the cement in Ghana excluding some option for specific cement. However, in 2000, the new cement company from Togo was established in Aflao, which is facing the national boarder between Ghana and Togo. The company will construct and operate the cement factory in the near future. It is expected that the company imports the clinker from Togo by road and produces 500,000 tons of cement of which 70 % will be exported. Remaining 30 % will be consumed in Ghana. The company will use their own port facilities so that their cargo volume does not affect Tema Port.

There is no production of clinker in Ghana and all clinker is imported from the foreign countries such as Great Britain, Scandinavian and Mediterranean countries. Gypsum is also imported from the foreign countries. Based on the hearings through Ghacem, we have assumed that the cement factories of Ghacem would not export to other countries and would not have a regional role in West African countries because each country has its own cement factory. The forecasts are therefore estimated only for domestic demand.

Since 1990, the cement production in Tema factory has 2.8 times increased from 401,278 to 1,118,298 tons in 1999. Such an increase shows that the demand is very high. The moderate growth will go on in the future because the demand will continue. The increase of the demand for building materials always follows the growth of the population and the steady increase of infrastructures.

A limestone quarry is said to exist in the north of Lake Volta. So, there are some ideas to produce cement by using the Ghananian raw materials (limestone) if the quality of this material fits the requirements. One idea is to transport the raw materials from the above site to Tema, and to process them into clinker instead of importing them. The possibility of this idea depends on the following conditions:

- Inland transportation costs between the quarry and the Tema factory should be low in spite of two additional transshipments from land to barges and from barges to trains,

- Year round availability of sufficient water depth in the lake has to be confirmed, and
- A railway between a port south of the lake and Tema should be constructed.

However, this idea is difficult to be materialized considering the capital investment, maintenance cost and implementation period.
The other one is to build the mill at the quarry area for the finished products to save the inland transportation cost. It would be logical to build the mill in the quarry area, because it is less expensive to carry finished products than raw materials. The disadvantages of this idea are as follows:

- The new factory has to carry fuel from the Tema refinery (or electrical power) to the site via Lake Volta.
- The cement would have to be delivered mostly to the southern regions, especially Greater Accra Region, where the main demand is.

It is said that a cement factory cannot be profitable if the production is less than 300,000 tons per year. So, if the northern cement factory could be constructed after the total demand of the northern areas such as the Northern, Upper West, Upper East Regions and Burkina Faso becomes more than 300,000 tons, this idea will become more feasible. However, this investment is considered as hazardous and it is preferable at present not to take into account in order to be on the conservative side for the definition of port facility requirements.

(b) Past performances

Table 10.4.11 Import Volume of Clinker

(Unit: ton)

Commodities	Import/Export	1997	1998	1999
Clinker in Tema	Import	977,691	883,661	985,067
Clinker in Takoradi	Import	503,220	599,214	737,652
Total	Import	1,480,911	1,482,875	1,722,719

Imports at both ports in last 3 years are shown above. In 1999, the import of clinker ranked first among all imports at both ports. Sometimes, Ghana has imported cement with specific qualities that are not produced in the country.

Previously, clinker transited to Burkina Faso via Tema Port, but now there are no such a transit clinker due to the higher inland transportation cost and bullish market in Ghana. It is expected that cement is partly exported from Togo to Burkina Faso.

(c) Future import demand

In the projection of the import volume of clinker, we assume all the cement that are needed in Ghana in the future will be produced from the imported clinker.
It is said that the total consumption of cement has a good correlation with gross fixed capital formation. Value of gross fixed capital formation could be calculated assuming its ratio to the total GDP is constant. Therefore, the total consumption of cement might have a good

correlation with GDP itself. Following table shows the import volume of clinker and GDP from 1991 to 2000. Cement constitutes of 90 % clinker, 5 % gypsum and 5 % other input.

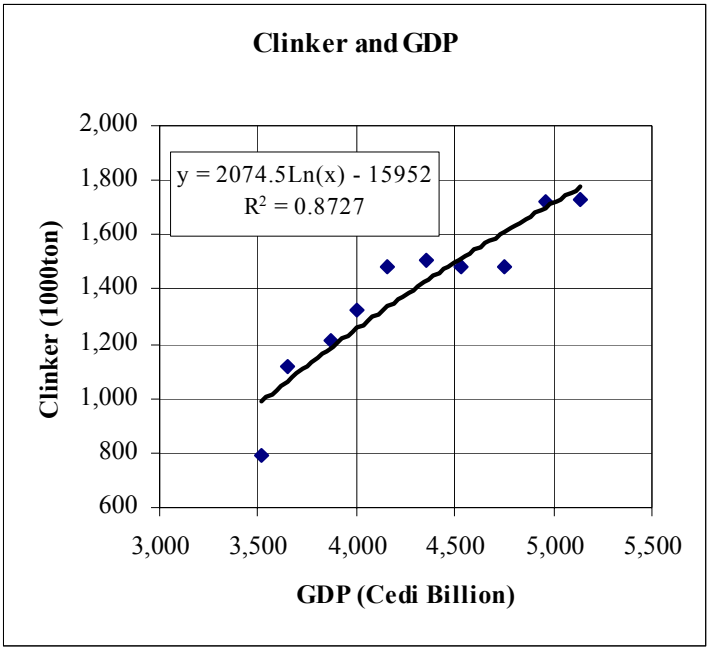
Table 10.4.12 Import Volume of Clinker and GDP 1991-2000

(Unit: 1000 ton)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
GDP (Cedi Billion)*	3,517	3,653	3,873	3,999	4,160	4,351	4,534	4,747	4,957	5,140
Clinker in Tema	470	626	767	795	1,032	981	978	884	985	973
Clinker in Takoradi	324	490	448	525	452	527	503	599	738	756
Total	794	1,116	1,215	1,320	1,484	1,508	1,481	1,483	1,723	1,729

**1993 constant price*

Figure 10.4.1 Correlation between Clinker and GDP



The correlation equation between the import volume of clinker and GDP is as follows.

$Y = 2074.5\ln(X) - 15952$ $(R^2=0.8727)$

Where, Y: Import volume of clinker (1000 ton)

X: GDP at 1993 constant price (Cedi Billion)

The estimated import volume of clinker is shown in the following table.

Table 10.4.13 Demand Forecast of Clinker

(Unit: ton)

Factories	Import/Export	2000	2010	2020
Total	Import	1,728,297	2,754,000	4,314,000
Existing*	Import	1,728,297	2,254,000	3,314,000
New	Import**	0	500,000	1,000,000

** Tema and Takoradi ports **By road*

Table 10.4.14 Planned GDP

Year	1999	2000	2010	2020
GDP (Cedi Billion)*	4,957	5,140	8,373	18,077

** 1993 constant price*

(d) Allotment by port

The future import volume of clinker by port might be estimated considering the hinterland of each port and Ghacem investments program. The maximum capacities of existing mills at Tema Port and Takoradi Port are 1,200,000 ton each. At present, Ghacem has no plan to build additional mill in Takoradi. The hinterland of Tema Port includes the greater Accra Region, the part of the Central Region, the Volta Region, the Eastern Region, part of the Northern Region and Upper East Regions. While the Takoradi Port serves western part of the country including the Western Region, the Ashanti Region, the Brong Ahafo Region, part of the Northern Region, the Upper West Region. The population of both hinterlands shares 56 % and 44 % respectively. These shares coincide with the shares of clinker import volume by each port at the year 2000. So, the distribution of import volume of clinker by port could be projected as follows assuming above shares.

Table 10.4.15 Demand Forecast of Clinker by Port

(Unit: ton)

Commodity	Import/Export	2000	2010	2020
Clinker Total	Import	1,728,297	2,254,000	3,314,000
Clinker in Tema	Import	972,772	1,262,240	1,855,840
Clinker in Takoradi	Import	755,525	991,760	1,458,160

(4) Wheat

(a) Outlook

Ghana can not produce any wheat due to the weather condition. So, all the wheat is imported from Europe and USA. Almost all wheat is used for the production of flour and the consumption amount of wheat is increasing by the demographic evolution and the upgrading of the living standard.

However, the growth rate in agriculture sector is only 2.8 % (1990-1999) that is lower than the demographic one and Ghana has not succeeded in self-sufficiency. Another altanative cereal crops such as maize and rice do not increase domestically. Consequently, the import of wheat will continuously increase in the future. There are four flour mills in Ghana, three in Tema and one in Takoradi. They handled all the imported wheat.

Table 10.4.16 Yearly Production of Main Cereals

(Unit:1000 MT)

Items	1993	1994	1995	1996	1997	1998	1999
Maize	961	940	1,034	1,008	1,021	1,015	1,014
Sorghum	328	324	361	353	320	355	302
Millet	198	168	209	193	139	162	158
Rice	157	162	221	216	197	281	210
Total	1,644	1,594	1,825	1,770	1,677	1,813	1,684

Source: Ministry of Food and Agriculture, Policy Planning, Monitoring and Evaluation Department, Accra

(b) Past performances

Table 10.4.17 Import Volume of Wheat by Port

(Unit: MT)

Commodities	Import/Export	1997	1998	1999
Wheat in Tema	Import	151,789	217,563	191,440
Wheat in Takoradi	Import	65,806	99,724	89,120
Total	Import	217,595	317,287	280,560

For the last three years (1997-1999), the import volume of wheat are between 217,595 ton and 317,287 ton per year.

(c) Future import demand

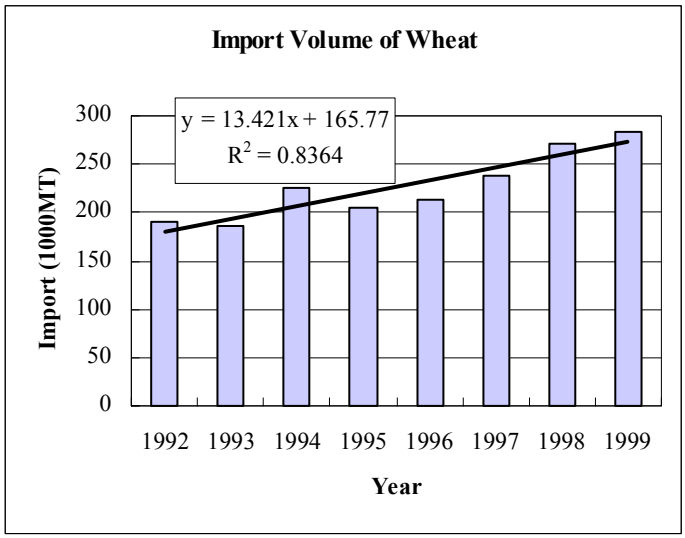
The wheat import will increase corresponding to the demographic evolution and the upgrading of the living standard. Table10.4.18 shows the yearly imported wheat volume in Ghana between 1990 and 1999.

Table 10.4.18 Import Volume of Wheat 1991-2000

(Unit: 1000 MT)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Import Vol.	206	126	238	192	245	176	218	317	280	252
3 Years Ave.	-	190	185	225	204	213	237	272	283	-

Figure 10.4.2 Yearly Import Volume of Wheat



The future import volume of wheat in Ghana can be estimated by a time series correlation analysis.

$Y = 13.421\ t + 165.77$

Where,

Y: Import volume of wheat

t : Number of years from 1992

The results of forecast are shown in Table 10.4.19.

Table 10.4.19 Demand Forecast of Wheat

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Wheat	Import	252,471	420,770	555,000

(d) Allotment by port

We will assume that there will be no limitations of production in the flour mills and that the investment programs will follow the evolution of the demand.

The total import volume will be transported to the flour mills at the hinterlands of both ports. Shares by both ports are assumed as 60 % and 40 % respectively considering the present shares. So, import volume of wheat is allotted by port as below.

Table 10.4.20 Demand Forecast of Wheat by Port

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Wheat Total	Import	252,280	420,770	555,000
Wheat in Tema	Import	141,135	252,462	333,000
Wheat in Takoradi	Import	111,145	168,308	222,000

(6) Rice

(a) Outlook

Table 10.4.21 Output, Area Cultivated and Average Yield per Hectare of Rice

Items	Unit	1993	1994	1995	1996	1997	1998	1999
Output	1000MT	157	162	221	216	197	281	210
Area Cultivated	1000HA	77	81	100	105	109	130	105
Unit Yield	MT/HA	2.0	2.0	2.2	2.1	1.8	2.2	2.0

Source: Ministry of Food and Agriculture, Policy Planning, Monitoring and Evaluation Department, Accra

Rice is one of the major cereals cultivated in the country, namely maize, millet, sorghum and rice. However, the output, area cultivated and yield of this main food crop have not increased through 1990s as shown in above table.

What would impact negatively on the agricultural growth is the overwhelming rainfed farming system in the country. The highly irregular pattern of annual rainfall in the country is an important factor in the fluctuating agricultural production. Irrigation facilities that can reduce the problem with rainfall are not extensively developed. So far, less than 10 % of the land cultivated under various crops annually is irrigated. For effective development of agriculture in the future, the provision of irrigation facilities and usage of fertilizers are indispensable.

(b) Past performances

Table 10.4.22 Import Volume of Rice

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Rice	Import	186,290	275,705	283,671

For the last three years (1997-1999), the import volume of rice increased from 186,290 to 283,097
ton per year and this cargo was mostly handled in Tema Port. Around 65 % of rice imports came from the Far East Asian countries.

(c) Future import demand

The rice import will increase corresponding to the demographic evolution and the upgrading of the living standard same as wheat. Table 10.4.23 shows the import volume of rice, the yield of rice and population in Ghana between 1993 and 1999.

Table 10.4.23 Yield, Import Volume of Rice and Population 1993-1999

Items	Unit	1993	1994	1995	1996	1997	1998	1999
Population	1000persons	15,432	15,825	16,231	16,637	17,067	17,510	17,952
Yield	1000MT	157	162	221	216	197	281	210
Import Vol.	1000MT	246	159	175	192	186	276	283
Total	1000MT	403	321	396	408	383	557	493

Source: Ministry of Food and Agriculture, Policy Planning, Monitoring and Evaluation Department, Accra /GPWH

The growth rate of import volume during this period is around 2.4 %, while population growth rate is 2.6 %. Although the increasing yield of rice could be expected by provision of irrigation facilities in the future, we assume this augment will be offset by the upgrading of the living standard. So, estimating the same growth rate as population, rice import might increase by:

+2.6 % from 2000 to 2020

The results of forecast are shown in Table 10.4.24.

Table 10.4.24 Demand Forecast of Rice

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Rice Total	Import	261,924	338,570	437,645
Rice in Tema	Import	261,924	287,785	262,587
Rice in Takoradi	Import	0	50,785	175,058

(7) Grain (Corn)

(a) Outlook

Corn is one of the important imported crops in the country. As for corn, the output, area cultivated and yield have not increased through 1990s and its effective development depends on the provision of irrigation facilities and usage of fertilizers. Although data on this commodity is not available, the situation is same as “other grain” (8).

(b) Past performances

Table 10.4.25 Import Volume of Grain (Corn)

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Grain (Corn)	Import	59,210	6,390	5,404

For the last three years (1997-1999), the import volume of other grain changed largely between 5,404 MT to 59,210 MT per year. This commodity was handled in Tema Port.

(c) Future import demand

Table 10.4.26 shows the import volume of grain (corn) between 1991 and 2000. The import volume of grain (corn) fluctuates largely depending on the agricultural situation in Ghana.

Table 10.4.26 Per Capita Consumption of Grain (Corn) 1991-2000

(Unit: 1000persons/MT)

Items	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	14,673	15,047	15,432	15,825	16,231	16,637	17,067	17510	17,952	18,412
Import Vol.	5,219	13,949	8,635	0	11,457	1,945	59,210	6,390	5,404	9,214
3 Years Ave.	-	9,268	7,528	6,697	4,477	24,214	22,525	23,275	7,003	-
Per Capita.	-	0.62	0.49	0.42	0.28	1.46	1.32	1.33	0.39	-

In this case, assuming 1.5 kg per capita consumption, we estimate the future demand. The results of forecast are shown in Table 10.4.27. Cargo types of this commodity will be DB and BC, half and half.

Figure 10.4.3 Per Capita Consumption of Grain (Corn)

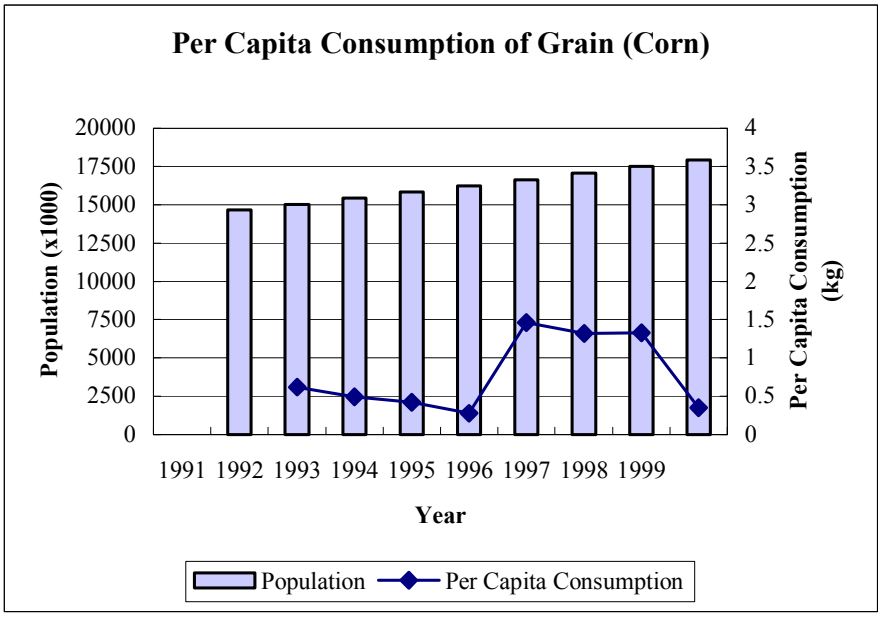


Table 10.4.27 Demand Forecast of Grain (Corn)

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Grain (Corn) Total	Import	9,214	35,916	45,072
Grain (Corn) in Tema	Import	9,214	30,529	27,043
Grain (Corn) in Takoradi	Import	0	5,387	18,029

(8) Other Grain

(a) Outlook

"Other Grain" includes malt, other (maize) and soya meal categorized in the port cargo statistics.
For example, maize is one of the "other grain" cultivated in the country. However, the output, area cultivated and yield of the maize have not increased through 1990s as shown in the table below. Effective development of maize depends on the provision of irrigation facilities and usage of fertilizers. Although data on another commodities are not available, the situation is same as maize.

Table 10.4.28 Output, Area Cultivated and Average Yield Per Hectare of Maize

Items	Unit	1993	1994	1995	1996	1997	1998	1999
Output	1000MT	961	940	1,034	1,008	1,021	1,015	1,014
Area Cultivated	1000HA	637	629	669	665	663	697	697
Yield	MT/HA	1.5	1.5	1.6	1.5	1.5	1.5	1.5

Source: Ministry of Food and Agriculture, Policy Planning, Monitoring and Evaluation Department, Accra

(b) Past performances

Table 10.4.29 Import Volume of Other Grain

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Other Grain	Import	11,344	7,483	14,125

For the last three years (1997-1999), the import volume of other grain changed largely between 7,483 MT to 14,125 MT per year. These commodities were handled in Tema Port.

(c) Future import demand

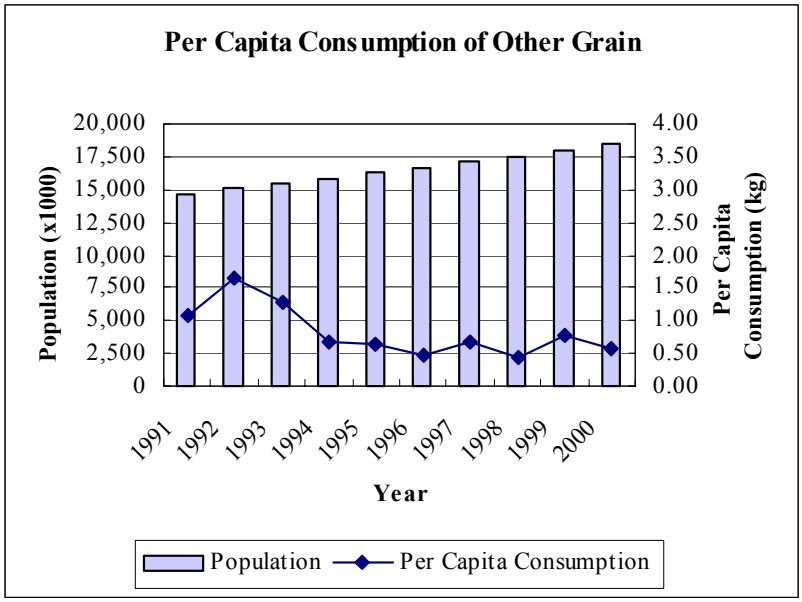
Table 10.4.30 shows the import volume of other grain between 1991 and 2000. The import volume of other grain fluctuates largely depending on the agricultural situation in Ghana.

Table 10.4.30 Per Capita Consumption of Other Grain 1991-2000

(Unit: 1000persons/MT/kg)

Items	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	14,673	15,047	15,432	15,825	16,231	16,637	17,067	17510	17,952	18,412
Import Vol.	15,887	24,599	19,477	10,534	10,637	7,843	11,344	7,483	14,125	10,823
Per Capita.	1.08	1.63	1.26	0.67	0.66	0.47	0.66	0.43	0.79	0.59

Figure 10.4.4 Yearly Import Volume of Other Grain



In this case, assuming 1.0 kg per capita consumption of other grain, we estimate the future demand. The results of forecast are shown in Table 10.4.31.

Table 10.4.31 Demand Forecast of Other Grain

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Other Grain Total	Import	10,823	23,944	30,048
Other Grain in Tema	Import	10,823	20,352	18,029
Other Grain in Takoradi	Import	0	3,592	12,019

(9) Sugar

(a) Outlook

The consumption amount of sugar is increasing by the demographic evolution and the upgrading of the living standard.

(b) Past performances

Table 10.4.32 Import Volume of Sugar

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Sugar	Import	99,425	189,933	214,371

For the last three years (1997-1999), the import volume of sugar increased from 99,425 ton to 214,371 ton per year. This commodity was handled in Tema Port. Around 90 % of the total sugar imports came from Brazil and the other South American countries.

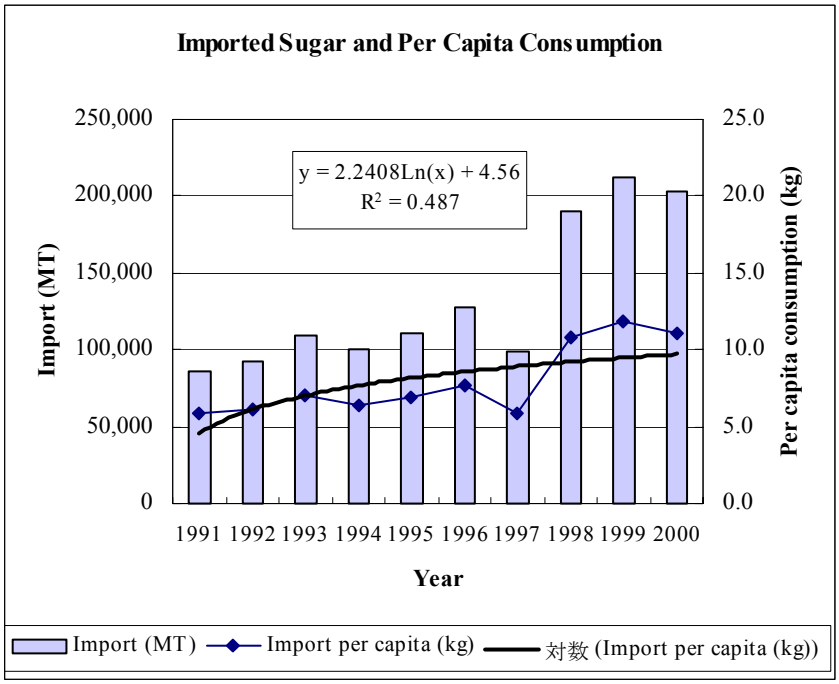
(c) Future import demand

Table 10.4.33 Import Volume of Sugar and Per Capita Consumption 1991-2000

(Unit: 1000persons/MT/kg)

Items	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	14,673	15,047	15,432	15,825	16,231	16,637	17,067	17510	17,952	18,412
Import Vol.	86,032	92,069	109,493	100,130	111,244	127,321	99,425	189,933	214,371	203,962
Per Capita	5.9	6.1	7.1	6.3	6.9	7.7	5.8	10.8	11.9	11.1

Figure 10.4.5 Import Sugar and Per Capita Consumption



The import volume of sugar increased constantly during 1990s with annual growth rate of 12 %, while population growth rate is 2.6 % in the same period. Per capita consumption can be estimated by the time series correlation equation as follows.

$Y = 2.2408\mathrm{Ln}(t) + 4.56 \quad (R^2=0.487)$

Where,

Y: Per capita consumption of sugar (kg)

t : Number of years from 1991

Based on the above equation, per capita consumption at 2010 and 2020 are calculated as 9.7 kg and 11.3kg respectively. Therefore, the results of forecast are shown in Table 10.4.34.

Table 10.4.34 Demand Forecast of Sugar

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Sugar Total	Import	203,962	232,255	339,543
Sugar in Tema	Import	203,962	197,417	203,726
Sugar in Takoradi	Import	0	34,858	135,817

(10) Traditional Agro-Products

(a) Outlook

Table 10.4.35 Ghana's Coc*o*a Output and Proportion of World Production

(Unit:1000MT)

Items	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Output	295	293	243	312	255	310	404	317	409	420
Growth Rate (%)	-	0.99	0.83	1.28	0.82	1.22	1.30	0.78	1.29	1.03
World Output	2,407	2,506	2,278	2,485	2,435	2,348	2,916	2,713	2,683	2,747
Share of World (%)	12.3	11.7	10.7	12.6	10.5	13.2	13.9	11.7	15.2	15.3

Source: Ghana Cocoa Board, Accra

Cocoa is the major traditional agricultural export commodity of the country. The output in 1999 contributed about 15.3 % to the world output and placed the country in the world second position after Cote d'Ivore. The leading growers in Africa are Cote d'Ivore, Ghana, Nigeria and Cameroon.

The main cocoa producing regions are south western part of Ghana, and the area cultivated under cocoa shares more than 50 % of the total cultivated area. Cocoa beans exports depend on the international market and the weather condition.

Ghana has relied on cocoa for major export earnings for long time, and the country has diversified agricultural production in order to reduce the volatility of the economy to external factors. However, cocoa is still the most important cash crop and its export will continue to grow.

The locally made cocoa products, cocoa liquor, cake and chocolate bars and sweets, have been exported. It seems that the manufacturing of cocoa products and their exports have sustained a low development but will increase gradually.

(b) Past performances

Table 10.4.36 Export Volume of Cocoa Beans

(Unit: MT)

Commodities	Import/Export	1997	1998	1999
Cocoa Beans	Export	109,337	154,583	119,482
Cocoa Products	Export	15,048	15,949	55,458

For the last three years (1997-1999), the exported volume of cocoa beans and its products changes between 109,337 ton and 154,583 ton per year and from 15,048 ton to 55,458 ton per year respectively. These commodities were handled in both ports.

(c) Future export demand

Table 10.4.37 Export Volume of Cocoa Beans 1991-2000

(Unit: MT)

Commodities	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cocoa Beans	186,979	140,572	186,237	132,646	102,846	146,483	109,337	154,583	119,482	207,089
Cocoa Products	9,578	7,262	10,217	7,846	12,518	11,575	15,048	15,949	55,458	79,188

As cocoa beans export depends on the international market and the climate, the fluctuation of the export volume could not be avoided. However, in the long run, the cocoa export might increase by:

+6% from 2000 to 2020

This increase rate is assumed by considering average growth rate of cocoa production in 1990s. As for the cocoa products, their export might increase by:

+8% from 2000 to 2020

The results of forecast are shown in Table 10.4.38.

Table 10.4.38 Demand Forecast of Cocoa Beans

(Unit: MT)

Commodities	Import/Export	2000	2010	2020
Cocoa Beans	Export	207,089	370,865	664,163
Cocoa Products	Export	79,188	170,961	369,092

(d) Allotment by port

Cocoa beans and cocoa products have been exported from Tema and Takoradi ports so far. As for the future export, we assume the on-going shares as 30 % and 70 % by each port.

Table 10.4.39 Demand Forecast of Cocoa Beans by Port

(Unit: MT)

Commodities	Import/Export	2000	2010	2020
Cocoa Beans Total	Export	207,089	370,865	664,163
Cocoa Beans from Tema	Export	76,439	111,260	199,249
Cocoa Beans from Takoradi	Export	130,656	259,605	464,914
Cocoa Products Total	Export	79,188	170,961	369,092
Cocoa Products from Tema	Export	45,474	51,288	110,728
Cocoa Products from Takoradi	Export	33,714	119,673	258,364

(11) Non-Traditional Agro-Products

(a) Outlook

Table 10.4.40 Yearly Export Volume of Major Non-Traditional Agro-Products

(Unit: MT)

Commodities	1994	1995	1996	1997	1998	1999
Pineapple	14,954	15,764	27,603	25,124	15,400	23,440
Cotton Seed	24,107	5,511	5,722	6,658	4,396	17,699
Coconut	9,089	9,924	10,940	7,674	5,752	9,344
Yam	5,323	6,866	8,086	7,018	7,421	9,763
Cocoyam	N.A	N.A	N.A	N.A	111	106
Vegetables/ Condiments	1,449	2,142	5,344	3,706	3,857	4,574
Coffee	1,634	1,988	2,590	2,032	2,622	2,692
Casewnuts	600	289	541	3,572	1,822	5,572
Banana	583	1,857	3,295	4,008	2,905	3,383
Mangoes	9	26	43	80	136	167
Others	N.A	N.A	N.A	N.A	N.A	13,627
Total	57,748	44,367	64,164	59,872	44,422	90,367

Source: Ghana Export Promotion Council, Accra

Non-traditional agro-products (N.T.A.P) include pineapple, cotton seed, coconut, Yam, cocoyam, vegetables/condiments, coffee, cashew nuts, banana and mangoes. These exports are likely to constitute an important source of container traffic in the future considering that the sector has received strong support and assistance from the Government as well as other bilateral and multilateral organizations.

(b) Past performances

Table 10.4.41 Export Volume of Non-Traditional Agro-Products

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
N.T.A.P	Export	59,872	44,422	90,367

Source: Ghana Export Promotion Council, Accra

These products are supposedly included in the terms of coffee, other, sheanuts, local foodstuff and “TEU NETWEIGHT” in the port cargo statistics. According to the above source, the exported volume of non-traditional agricultural commodities changed between 59,872 ton and 90,367 ton per year for the last three years (1997-1999). These products were handled in Tema Port and Takoradi Port with shares of 60 % and 40 % respectively.

(c) Future export demand

Table 10.4.40 shows the yearly export volume of non-traditional agro-products. Export of these products increase gradually in 1990s corresponding to the demand for this commodity in advanced country. The future growth rate is assumed by considering the average growth rate of N.T.A.P and the strategic position of N.T.A.P in Ghana’s export.

As for the non-traditional products, their export might increase by:

+8% from 2000 to

The results of forecast are shown in Table 10.4.42.

Table 10.4.42 Demand Forecast of Non-Traditional Agro-Products

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
N.T.A.P	Export	93,583	202,038	436,185

(d) Allotment by port

Non-traditional agro-products have been exported from Tema and Takoradi ports so far. As for the future export, we assume the on-going shares as 60 % and 40 % by each port. Therefore, export volume of these products is allotted by port as below. Estimated containerization at 2010 and 2020 are 80 % and 100 % respectively.

Table 10.4.43 Demand Forecast of Non-Traditional Agro-Products by Port

(Unit: MT)

Commodities	Import/Export	2000	2010	2020
N.T.A.P Total	Export	93,583	202,038	436,185
N.T.A.P in Tema	Export	82,819	121,223	261,711
N.T.A.P in Takoradi	Export	10,764	80,815	174,474

(12) Fertilizer

(a) Outlook

The country continued to import all of its fertilizer requirements in 1999. The quantity of the different types of fertilizer that the country usually imports decreased in 1999 in many instances. Annual imports of fertilizers amount to only 20,000/40,000 tons during 1990s.
The reasons are:
Extensive agriculture is practiced and fertilizers are not used because they are expensive and because there are not enough artificially irrigated areas to make fertilizers efficient.
However, for effective development of agriculture in the future, the usage of fertilizers will be promoted.

(b) Past performances

Table 10.4.44 Import Volume of Fertilizer

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Fertilizer	Import	36,376	62,173	28,124

For the last three years (1997-1999), the import volume of fertilizers changed between 28,124 ton and 62,173 ton per year. These commodities were handled in both ports.

(c) Future import demand

Table 10.4.45 Yearly Import Volume of Fertilizer

(Unit: MT)

Items	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Import Vol.	2,904	33,547	13,866	15,246	26,068	43,538	36,376	62,173	28,124	65,369
3 Years Ave	-	16,772	20,886	18,393	28,284	35,327	47,362	42,210	51,889	-

Assuming the same annual growth rate as designed for agriculture, fertilizer import might increase by:

+6.0 % from 2000 to 2010

+5.0% from 2010 to 2020

The results of forecast are shown in Table 10.4.46.

Table 10.4.46 Demand Forecast of Fertilizer

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Fertilizer	Import	65,369	117,066	190,688

(d) Allotment by port

Fertilizer has been exported from Tema and Takoradi ports so far. As for the future export, we assume the on-going shares as 60 % and 40 % by each port. Therefore, import volume of fertilizer is allotted by port as follows.

Table 10.4.47 Demand Forecast of Fertilizer by Port

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Fertilizer Total	Import	65,369	117,066	190,688
Fertilizer in Tema	Import	59,644	70,240	114,413
Fertilizer in Takoradi	Import	5,725	46,826	76,275

(13) Wood Products

(a) Outlook

Most of Ghana's productive forests are legally designated as permanent Forest Reserves. They are controlled by the Forestry Department within policies, regulations and management plans based on a forty year felling cycle and incorporating environmental and social safeguards. Previously, they were controlled by a twenty-five year felling cycle and there was a time when export of logs was high as 1.1 million cubic metres (in 1973). However, at present, annual gross wood production from the forest, which represents the annual allowable cut, is limited to 1 million cubic metres due to the decrease of forest resources and the few traditional species. Above production volume is guided as follows. These figures are log equivalent volume.

1,000,000 m^3 { 450,000 m^3: for Export
550,000 m^3: for Domestic Use }

(b) Past performances

Table 10.4.48 Export Volume of Wood Products

(Unit: MT)

Commodity	Import/Export	1997	1998	1999
Wood Products	Export	281,753	267,240	298,860

For the last three years (1997-1999), the export volume of wood products did not change remarkably with the volume of around 300,000 MT. However, the contents of wood products are transferring from sawn timber to processed products. The figures in Table 10.4.48 represent the cargo volume with unit of MT. Given that the wood products of 1 MT are equivalent to logs of 1.5 m^3, above cargo volume is nearly equal to around 450,000 m^3 in "log equivalent volume". These commodities were handled in Takoradi Port mostly.

(c) Future export demand

Ghana has a large number of wood processing businesses which together cover virtually the whole range of wood products. There are about one hundred sawmills. Of two hundred furniture producers an increasing number sell furniture components. Another kind of wood products such as sliced and rotary veneer, plywood etc. are also included in these businesses. These businesses are located mainly Kumasi and its environs. The Forestry Department is undertaking the studies on the feasibility of "Imported Logs" and the commercialization of "Lesser Known Species". At the same time, it promotes the high value, low volume export instead of the low value, high volume export with higher value added by further processing. Therefore, export amount will increase in the future while export volume will not increase.

In the long term, above-mentioned utilization of resources could be materialized so that the guideline on the wood products export will be maintained. The containerization of this commodity will be expedited rapidly in order to secure the quality control and to prevent the damages on the transportation. Estimated containerization at 2010 and 2020 are 80 % and 90 % respectively.

The results of traffic forecast are shown in Table 10.4.49.

Table 10.4.49 Demand Forecast of Wood Products

(Unit: MT)

Commodity	Import/Export	2000	2010	2020
Wood Products	Export	295,437	300,000	300,000

(14) Crude Oil and Petrol Products

(a) Outlook

Almost all of the crude oil comes from Nigeria. The crude oil is unloaded at the oil jetty in Tema Port and transported to the refinery through the pipelines. The refinery is operated by the

Tema Oil Refinery Co. Ltd., which is owned by the Government of Ghana. The existing refinery capacity is 45,000 barrel per day, that is, 2,600,000 ton per year. Up to 2002, the refinery will complete the additional capacity of 14,000 barrel per day by using of residue, but the crude oil volume does not change.

Oil consumption has increased with around 5 % growth rate annually. The Tema Oil Refinery has supplied LPG to foreign countries such as landlocked countries and Togo as well as domestic consumption. In the long term, it is expected that the import of crude oil and petrol products will increase corresponding to the GDP growth in Ghana.

(b) Past performances

Table 10.4.50 Import Volume of Crude Oil and Petrol Products

(Unit: 1000 MT)

Commodity	Import/Export	1997	1998	1999
Crude Oil*	Import	265	766	1,101
Petrol Products*	Import	1,151	889	923
Total		1,416	1,655	2,024
Petrol Products*	Export	232	223	372
Petrol Products**	Import	94	108	130

**Tema ** Takoradi*

For the last three years (1997-1999), the total import volume of crude oil and petrol products increased from 1,416,000 MT to 2,024,000 MT per year.

(c) Future import demand

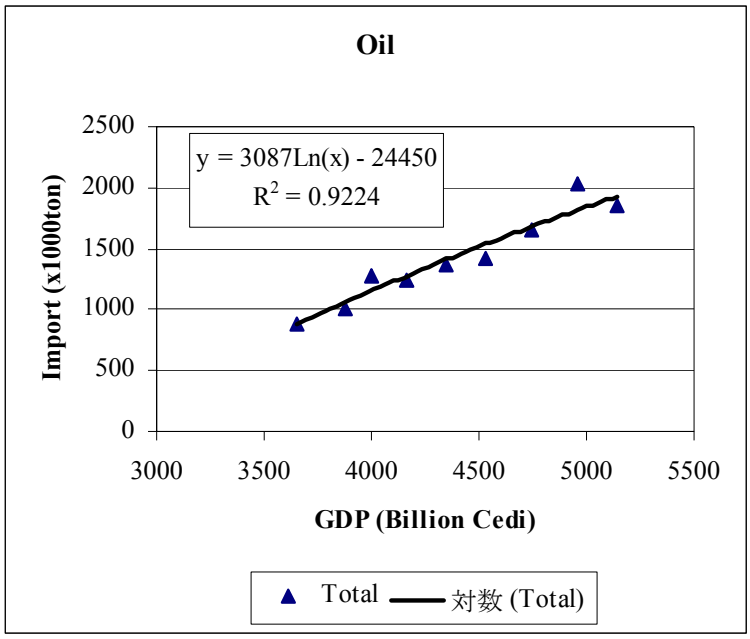
Table 10.4.51 Yearly Import Volume of Crude Oil and Petrol Products

(Unit: 1000 MT)

Year		1992	1993	1994	1995	1996	1997	1998	1999	2000
GDP (Cedi Billion)		3,653	3,873	3,999	4,160	4,351	4,534	4,747	4,957	5,140
Crude Oil*	Import	755	520	980	833	942	265	766	1,101	1,000
Petrol Products*	Import	134	489	297	414	427	1,151	889	923	850
Total Oil		889	1,009	1,277	1,247	1,369	1,416	1,655	2,024	1,850
Petrol Products*	Export	343	188	185	254	183	232	223	372	247
Petrol Products**	Import	101	110	75	17	20	94	108	130	138

**Tema ** Takoradi*

Figure 10.4.6 Correlation between Total Oil and GDP



The correlation equation between the total oil and GDP is as follows.

$Y = 3087Ln(X) - 24450 \quad (R^2=0.9224)$

Where, Y: Import volume of total oil (1000 MT)

X: GDP at 1993 constant price (Cedi Billion)

The estimated import volume of the total oil is shown in the following table. Crude oil and petrol products with 75 % and 25 % respectively assuming the same shares as before will share the total oil.

"Export volume of petrol products at Tema" will be shipped to the foreign countries and Takoradi with the annual growth rate of 5 % between 2000 and 2010 and 8 % between 2010 and 2020 same as the planned GDP growth rate. "Import volume of petrol products at Takoradi" will be consumed at Takoradi including its hinterland projecting 5 % annual increase rate.

Table 10.4.52 Demand Forecast of Crude Oil and Petrol Products

(Unit: MT)

Commodities	Import/Export	2000	2010	2020
Crude Oil*	Import	1,000,000	2,575,500	4,357,500
Petrol Products*	Import	850,000	858,500	1,452,500
Total		1,850,000	3,434,000	5,810,000
Petrol Products*	Export	246,584	401,659	867,152
Petrol Products**	Import	138,000	224,787	366,154

* Tema **Takoradi

10.4.2 Other Commodities

Other commodities consist of the general cargo (excluding major commodities) and the containerized cargo.

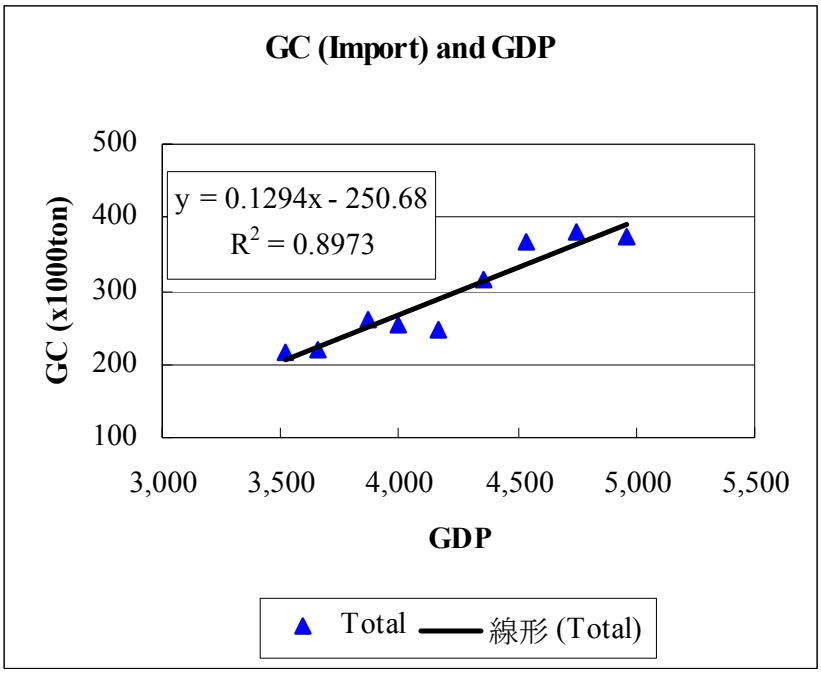
(1) Import GC (excluding VALCO)

The correlation equation between GC (Import) and GDP is expressed as follows.

$$Y = 0.1294X - 250.58 \quad (R^2=0.8973)$$

Where, Y: Import volume of general cargo (1000 MT)
X: GDP at 1993 constant price (Cedi Billion)

Figure 10.4.7 Correlation between GC (Import) and GDP



The results of forecast are shown in the table below. As for the future import, we assume the future shares as 80 % and 20 % in 2010, and 60% and 40% in 2020 by each port. Some portion of this cargo will be containerized at 2010 and 2020.

Table 10.4.53 Demand Forecast of General Cargo (Import)

(Unit: 1000MT)

Commodities	Import/Export	2000	2010	2020
GC Total	Import	235	832	2,088
GC in Tema	Import	207	666	1,253
GC in Takoradi	Import	28	166	835

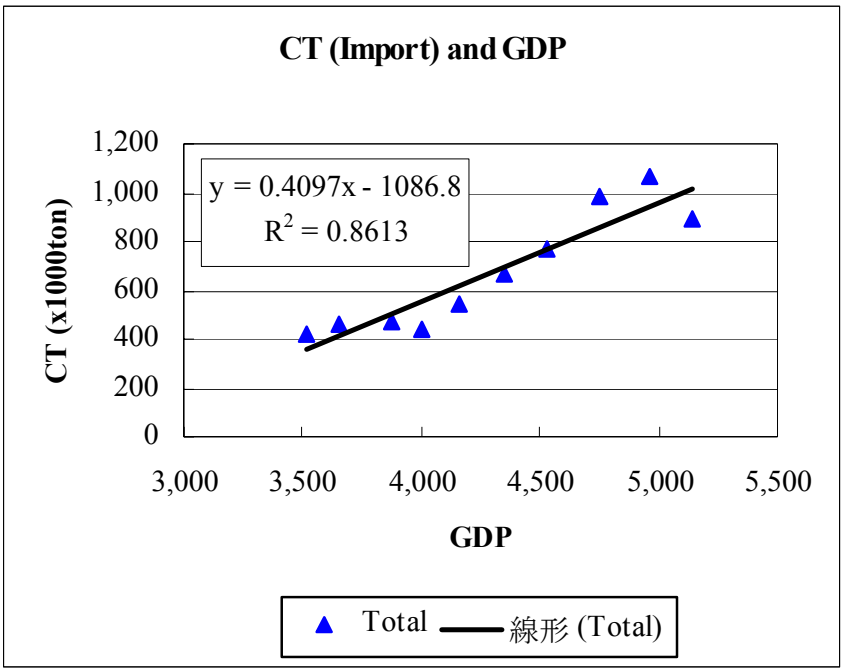
(2) Import CT

The correlation equation between CT (Import) and GDP is expressed as follows.

$$Y = 0.4097X - 1086.8 \quad (R^2=0.8613)$$

Where, Y: Import volume of container cargo (1000 MT)
X: GDP at 1993 constant price (Cedi Billion)

Figure 10.4.8 Correlation between CT (Import) and GDP



The results of forecast are shown in the table below. As for the future import, we assume the future shares as 80 % and 20 % in 2010, and 70% and 30% in 2020 by each port.

Table 10.4.54 Demand Forecast of Container Cargo (Import)

(Unit: 1000MT)

Commodities	Import/Export	2000	2010	2020
CT Total	Import	894	2,344	6,319
CT in Tema	Import	833	1,875	4,423
CT in Takoradi	Import	61	469	1,896

(3) Export GC

Here, GC is defined as the cargoes other than the main commodities consisting of cars, others, VALCO, and vehicles. Past performance of export GC is fluctuated largely as shown in the following table.

Table 10.4.55 Yearly Export Volume of General Cargo

(Unit: MT)

Year	1991	1992*	1993*	1994	1995	1996	1997	1998	1999	2000
Ex. Vol.	14,740	154,913	179,929	65,370	26,860	18,602	42,718	35,697	52,757	10,062

* In 1992 and 1993, aluminium export volume were added in above figures.

We assume the average growth rates as 5.0% from 2000 to 2010 and 8.0% from 2010 to 2020 respectively. As for the future import, we assume the on-going shares as 75 % and 25 % by each port.

Table 10.4.56 Demand Forecast of General Cargo (Export)

(Unit: MT)

Commodities	Import/Export	2000	2010	2020
GC Total	Export	10,062	16,390	35,385
GC in Tema	Export	7,820	12,292	26,539
GC in Takoradi	Export	2,242	4,098	8,846

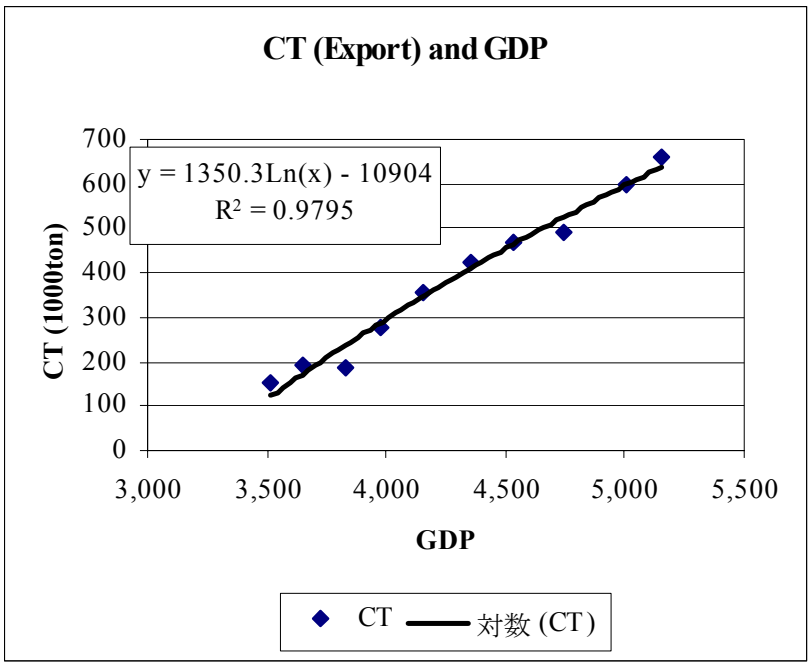
(4) Export CT

The correlation equation between CT (Export) and GDP is expressed as follows.

$$Y = 1350.3L(X) - 10904 \quad (R^2=0.9795)$$

Where, Y: Export volume of container cargo (1000 MT)
X: GDP at 1993 constant price (Cedi Billion)

Figure 10.4.9 Correlation between CT (Export) and GDP



The results of forecast are shown in the table below. As for the future export, we assume the on-going shares as 60 % and 40 % by each port.

Table 10.4.57 Demand Forecast of Container Cargo (Export)

(Unit: 1000MT)

Commodities	Import/Export	2000	2010	2020
CT Total	Import	661	1,297	2,336
CT in Tema	Import	382	778	1,402
CT in Takoradi	Import	279	519	934

10.5 Summary of the Demand Forecast

10.5.1 Cargo Volume by Commodity, by Handling Mode

Compared with the results of the total demand forecast, the results of commodity-wise demand forecast are a little different. However, the differences are within 10 % and the commodity-wise demand forecast seems to be fairly reasonable. Therefore, the level of future volumes obtained by the commodity-wise demand forecast is adopted for the development plans for seaports in Ghana in this study.

Total cargo volume by commodity, by handling mode is shown in Table 10.4.58, 59.

Table 10.4.58 Total Cargo Volume by Commodity, by Handling Mode (1/2)

Import

IMPORT	Code	1999			2000			2010			2020		
		Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total
ALUMINA	DB	186,972	-	186,972	301,755	-	301,755	384,950	-	384,950	800,645	-	800,645
CEMENT	DB	6,615	-	6,615	-	-	-	5,000	-	5,000	5,000	-	5,000
CLINKER	DB	985,067	737,652	1,722,719	972,772	755,525	1,728,297	1,262,240	991,760	2,254,000	1,855,840	1,458,160	3,314,000
COKE	DB	76,871	-	76,871	73,409	-	73,409	93,648	-	93,648	194,776	-	194,776
GRAIN (CORN)	DB	-	-	-	8,233	-	8,233	14,400	-	14,400	12,407	-	12,407
GYPSUM	DB	48,049	-	48,049	88,000	50,384	138,384	63,728	50,072	113,800	92,932	73,018	165,950
OTHER	DB	55,738	-	55,738	52,897	32,926	85,823	63,728	50,072	113,800	92,932	73,018	165,950
PITCH	DB	12,089	-	12,089	16,036	-	16,036	20,450	-	20,450	42,532	-	42,532
WHEAT	DB	189,224	89,120	278,344	139,455	111,145	250,600	249,603	166,626	416,229	329,238	219,782	549,020
Sub-Total	DB	1,560,625	826,772	2,387,397	1,652,557	949,980	2,602,537	2,157,747	1,258,530	3,416,277	3,426,302	1,823,978	5,250,280
CHEMICALS (LEVER)	LB	8,725	-	8,725	3,315	-	3,315	5,000	-	5,000	5,000	-	5,000
CRUDE OIL	LB	1,101,503	-	1,101,503	1,000,000	-	1,000,000	2,575,500	-	2,575,500	4,357,500	-	4,357,500
PETROL PRODUCTS	LB	923,207	130,069	1,053,276	850,000	138,000	988,000	858,500	224,787	1,083,287	1,452,500	366,154	1,818,654
Sub-Total	LB	2,033,435	130,069	2,163,504	1,853,315	138,000	1,991,315	3,439,000	224,787	3,663,787	5,815,000	366,154	6,181,154
CEMENT	BC	1,001	-	1,001	1,333	1,200	2,533	3,285	1,750	5,035	2,817	1,250	4,067
FERTILIZER	BC	21,726	6,356	28,082	59,609	5,725	65,334	24,590	16,389	40,979	28,630	19,069	47,698
GRAIN (CORN)	BC	4,225	-	4,225	-	-	-	5,812	1,885	7,698	4,403	4,507	8,910
OTHER GRAIN	BC	14,125	-	14,125	10,823	-	10,823	7,123	1,257	8,380	4,507	3,005	7,512
RICE	BC	277,609	5,488	283,097	261,447	-	261,447	100,806	17,775	118,581	66,009	43,765	109,773
SUGAR	BC	212,806	-	212,806	202,660	-	202,660	69,318	12,193	81,511	51,919	33,954	85,873
WHEAT	BC	1,986	-	1,986	1,680	-	1,680	1,033	589	1,622	1,085	555	1,640
Sub-Total	BC	533,478	11,844	545,322	537,552	6,925	544,477	211,967	51,839	263,805	159,370	106,104	265,474
CARS	GC	20,445	688	21,133	14,920	407	15,327	37,076	5,830	42,906	56,754	19,782	76,535
CHEMICALS	GC	24,839	34,884	59,723	15,828	19,862	35,690	112,949	82,112	195,061	184,257	240,199	424,456
LIME PRODUCTS	GC	-	53,656	53,656	-	-	-	-	-	-	-	-	-
MACH/EQUIPM.	GC	8,083	1,327	9,410	10,885	1,766	12,651	238,931	42,973	281,904	398,439	126,223	524,662
OTHER	GC	37,121	21,675	58,796	13,550	2,747	16,297	270,596	38,136	308,732	450,776	112,784	563,560
PAPER REELS	GC	15,930	50	15,980	27,656	239	27,895	37,056	14,643	51,699	51,835	47,744	99,579
PLATES	GC	31,980	867	32,847	27,317	1,627	28,944	39,578	7,653	47,231	56,216	27,496	83,712
RODS/PIPES	GC	68,533	2,306	70,839	55,441	352	55,793	73,169	16,639	89,808	102,034	59,001	161,034
STEEL/WIRE COILS	GC	23,939	4	23,943	18,748	-	18,748	24,850	5,636	30,487	34,684	19,980	54,664
VEHICLES	GC	26,298	688	26,986	23,050	590	23,640	52,309	8,628	60,936	79,303	29,467	108,770
VALCO (General Cargo)	GC	17,076	-	17,076	27,740	-	27,740	12,386	-	12,386	18,401	-	18,401
Sub-Total	GC	274,244	116,145	390,389	235,135	27,590	262,725	898,900	222,250	1,121,150	1,432,697	682,675	2,115,372

Table 10.4.58 Total Cargo Volume by Commodity, by Handling Mode (2/2)

IMPORT	Code	1999			2000			2010			2020		
		Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total
CEMENT	CT	741	-	741	616	-	616	6,101	3,250	9,351	8,452	3,750	12,202
FERTILIZER	CT	42	-	42	35	-	35	45,667	30,437	76,104	85,889	57,206	143,095
GRAIN (CORN)	CT	1,179	-	1,179	981	-	981	10,794	3,502	14,295	13,208	13,522	26,730
OTHER GRAIN	CT	-	-	-	-	-	-	13,229	2,335	15,564	13,522	9,014	22,536
RICE	CT	574	-	574	477	-	477	187,211	33,010	220,221	198,026	131,294	329,320
SUGAR	CT	1,565	-	1,565	1,302	-	1,302	128,733	22,645	151,377	155,756	101,863	257,619
WHEAT	CT	230	-	230	191	-	191	1,918	1,093	3,012	3,256	1,664	4,919
CARS	CT	31,004	698	31,702	25,793	610	26,403	68,855	10,827	79,682	170,261	59,345	229,606
CHEMICALS	CT	145,285	32,850	178,135	120,866	28,730	149,596	209,763	152,494	362,257	552,771	720,597	1,273,368
LIME PRODUCTS	CT	-	-	-	-	-	-	-	-	-	-	-	-
MACH/EQUIPM.	CT	346,110	16,884	362,994	287,936	14,766	302,702	443,728	79,808	523,536	1,195,318	378,668	1,573,985
OTHER	CT	389,883	14,522	404,405	324,351	12,701	337,052	502,536	70,824	573,360	1,352,327	338,353	1,690,680
PAPER REELS	CT	9,118	2,916	12,033	7,585	2,550	10,135	68,818	27,194	96,012	155,504	143,233	298,736
PLATES	CT	13,551	-	13,551	11,273	-	11,273	73,503	14,212	87,715	168,648	82,488	251,136
RODS/PIPES	CT	16,576	468	17,045	13,790	410	14,200	135,886	30,901	166,787	306,101	177,002	483,103
STEEL/WIRE COILS	CT	5,769	163	5,931	4,799	142	4,941	46,150	10,468	56,618	104,052	59,941	163,992
VEHICLES	CT	40,309	918	41,227	33,534	803	34,337	97,145	16,023	113,167	237,910	88,400	326,310
VALCO (General Cargo)	CT	-	-	-	-	-	-	23,002	-	23,002	55,202	-	55,202
TEU NETWEIGHT	CT	1,001,934	69,419	1,071,353	833,529	60,712	894,241	2,063,039	509,022	2,572,060	4,776,202	2,366,337	7,142,539
TOTAL IMPORTS		**5,403,716**	**1,154,249**	**6,557,965**	**5,112,088**	**1,183,207**	**6,295,295**	**8,770,653**	**2,266,427**	**11,037,080**	**15,609,571**	**5,345,248**	**20,954,819**
Bulk		3,594,060	956,841	4,550,901	3,505,872	1,087,980	4,593,852	5,596,747	1,483,317	7,080,064	9,241,302	2,190,132	11,431,434
Liner		1,809,656	197,408	2,007,064	1,606,216	95,227	1,701,443	3,173,906	783,110	3,957,016	6,368,269	3,155,116	9,523,385
Containerizable Cargo		1,809,656	197,408	2,007,064	1,606,216	95,227	1,701,443	3,173,906	783,110	3,957,016	6,368,269	3,155,116	9,523,385
Container Cargo		1,001,934	69,419	1,071,353	833,529	60,712	894,241	2,063,039	509,022	2,572,060	4,776,202	2,366,337	7,142,539
Containerization (%)		55	35	53	52	64	53	65	65	65	75	75	75

Table 10.4.59 Total Cargo Volume by Commodity, by Handling Mode

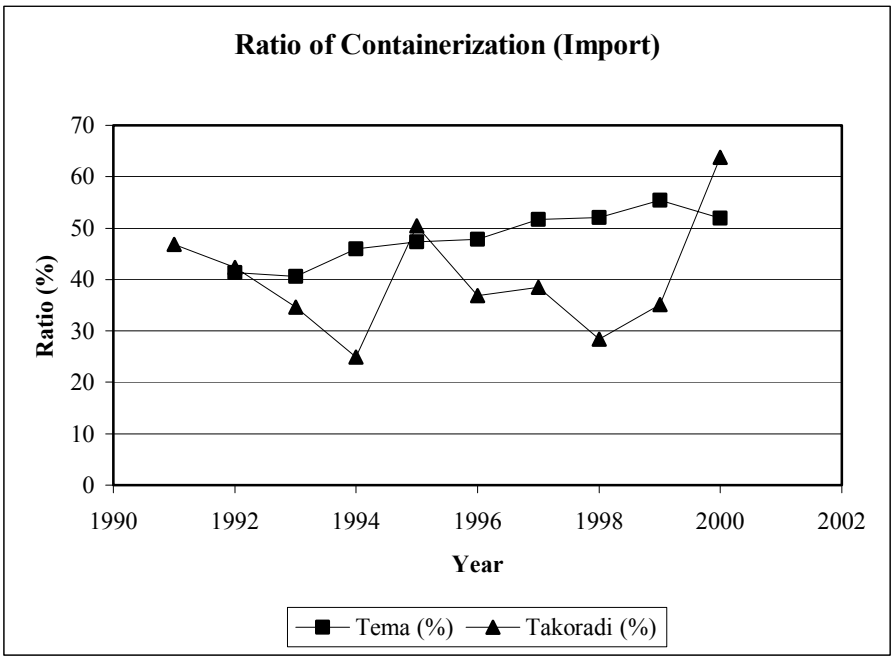
Export

EXPORT	Code	1999			2000			2010			2020		
		Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total	Tema	Takoradi	Total
BAUXITE	DB	-	355,255	355,255	-	439,813	439,813	-	1,000,000	1,000,000	-	1,500,000	1,500,000
MANGANESE	DB	-	656,684	656,684	-	935,608	935,608	-	1,000,000	1,000,000	-	1,000,000	1,000,000
OTHER	DB	-	-	-	-	28,335	28,335	-	-	-	-	-	-
Sub-Total	DB	-	1,011,939	1,011,939	-	1,403,756	1,403,756	-	2,000,000	2,000,000	-	2,500,000	2,500,000
PETROL PRODUCTS	LB	372,427	-	372,427	246,584	-	246,584	401,659	-	401,659	867,152	-	867,152
OTHER	LB	-	2,744	2,744	-	-	-	-	-	-	-	-	-
Sub-Total	LB	372,427	2,744	375,171	246,584	-	246,584	401,659	-	401,659	867,152	-	867,152
COCOA BEANS	BC	13,509	57,871	71,380	75,988	75,018	151,006	15,576	18,172	33,749	13,947	23,246	37,193
N.T. AGRO-PRODUCTS	BC	37,296	9,261	46,557	28,382	9,000	37,382	11,314	3,771	15,086	12,213	5,816	18,029
Sub-Total	BC	50,805	67,132	117,937	104,370	84,018	188,388	26,891	21,944	48,834	26,161	29,062	55,222
CARS	GC	20	4	24	16	2	18	589	3	592	534	4	538
OTHER	GC	34,098	12,396	46,494	6,894	2,150	9,044	52,818	9,813	62,631	47,833	12,639	60,472
VALCO	GC	18,449	-	18,449	-	-	-	-	-	-	-	-	-
VEHICLES	GC	190	220	410	910	90	1,000	5,310	29	5,338	4,815	44	4,859
ALUMINIUM	GC	110,128	-	110,128	132,968	-	132,968	28,000	-	28,000	29,118	-	29,118
COCOA PRODUCTS	GC	1,210	-	1,210	-	20,516	20,516	14,361	4,787	19,148	15,502	7,382	22,884
N.T. AGRO-PRODUCTS	GC	16,027	1,531	17,558	14,889	649	15,538	5,657	1,886	7,543	6,107	2,908	9,015
WOOD PRODUCTS	GC	434	133,565	133,999	553	102,512	103,065	-	21,000	21,000	-	15,000	15,000
Sub-Total	GC	180,556	147,716	328,272	156,230	125,919	282,149	106,734	37,517	144,251	103,908	37,977	141,885
COCOA BEANS	CT	426	47,676	48,102	451	55,632	56,083	95,683	241,434	337,116	185,302	441,668	626,970
N.T. AGRO-PRODUCTS	CT	42,575	5,809	48,384	45,091	6,778	51,869	69,502	50,106	119,607	162,260	110,500	272,760
CARS	CT	1,895	-	1,895	2,007	-	2,007	3,617	38	3,655	7,089	85	7,173
OTHER	CT	212,129	6,412	218,541	224,666	7,482	232,147	324,450	130,373	454,823	635,495	240,134	875,629
VALCO	CT	-	-	-	-	-	-	-	-	-	-	-	-
VEHICLES	CT	17,030	-	17,030	18,036	-	18,036	32,617	381	32,999	63,971	841	64,812
ALUMINIUM	CT	22,480	-	22,480	23,808	-	23,808	172,000	-	172,000	386,855	-	386,855
COCOA PRODUCTS	CT	42,937	11,311	54,248	45,474	13,198	58,672	88,216	63,597	151,813	205,953	140,255	346,208
N.T. AGRO-PRODUCTS	CT	21,564	2,861	24,425	22,839	3,338	26,176	34,750	25,052	59,802	81,130	55,251	136,381
WOOD PRODUCTS	CT	-	164,861	164,861	-	192,372	192,372	-	279,000	279,000	-	285,000	285,000
TEU NETWEIGHT	CT	361,035	238,929	599,964	382,371	278,800	661,171	820,835	789,981	1,610,816	1,728,055	1,273,734	3,001,789
TOTAL EXPORTS		**964,823**	**1,468,460**	**2,433,283**	**889,555**	**1,892,493**	**2,782,048**	**1,356,118**	**2,849,442**	**4,205,560**	**2,725,276**	**3,840,773**	**6,566,049**
Bulk		372,427	1,014,683	1,387,110	246,584	1,403,756	1,650,340	401,659	2,000,000	2,401,659	867,152	2,500,000	3,367,152
Liner		592,396	453,777	1,046,173	642,971	488,737	1,131,708	954,459	849,442	1,803,901	1,858,124	1,340,773	3,198,897
Containerizable Cargo		592,396	453,777	1,046,173	642,971	488,737	1,131,708	954,459	849,442	1,803,901	1,858,124	1,340,773	3,198,897
Container Cargo		361,035	238,929	599,964	382,371	278,800	661,171	820,835	789,981	1,610,816	1,728,055	1,273,734	3,001,789
Containerization (%)		61	53	57	59	57	58	86	93	89	93	95	94

10.5.2 Containerization

(1) Import Container

Figure 10.4.10 Performance of Containerization



Performances of containerization in 1990s are shown in Figure 10.4.12. The trend of Takoradi is fluctuated sharply. However, the ratios of containerization for both ports during the planning period are expressed by the following equations.

$$Y = 1/[1+\exp\{-(-94.5240 + 0.0473t)\}]$$

Where, Y: Ratio of containerization (%)
t : Year

Following table shows the forecast of containerization at each port.

Table 10.4.60 Containerization Rate (Import)

(Unit: %)

Port	2000	2010	2020
Tema	52	65	75
Takoradi	-	65	75

(2) Export Container

Performances of containerization in 1990s are shown in Figure 10.4.13. The trends of both ports are similar. The ratios of containerization during the planning period are expected by the following equations. Expected containerization rates in the future are shown in the Table 10.4.61.

For Tema:

$$Y = 1/[1+\exp\{-(-325.2327 + 0.1630t)\}]$$

For Takoradi:

$$Y = 1/[1+\exp\{-(-663.6484 + 0.3320t)\}]$$

Where, Y: Ratio of containerization (%)
t : Year

Figure 10.4.11 Performance of Containerization

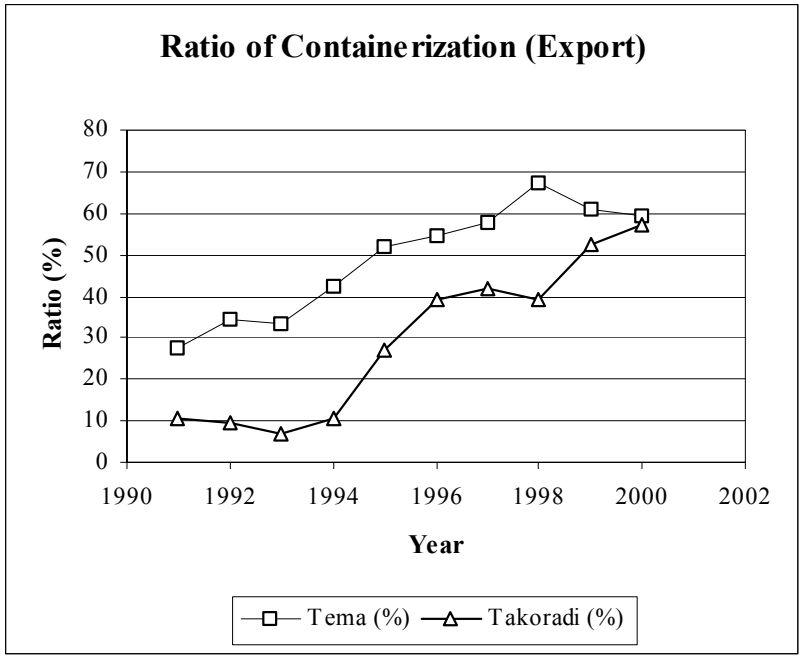


Table 10.4.61 Containerization Rate (Export)

(Unit: %)

Port	2000	2010	2020
Tema	76	86	93
Takoradi	60	93	95

(3) Future Container Cargo in Ghana seaports.

TEUs of future container cargo are summarized in the Table 10.4.63. Around 1.46 million TEUs are expected at 2020.

Table 10.4.62 Indices on the Containerization

Import Container

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo (MT)												
Tema	749,819	1,067,356	1,100,561	881,479	1,088,382	1,306,120	1,358,700	1,726,564	1,809,656	1,606,216	3,173,906	6,368,269
BC	127,977	374,684	400,012	281,146	326,934	391,857	368,394	580,193	533,478	537,552	211,967	159,370
GC	224,179	250,801	253,581	194,693	246,648	288,910	288,361	246,429	274,244	235,135	898,900	1,432,697
CT	397,663	441,871	446,968	405,640	514,800	625,353	701,945	899,942	1,001,934	833,529	2,063,039	4,776,202
Takoradi	43,992	57,688	75,949	127,891	66,413	100,481	178,791	280,843	197,408	95,227	783,110	3,155,116
BC	2,514	9,910	5,337	6,702	11,132	10,269	2,950	44,180	11,844	6,925	51,839	106,104
GC	20,868	23,370	44,333	89,268	21,756	53,196	107,055	156,932	116,145	27,590	222,250	682,675
CT	20,610	24,408	26,279	31,921	33,525	37,016	68,786	79,731	69,419	60,712	509,022	2,366,337
Container Cargo (MT)												
Tema	397,663	441,871	446,968	405,640	514,800	625,353	701,945	899,942	1,001,934	833,529	2,063,039	4,776,202
Takoradi	20,610	24,408	26,279	31,921	33,525	37,016	68,786	79,731	69,419	60,712	509,022	2,366,337
Containerization												
Tema (%)		41	41	46	47	48	52	52	55	52	65	75
TEU. Loaded	33,472	39,182	43,832	39,823	49,918	60,695	68,359	81,104	99,089	76,024	192,807	446,374
TEU. Empty	1,599	3,251	4,351	5,224	4,245	6,316	5,870	6,185	5,739	5,837	9,640	22,319
Ave. Cargo Volume in TEU	11.9	11.3	10.2	10.2	10.3	10.3	10.3	11.1	10.1	11.0	10.7	10.7
Ratio of Empty (%)	5	8	10	13	9	10	9	8	6	8	5	5
Takoradi (%)	47	42	35	25	50	37	38	28	35	64	65	75
TEU. Loaded	1,828	2,003	2,354	2,703	2,781	3,450	5,328	5,994	5,101	4,501	41,384	192,385
TEU. Empty	2,594	2,123	3,096	5,649	5,744	5,480	6,586	6,643	10,922	10,415	25,510	9,619
Ave. Cargo Volume in TEU	11.3	12.2	11.2	11.8	12.1	10.7	12.9	13.3	13.6	13.5	12.3	12.3
Ratio of Empty (%)	142	106	132	209	207	159	124	111	214	231	62	5

Export Container

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2010	2020
Containerizable Cargo (MT)												
Tema	380,105	446,242	411,102	443,658	426,183	502,115	504,922	477,608	592,396	642,971	954,459	1,858,124
BC	84,092	62,196	84,664	84,491	44,751	69,501	57,558	58,405	50,805	104,370	26,891	26,161
GC	192,109	231,421	189,302	170,134	160,288	159,817	154,772	98,366	180,556	156,230	106,734	103,908
CT	103,904	152,625	137,136	189,033	221,144	272,797	292,592	320,837	361,035	382,371	820,835	1,728,055
Takoradi	445,842	408,844	725,123	804,133	496,968	388,304	418,950	437,807	453,777	488,737	849,442	1,340,773
BC	106,772	87,714	113,509	73,576	59,446	85,381	74,092	107,958	67,132	84,018	21,944	29,062
GC	292,888	282,815	562,676	644,045	303,550	151,164	168,784	157,440	147,716	125,919	37,517	37,977
CT	46,182	38,315	48,938	86,512	133,972	151,759	176,074	172,409	238,929	278,800	789,981	1,273,734
Container Cargo (MT)												
Tema	103,904	152,625	137,136	189,033	221,144	272,797	292,592	320,837	361,035	382,371	820,835	1,728,055
Takoradi	46,182	38,315	48,938	86,512	133,972	151,759	176,074	172,409	238,929	278,800	789,981	1,273,734
Containerization												
Tema (%)	27	34	33	43	52	54	58	67	61	59	86	93
TEU. Loaded	8,187	12,138	11,222	15,959	18,193	22,550	24,533	27,192	30,836	30,389	67,282	141,644
TEU. Empty	27,665	30,558	33,818	27,529	30,453	36,081	41,498	55,206	62,236	49,393	146,000	343,850
Ave. Cargo Volume in TEU	12.7	12.6	12.2	11.8	12.2	12.1	11.9	11.8	11.7	12.6	12.2	12.2
Ratio of Empty (%)	338	252	301	172	167	160	169	203	202	163	217	243
Takoradi (%)	10	9	7	11	27	39	42	39	53	57	93	95
TEU. Loaded	3,634	3,074	3,859	6,703	10,411	12,277	14,579	14,624	19,986	23,368	63,708	102,721
TEU. Empty	1,056	942	1,415	1,681	1,547	1,814	2,650	2,080	1,834	1,682	4,390	101,150
Ave. Cargo Volume in TEU	12.7	12.5	12.7	12.9	12.9	12.4	12.1	11.8	12.0	11.9	12.4	12.4
Ratio of Empty (%)	29	31	37	25	15	15	18	14	9	7	7	98

Table 10.4.63 Future Container Cargo in Ghana Seaports - TEUs

Tema and Takoradi Port

Year	Import			Export			Transit		Transshipment		Total	
	Loaded	Empty	Total	Loaded	Empty	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty
2000	80,525	16,252	96,777	53,757	51,075	104,832	2,571	77	1,718	140	138,571	67,544
2010	234,191	35,150	269,341	130,990	150,390	281,380	11,348	340	54,397	4,352	430,926	190,232
2020	638,759	31,938	670,697	244,364	445,000	689,364	17,597	528	73,104	5,848	973,824	483,314

Tema Port

Year	Import			Export			Transit		Transshipment		Total	
	Loaded	Empty	Total	Loaded	Empty	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty
2000	76,024	5,837	81,861	30,389	49,393	79,782	2,571	77	1,718	140	110,702	55,447
2010	192,807	9,640	202,447	67,282	146,000	213,282	10,213	306	54,397	4,352	324,699	160,298
2020	446,374	22,319	468,693	141,644	343,850	485,494	15,837	475	73,104	5,848	676,959	372,492

Takoradi Port

Year	Import			Export			Transit		Transshipment		Total	
	Loaded	Empty	Total	Loaded	Empty	Total	Loaded	Empty	Loaded	Empty	Loaded	Empty
2000	4,501	10,415	14,916	23,368	1,682	25,050	0	0	0	0	27,869	12,097
2010	41,384	25,510	66,894	63,708	4,390	68,098	1,135	34	0	0	106,227	29,934
2020	192,385	9,619	202,004	102,721	101,150	203,871	1,760	53	0	0	296,866	110,822

Chapter 11 Port Development Principle

11.1 Viability of a New Port Development

11.1.1 Background of Necessity of a New Port Development

In the Final Report on the Special Assistance for Project Sustainability (SAPS) for Ports Rehabilitation Project[1], the SAPS Team recommended that a new master plan study be conducted in order to confirm that dredging the basin of the existing port is the best option among other alternative plans to provide deep water berthing facilities for container and bulk carriers. The Team also indicated the following three possible concepts for the long-term development of the ports: (1) alternative layout different from the master plan proposed by European consultant in 1994[2], (2) expansion of Tema Port toward offshore and (3) a third port. Regarding (3), a new port would be feasible if the dredging cost for securing deep berthing facilities were high. But there was no suggestion on possible sites.

In this chapter, the viability of a new port development is examined.

11.1.2 Possible Sites for a New Port

(1) Requirements of a new port

① Deep berthing facilities for container and/or bulk carriers
② Close proximity to origins and destinations of cargoes in the case of container terminals
③ Berths that can be connected with production sites or storage areas by economical transport means such as belt conveyers and railways in the case of bulk terminals
④ Well linked with inland transportation modes
⑤ Accumulation of supporting services for maritime transport
⑥ No serious environmental problems

(2) Possible sites

Possible sites for a new port are selected by considering the following points.

① Existence of calm water area such as coves
② Sites close to deep water areas (more than 12m deep under sea level)
③ Existence of enough space for development
④ Sites near to major consumption and production areas
⑤ Sites linked well with inland transportation facilities

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[1] Final Report on The Special Assistance for Project Sustainability (SAPS) for Ports Rehabilitation Project in Republic of Ghana, SAPS Team for The Overseas Economic Cooperation Fund (OECF), February 1998

[2] Final Master Plan Report of Ports Rehabilitation Project Phase II, Portconsult etc., December 1994

As for ①, there are no such area along the Ghanaian coast. However, calm water areas like the Volta estuary are worth investigation. Cape areas such as Apam and Legu are also worth investigating because it may be secure calm water areas in these areas more easily than in straight coastal areas. Good examples are Takoradi Port and Sekondi Port. Apam and Legu are located 60 km and 70 km west of Accra respectively.

As for ②, good examples are Tema and Takoradi. Legu and Cape Three Points are nominated as they satisfy this criterion.

As for ③, although there are several potential sites. Winneba is nominated because it also satisfies criteria ④ and ⑤ to some extent.

From the above, Ada, Winneba, Apam, Dago and Cape Three Points could be considered as possible sites for a new port (Fig. 11.1.1 shows the location of theses sites). However, since Cape Three Points is a steep area, the development space is limited, and moreover it is situated far from main consumption and production areas of cargoes, this site is omitted. So, Cape Three Points are omitted. **Ada, Winneba**, **Apam** and **Dago** from the west are investigated more deeply as possible sites for a new port.

(3) Evaluation

Each site is evaluated by criteria listed in (1) and other more specific items. **Ada** is located 110 km east of Accra and is linked with Tema by a two-lane road. Road condition is not so bad. However, Ada has several problems. First, the estuary of the Volta River is very shallow. And the coastal area is prone to erosion and very vulnerable to topographical change[3]. A new port will have to be developed on the west bank of the river because otherwise a bridge would be needed. On the west bank, the hotels and houses which currently occupy this area would have to be removed. In addition, the west bank of the Volta River is inside the area designated as waterfowl habitats by the Convention of International Importance Especially as Water Fowl Habitat (Ramsar Convention in short). Moreover, it is very difficult for vessels to enter the river, because the shallow area spreads to the front of the river mouth.

Winneba is located 50 km west of Accra and 80 km east of Cape Coast, and is 15 km from the Accra – Cape Coast Road. The eastern part of Winneba City, which is on the cape, is a huge undeveloped area. Outcrop of rocks on the beach suggest the seabed is rock. And there is no industry that supports maritime transport activity at present. The slope of sea bottom is about 0.4% (the point with the depth of 10m is 2.5 km from the coastal line) thus necessitating a huge amount of dredging works. Breakwater is also necessary for a new port development.

Apam is located 10 km west of Winneba and 7 km from the main road. There is a large fishing village, which is on the cape and is the center of fishing activities in the sub-region. Salt ponds spread across the western part of the village. Sea area is more sheltered by the cape than Winneba but the slope of sea bottom is about 0.7% (the point with the depth of 10m is 1.5 km from the coastal line). Breakwater is indispensable for a new port development. There is a small lagoon.

[3] Annual Report 1999, Water Research Institute

Dago is located 20 km west of Winneba and 8.5 km from the main road. This site also has the cape. There is a small lagoon in the west of Dago village. The problem of this site is limited space for development because the land is very steep. Another problem concerns environment. The field reconnaissance survey indicates the coastal area of the site has plenty of littoral drift. And judging from sand size, beach slope, vegetation and distance between shore line and vegetation site, these sandy shores would also seem to be an ideal nesting ground for sea turtles, which is listed as an endangered species. The slope of sea bottom is almost the same as Apam but it is steeper beyond the point with the depth of more than 10m. Breakwater is indispensable for a new port development. The urban function is smaller than Winneba.

Summary of evaluation is shown in Table 11.1.1. Winneba is the most favorable for a new port construction among 4 possible sites except the construction cost. The construction cost of a new port is roughly estimated. The construction cost consists of breakwater construction, dredging works and reclamation works. As for Ada, breakwater is not necessary and dredging works is cheaper than other sites because seabed is sand. However, a huge amount of maintenance dredging would be necessitated.

Table 11.1.1 Comparison of Possible Sites for a New Port Construction

Evaluation item	Ada	Winneba	Apam	Dago
Development space	1	3	3	2
Proximity to deep sea area	1	1	1	2
Proximity to OD of cargoes	1	2	2	1
Linkage to inland transport modes	2	1	2	2
Accumulation of supporting services	1	2	1	1
Environmental aspects	1	2	2	1
Natural conditions	1	2	2	1
Cost Index	1.0	1.5	1.6	1.3

Note: 3: Good, 2: Fair, 1: Poor

Cost consists of breakwater construction, capital dredging and reclamation

11.1.3 Comparison of a New Port and the Existing Port Expansion

The expansion of existing ports is more realistic than the development of a new port. This is because existing ports have enough space to handle future cargo forecasted up to the year 2020 and any evaluation item is favorable to existing ports. This means there is not any site that has topographical advantages to compensate for the reduced accessibility to major industrial and urban areas and the lack of facilities and services supporting port activity.

Even the construction cost is also favorable to existing ports. According to the very rough cost estimation, the cost of expansion of Tema Port is almost half to three quarters of that of Ada case, for example. And adding inland transportation cost, a new port development costs more.

There is another reason that supports expansion of existing ports. Competition with foreign ports has become more and more severe and dispersion of port activities would weaken Ghanaian ports' competitiveness especially in the case of container ports.

A new port development would be worth considering when development projects in the coastal area are planed such as large scale industrial area developments and construction of thermal power plants.

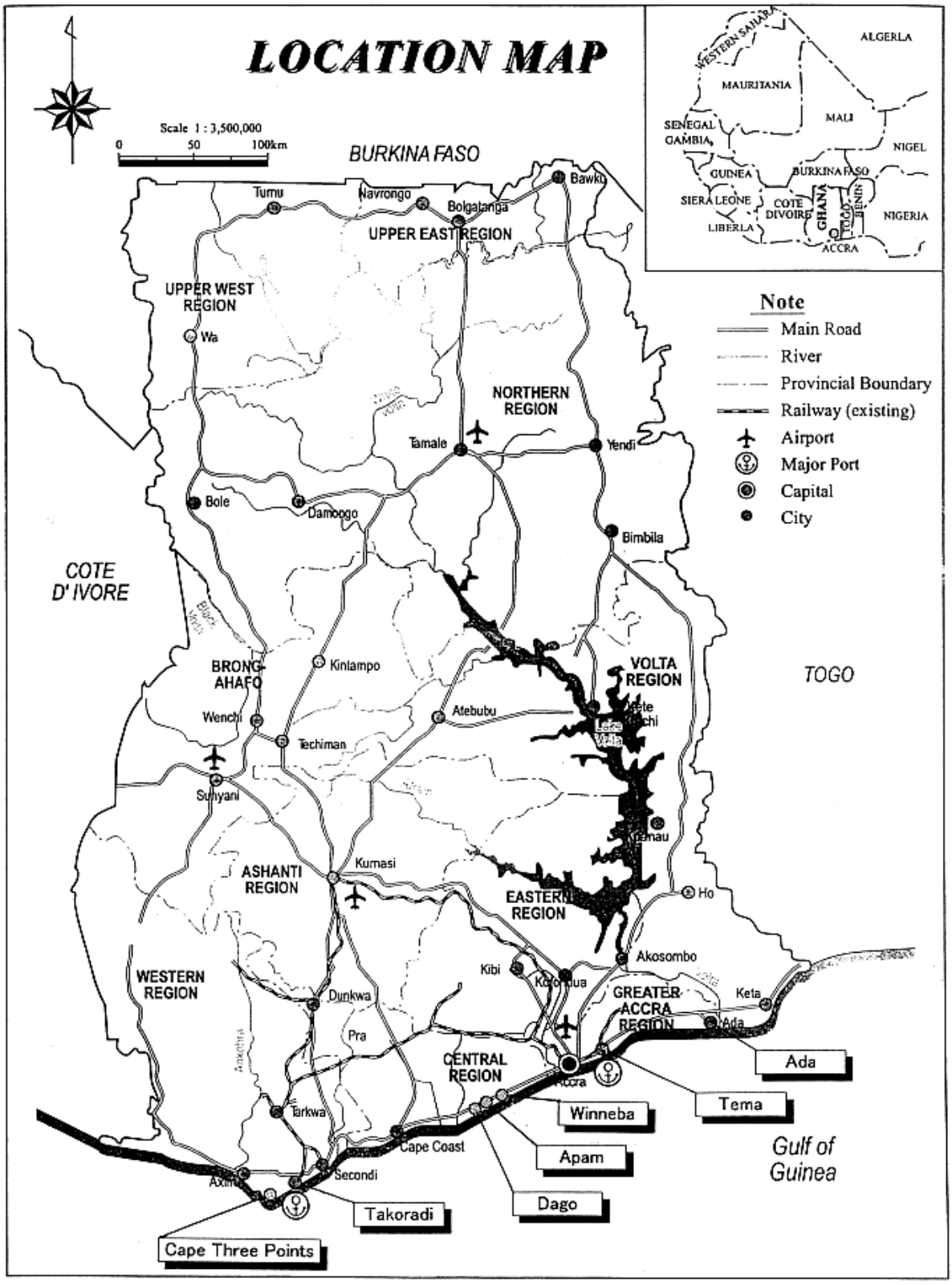

Fig.11.1.1 Location of Possible Sites

11.2 Ghana Sea Ports in West Africa

In this chapter the role and function of Ghana Sea Ports as container ports are described.

11.2.1 Present Situation of West African Ports

(1) Container Traffic and Terminal Facilities

Table 11.2.1 shows the present situation of container terminals facilities in West Africa. In Abidjan to Douala range, Abidjan Port is the largest container port in terms of container traffic, followed by Tema Port and Douala Port. Lagos Port handled 110 thousand TEUs in 1996 but traffic there has decreased because of political and economic instability. Recent figures for Lagos Port are not available.

Abidjan Port and Lagos Port have quayside gantry cranes. Abidjan, Lome, Cotonou and Lagos Ports have berths with depth of more than 10 m. Abidjan Port has a plan to deepen the entrance channel (at present 10.5m in depth) and construct a new terminal with a length of 600m and install 4 gantry cranes. In Tema Port dredging work of the entrance channel and basin is now in progress and quay 2 will be extended by 200 m.

Abidjian Port and Lagos Port have quayside gantry cranes and Duala Port is now installing 2 gantry cranes. However, according to the information of shipping companies, only one gantry crane out of three at Lagos Port is in operation because of lack of maintenance and shortage of electricity, and even the one operating crane often stops because of some troubles.

Table 11.2.1 Container Ports in West Africa

Port	Nation	Traffic ('000TEUS)	Depth (m)	Length (m)	No. of Berths	Gantry Crane	Remarks
Dakar	Senegal	124.2	8-10.5	2,562	15	0	RO/RO Berth
Abidjan	Cote d'Ivoire	468.7	11.5-12.5	800	3	3	Channel: 10.5m deep
Tema	Ghana	197.9	7.6, 9.6	183, 366	2	0	Berth No.11, No.1/2
Takoradi	Ghana	37.8	8.0, 9.5	153, 225	2	0	Berth No.2, No.5/6
Lome	Togo	50.0	11.0	440	2	0	RO/RO Berth
Cotonou	Benin	59.6	11.0	220	1	0	
Lagos	Nigeria	3.2	11.5	1,005		3	
Douala	Cameroon	120.0	8.5	500	2	(2)	Channel: 5.1m deep
Cape Town	South Africa	325.3	14.1	1,371	5	3	
Durban	South Africa	985.9	12.8	1,583	6	12	

Note: Container traffic figures are from 1998 except Tema and Takoradi (1999) and Lagos (1997).

Source: Containerization International Year Book 2000, Lloyd's Ports in the World 2000, Shipping Statistics Yearbook 1999 and others

(2) Shipping Routes

Table 11.2.2 shows the shipping loops for regular container, RORO and multipurpose vessels between West Africa and other regions operated by Delmas. Every loop calls at Abidjan Port while almost every loop calls at Ghanaian ports and Lagos Port (Apapa or Tin Can Island).

Table 11.2.2 Shipping Loop between West Africa and Other Regions by DELMAS

Loop	Vessel	Frequency	Abi.	Tak.	Tema	Lome	Coto.	Lag.	Dou.
West A – Europe	Container	1/7 days	○		○	○	○	○	F
West A – Europe	Container	1/11 days	○					○	
West A – Europe	RORO	1/8 days	○	○					○
West A – Europe	RORO	1/12.5 days	○	○	○			○	
West A – Asia	Multi.	1/10 days	○		○	○	○	○	○
West A – M East	Multi.	1/16 days	○	F	○	F	F	○	F

Note: ○ means vessels directly call at ports, F means feeder services

Source: Delmas

Maersk / Sealand is the largest shipping company in terms of container handling and also one of the largest shipping companies in West Africa. Container vessels of the company call at every main container port on a weekly basis in West Africa. According to the sailing schedule of the company, Abidjan has a favorable position in terms of trade with other regions. Table 11.2.3 shows the transit time difference between Abidjan Port and other West African ports to / from other regions. Abidjan Port is the first port of call in West Africa for vessels from other regions and the last port in West Africa for vessels to other regions.

Table 11.2.3 Transit Time Difference between Abidjan Port and Other West African Ports to / from Other Regions

Direction	Abidjan	Takoradi	Tema	Lome	Cotnou	Lagos	Douala
North Europe→	-	7 days	8 days	2 days	3 days	5 days	9 days
→North Europe	-	1 day	2 days	6 days	4 days	3 days	7 days
Mediterranean→	-	7 days	6 days	2 days	3 days	4 days	10 days
→Mediterranean	-	2 days	3 days	7 days	5 days	4 days	3 days
Middle East→	-	7 days	6 days	2 days	3 days	4 days	10 days
→Middle East	-	1 day	2 days	7 days	5 days	4 days	5 days
Far East→	-	7 days	6 days	2 days	3 days	4 days	10 days
→Far East	-	1 day	2 days	7 days	5 days	4 days	5 days
Americas→	-	7 days	6 days	2 days	3 days	4 days	10 days
→Americas	-	1 das	2 days	7 days	5 days	4 days	- 2 days

Note: No. of days indicates the extra days for transit compared with Abidjan Port

Source: Sailing Schedule of Maersk

(3) Port Dues and Cargo Handling Charges

Port dues of West African Ports that are chargeable to vessels have been studied and analyzed by GPHA. GPHA concluded that although there is some difficulty in comparing the port dues among the ports due to differences in port dues structure at each port, roughly speaking there is no significant difference in the level of port dues.

According to information the Study Team obtained from shipping companies and other sources, container handling charges that include stevedorage, shore handling and storage charges vary among West African ports. Stevedorage of Tema and Takoradi Ports is higher than Abidjan, Cotonou, Lome and Lagos Ports. On the other hand, shore handling and storage charges of Abidjan are highest in the region. A shipping agent representative mentioned that Tema and Takoradi Ports have charging systems favorable to consignees while Abidjan Port has a charging system favorable to shipping companies.

11.2.2 Future Positioning of Ghana Sea Ports in West Africa

At present, the Hub-and-Spoke system in container transportation does not exist in the West African region. Although there are conflictive opinions[4], in the near future this system might be introduced here as in other regions in the world. And some of container cargoes will be transshipped at major container ports in the region. As no single container port in the region has an absolute geographical advantage, each port has the possibility to become a hub port in the region. Accordingly each government has made efforts to strengthen their ports' competitiveness and tried to make their port a gateway in the region.

As explained above, at this moment Abidjan Port is the largest container port in West Africa and has a good reputation for cargo handling. Considering the economic scale of countries, Lagos Port (see Table 11.3.4) followed by Cote d'ivore and Cameroon would seem to have advantages. However, Lagos Port has suffered due to the political and economical instability in Nigeria. And Douala Port is located 24 km up stream of the bank on the River Wouri where the depth of the channel is only 5.1 m.

Ghana Sea Ports have several advantages, the most of important of which is political stability. The peaceful transition of political power in December, 2000 highlighted this fact to the world. Another important advantage is the Ghanaian Government's policy and continuing efforts to make Ghana Sea Ports a Gateway of the West African region.

It is clear that the strongest competitor of Ghana Sea Ports in container transshipment is Abidjan Port. Although Ghana Sea Ports should strive to become the leading container ports in the region and gateways to the landlocked countries, the Study Team thinks that over-zealous competition such as dumping of port charges for sake of acquiring transshipment container impedes sound port development. The purpose of Ghana Sea Port Development is not to make Ghana Sea Ports the hub of West Africa but to make Ghana Sea Port the most advanced container ports in West Africa in

[4] Multiple Ports of Call versus Hub-and –Spoke, Containerized Maritime Trade between West Africa and Europe, Gylfi Palsson, Africa Region of World Bank, January 1998

terms of facilities and management to facilitate captive container cargo transportation. Hub function will come naturally.

Table 11.2.4 Socio-economic Indicators of West African Countries

	Population	Area	GDP	GDP per Capital	Exports		Imports	
	million	1000km2	US$million	US$	US$million	Index	US$million	Index
GHANA	18.9	23.9	6,989.3	370	1,823	1.0	1,510	1.0
CÔTE D'IVOIRE	15.8	32.2	10,915.8	690	2,818	1.5	4,183	2.8
TOGO	5.1	5.7	1,676.4	330	530	0.3	346	0.2
BENIN	6.3	11.3	2,397.8	380	614	0.3	400	0.3
NIGERIA	113.8	92.4	29,595.8	260	7,997	4.4	18,614	12.3
CAMEROON	15.5	47.5	10,049.0	650	1,359	0.7	1,861	1.2
BURKINA FASO	11.6	27.4	2,779.2	240	530	0.3	250	0.2
MALI	10.4	124.0	2,711.8	260	691	0.4	563	0.4
NIGER	10.0	126.7	1,992.0	200	387	0.2	281	0.2

Source: Imidas 2000

11.3 Development Principle of Ghana Sea Ports

11.3.1 Basic Recognition of Ghana Sea Ports

At the beginning of 21st century, Ghana Sea Ports have been confronted with many difficulties. Among others, the main difficulties are as follows:

- Low productivity of cargo handling compared with international standards
- Lack of deep berths and yards for cargo handling

These are well recognized by GPHA and many effective measures have already been adopted. As a result, port performance has been improving. The efforts should be highly evaluated. However, despite these efforts cargo handling productivity is still low compared with international standards and together with the lack of deep berths and the shortage of yards many vessels have to wait for berthing for many hours and stay for long periods at the ports, and cargoes also have to dwell at ports for a long while.

GPHA might be losing cargoes and shippers and shipping companies are losing their money. However, hardest hit are Ghanaian people who have to pay more to buy goods and Ghanaian industries which lose competitiveness. These two difficulties are closely related with each other. To solve these problems, fundamental countermeasures should be taken in addition to daily improvements.

There are three main reasons for these difficulties. One is that physical layouts of Ghana Sea Ports have become old-fashioned and not suitable to the recent trends and technological advancements in sea transportation such as containerization and utilization of large vessels. Tema Port and Takoradi Port were constructed in the 1960's and 1920's respectively, well before containerization reached Africa. Cargoes are still handled at berths with narrow aprons and aged sheds behind them. Now is the time to consider having dedicated container terminals and other specialized terminals for designated cargoes in order to attain high productivity of cargo handling.

Another reason is that due to the rapid increase in cargo traffic, the demands on existing port space will reach beyond the port capacity in the near future. And this situation deteriorates cargo handling conditions. According to the future demand forecast, cargo traffic of Ghana Sea Ports will reach 27.5 million tons in 2020. These figures are 3 times as much as that of the year 2000. Together with pursuing the improvement of the cargo handling system, expansion of the ports beyond the existing breakwaters should be considered carefully to meet the future demand.

The other reason is the lack of practical competition on port management and operation and vague responsibility demarcation system between the port authority and port users, especially in cargo handling activities. In this respect, the Ghanaian Government intends to transform the nature of GPHA from a service port to a landlord port and the bill to legislate this change will soon be submitted to the Parliament. Cargo handling business will be fully privatized upon passage of the bill. Some shipping companies and shippers are assisting GPHA and other stevedoring companies for cargo operation by providing their own cargo handling equipment and supervising the operation. This situation might be the phenomena of transition from a service port to a landlord

port. But this system makes the responsibility for cargo handling ambiguous and weakens the initiative of the both sides to improve operation. The new system should be introduced as soon as possible.

Although to settle these problems might necessitate enormous efforts, once Ghana Sea Ports have overcome them, Ghana Sea Ports have entered a new era and a new door to Ghana's future will have been opened.

11.3.2 General Development Guideline of Ghana Sea Ports

The volume of cargoes handled at Ghana Sea Ports is expected to increase steadily in the future; projected total volumes of cargo in the year 2020 are 27.5 million tons (3 times as much as the volume in 2000) and 1.46 million TEUs (7 times as much as the volume in 2000).

Even now there is a shortage of the required infrastructure or cargo handling machines, resulting in inefficient, costly and time consuming cargo handling operations and consequent long berth waiting times and turnaround time at Ghana Sea Ports.

Thus to resolve the present problems and meet increasing demand for handling conventional cargo and containerized cargo in the future, it is necessary to develop and modify Ghana Sea Ports into advanced ports.

(1) Objectives of Development

- Enhancing the potential of container ports and becoming leading container ports in West Africa.
- Enhancing the potential of a bulk cargo distribution base for items such as clinker, manganese, bauxite, petroleum, alumina and wheat.
- Supporting agriculture by providing necessary facilities for import of fertilizer and export of crops.
- Supporting the EPZ and industrial estates by providing necessary facilities for import of materials and export of manufactured goods
- Providing necessary facilities for transportation of food and customer goods
- Becoming the most efficient port in West Africa and customer friendly port
- Providing employment opportunities in direct port services as well as numerous ancillary services
- Securing safe navigation in ports
- Becoming environment-friendly ports

(2) Strategies to Achieve Objectives

- Development of dedicated container terminals and introduction of advanced operation system
- Development of deep berths capable to accept large vessels at full draft
- Improvement of cargo handling system for bulk cargo
- Development of adequate road network in and around port areas to handle road traffic

demand generated by port activities

- Reduction of restriction on vessel navigation and provision of necessary navigational aids
- Introduction of practical competitiveness in cargo handling business and establishment of responsibility demarcation system between port authorities and private operators
- Introduction or improvement of EDI system suitable to Ghana Sea Ports considering the present conditions of GCNET
- Enhancement of port promotion activities and exchange of information between ports and users
- Reduction of adverse environmental impact, if any, during construction works and after the development

11.4 Role Sharing between Tema Port and Takoradi Port

In 2000, Tema Port handled 82% of import cargo and 33% of export cargo in Ghana. As for containerized cargo, Tema handled 94% of import containerized cargo and 58% of export containerized cargo. Takoradi Port handled the remainder.

Tema Port is located in the Accra-Tema Metropolis and functions as the main import port. Import cargo volume is always dominant to export cargo volume with a ratio of about 6:1. Takoradi Port functions as the main export port in Ghana and exports typical Ghanaian products such as cocoa beans, sawn timber, manganese and bauxite. Ratio of export cargo traffic to import cargo traffic is about 6:4.

Thus, the characteristics of the two ports are different. This difference mainly comes from the different characteristics of their hinterlands such as population, geographical conditions, industrial conditions and infrastructure development situations. However, from the viewpoint of the national economy, severely imbalanced cargo flow is not desirable. To establish a rational physical distribution system it is necessary to balance cargo volumes between import and export in each port. For example, although most foodstuffs are imported at Tema Port, it would be rational for Takoradi Port to import more foodstuffs given the size of its hinterland population of its hinterland. In formulating the master plans, rationalization of the national physical distribution has to be considered.

In the near future the Hub-and –Spoke system in container transportation will be introduced. Some container cargoes will be transshipped at major container ports in the region. But as explained in 11.2.2, the Study Team thinks that over-zealous competition such as dumping of port charges for the sake of acquiring transshipment container impedes sound port development. The purpose of Ghana Sea Port development is not to make Ghana Sea Ports the hub of West Africa but to create advanced container ports in West Africa. However, the function of Tema Port as a container port might be different from that of Takoradi Port. To compete with foreign container ports, the construction of deeper container berths at Tema Port seems to be a realistic strategy.

Chapter 12 EIA System in Ghana

12.1 Development of EIA System in Ghana

Government of Ghana commenced the effort to conserve the environment in 1972 with the participation to the United Nations Conference on the Human Environment held in Stockholm, Sweden. It was the first event in African countries to have established an organization for environmental policy-making known as Environmental Protection Council (EPC) in 1974. In late 1980s, rapid economic re-construction accompanied some environmental problems, such as deforestation, water pollution, harmful substances from mining, and degradation of the living environment in urbanized areas.

In March 1989, the preparation of National Environmental Action Plan (NEAP), assisted by the World Bank, required the Government of Ghana many things to do. The NEAP became the first comprehensive environmental initiatives in Ghana including the establishment of environmental legislation including EIA and enforcement of natural resources management, living environment management, environmental education, environmental monitoring, and environmental institutions for 1991-2000. This was almost achieved through the Ghana Environmental Resource Management Project (GERMP) from 1993-1997 also assisted by the WB. The efforts were relayed to EPA 5 Year Strategic Plan, 1999-2003, approved by EPA, MEST, and the WB and assisted by Environmental Protection Authority of Victoria, Australia.

As for the provision of the EIA system, EPC set up Environmental Impact Assessment Committee in 1985, responding the requirement by Ghana Investment Code in the same year. The Committee immediately began to develop the procedure for EIA Guidelines. A government directive to agencies and organizations involved in the authorization process of development projects was launched in 1989. The directive stated that EPC was to be consulted formally on all development proposals and to issue a "Certificate of Clearance". This was the first official attempt to establish EIA in Ghana. In July 1989, EPC published draft Guidelines for EIA.

Since the Government's administrative directive in 1989, all EIA activities were conducted under this mandate. Despite the absence of formal EIA procedures, there was a systematic environmental review procedure, with EPC as the assessing authority deciding whether an environmental certificate should be issued or not. Since the 1989 directive, EPC processed over 1000 environmental assessment applications and reviewed over 50 EISs that were mostly for the mining sector and included several reports for port development projects.

EIA procedures have evolved over time since EIA became a requirement in Ghana in 1989. The legal basis of EIA procedures at the present is the 1999 Environmental Impact Assessment Regulation (LI 1652). It formalized the process that had been in operation since 1996, when the EPA published the general guidelines for EIA in Ghana. Also it has been empowered legally through a various provisions including penalty rules for proponents who would not follow the regulations. The guidelines stipulate that the GOG requires prior environmental impact assessment of new investments and developments that could affect the quality of the environment, before issuing an environmental permit.

12.2 Current EIA System in Ghana

The procedure of EIA in Ghana is shown in Figure 12.2.1. The EIA procedure provides the framework for screening and evaluating all undertakings[1] that have the potential to give rise to significant environmental impacts. Depending on the nature of the undertaking and the sensitivity of the receiving environment, some or all of the steps listed below may have to be followed by the proponent before the EPA makes an Environmental Permitting Decision:

- Registration,
- Screening to allow EPA to determine the level of assessment,
- Scoping/Terms of Reference (TOR) for EIA,
- Preparation of EIS, and
- Public Hearing.

A full EIA process as outlined above requires 90 working days (Figure 12.2.1). The EPA determines the level of assessment through its screening process. The EPA's screening decision considers:

- the location, size, and likely output of the undertaking;
- the technology to be used;
- the concerns of the general public, and in particular, the concerns of immediate residents;
- land use; and
- any other factors of relevance to the particular undertaking to which the application relates.

The EPA screening decision also considers whether or not the undertaking will affect environmentally sensitive areas (ESA). ESA is defined as areas within which new development could have a significant effect on the environment and in which EPA will require an EIA for any proposed new project. ESA includes:

- All areas declared by law as national parks, watershed reserves, forest reserves, wildlife reserves and sanctuaries including sacred groves,
- Areas with potential tourism value,
- Areas which constitute the habitat of any endangered or threatened species of indigenous wildlife (fauna and flora),
- Areas of unique historic, religious, cultural, archaeological, scientific or educational interest,
- Areas which provide space, food and materials for people practicing a traditional style of life,
- Areas prone to natural disaster (geological hazards, floods, rainstorms, earthquakes, landslides, volcanic activity, etc.),
- Areas prone to bushfires,
- Hilly areas with critical slopes,
- Areas classified as prime agricultural lands,
- Recharge areas of aquifers,

[1] undertakings: means any enterprise, activity, scheme of development, construction, project, structure, building, work, investment, plan, program and any modification, extension, abandonment, demolition or decommissioning of such undertaking, the implementation of which may have a significant impact.

- Water bodies characterized by one or any combination of the following conditions,
  (a) tapped for domestic purposes;
  (b) within controlled and/or protected areas;
  (c) which support wildlife and fishery activities.
- Mangrove areas characterized by one or any combination of the following conditions,
  (a) with primary pristine and dense growth;
  (b) adjoining mouth of major river system;
  (c) near or adjacent to traditional fishing grounds;
  (d) which act as natural buffers against shore erosion, strong winds and storm floods.
- Estuaries and lagoons,
- Other coastal areas of ecological, fisheries or tourism importance or which are subject to dynamic change,
- Wetlands,
- Rivers,
- Areas of high population density.

The EPA normally screens projects within 25 days after receiving a proponent's registration form. The screening process results in one of four decisions:

Objection	⇒	Environmental permit is decline.
No objection	⇒	Environmental permit is issued.
PER[1] is required	⇒	More information is needed.
EIA is required	⇒	Proponent prepares Scoping Report and TOR for EIA study.

As for port development projects, it is stipulated that EIA is mandatory if the project is to construct a new port or to expand the port involving an increase of 25 % or more in yearly handling capacity (Environmental Impact Assessment Procedures, EPA, 1995). Thus, present study should prepare necessary information to follow the procedure for a detailed EIA described in Table 12.2.1 and Figure 12.2.1.

[1] PER: Preliminary Environmental Report

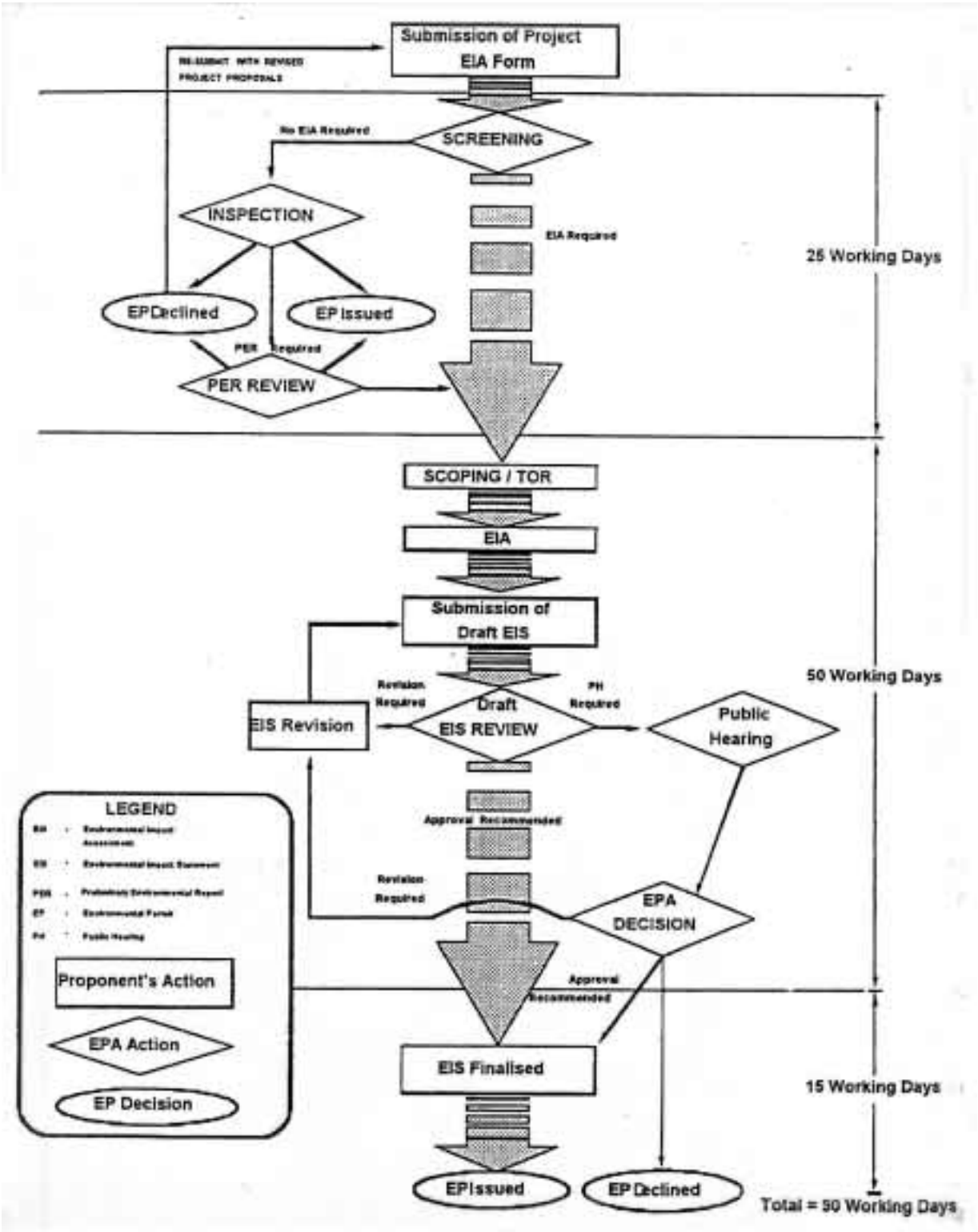

Figure 12.2.1 EIA Procedure in Ghana

Source: Environmental Assessment in Ghana. - A Guide -, EPA, 1996.

Table 12.2.1 Environmental Assessment Procedure

Step	What is involved	Responsibility
Registration	Project proponent completes the registration forms obtained from the EPA. Informations relating to the project, possible impacts, and proposed management measures are to be provided on the registration form.	Project proponent
Screening	Based on the information in the registration form the EPA determines whether or not an EIA needs to be undertaken.	EPA. Decision to be made within 25 days. Outcome of the screening process can be: - Objection to the undertaking - No objection to the undertaking - Preliminary Environmental Report (PER) required - EIA required If significant impacts are anticipated, an EIA is required and the following stages should be undertaken. An EIA results in the production of an Environmental Impact Statement (EIS).
Scoping study and TOR	First stage in the EIA process. Consultations are held with relevant government departments, NGOs and the public to identify potential concerns and impacts. This information is used as a basis for the Terms of Reference (TOR) for the EIA study.	Project proponent
Approval of the TOR	Project proponent submits a scoping report, which includes a draft TOR. 10 copies are submitted to the EPA.	EPA. Approval of the TOR is given within 25 days of receipt of the document.
Undertaking of the EIA and development of the EIS	EIS preparation is supposed to include a public information program. Public notice of the assessment process is to be issued by the project proponent through newspaper advertisements and/or posted in public places.	Project proponent.
EIS review	Proponent has to submit 12 copies of the EIS to the EPA. A 21 day public notice of the publication shall be served by EPA for public information and reaction through newspaper advertisement or posting in public places	EPA. Comments from EPA are given within approximately 50 days.
Finalize EIS	Address comments received by EPA.	Project proponent.
Environmental Permit	Environmental Permit is issued.	EPA.

12.3 EIA Procedure to Be Required to the Planned Port Development Projects

(1) Registration

A project proponent should register every port development project with the EPA. The following information is required for registration:

- Proponent
  Details of the proponent (contact address and telephone number)
- Proposal
  Brief description of the proposal, map/site plan, co-ordinates of site, elevation and slope of site, nearby areas or features of environmental significance and adjacent land uses, including the nearest homes or areas zoned residential
- Services
  Details of water supply, stormwater drainage, power corridors, access to and impact on transport.
- Environmental impact
  - the character and resilience of the receiving environment,
  - the potential impact of the proposal and confidence of predicting impact,
  - plans, policies or procedures to manage potential environmental impacts,
  - other statutory decision-making processes that may provide a forum to examine relevant issues of concern, and
  - degree of public interest

(2) Screening

The project proposals for port development through the present study will be required a detailed EIA as mentioned in section 12.2. The first stage of implementation of an EIA is to conduct a Scoping exercise.

(3) Scoping

This will involve consultation with interested/affected parties such as government officials, traditional authorities and members of the public. The objective is to determine how their concerns and others will be addressed in the Terms of Reference (TOR) for the EIA. Furthermore, the scoping process identifies all the key issues of concern to be addressed in the EIA. These results will be compiled in a Scoping Report.

The present study carried out the Scoping and prepared the TORs for EIA on the Master Plans of Takoradi and Tema port development according to the Scope of Study agreed in prior to the implementation of the Study between GPHA and JICA.

The results of the Scoping are described in Sections 13.8 and 14.8 for Takoradi Port and Tema Port, respectively. The TORs for EIA prepared for two (2) ports are attached to the Appendices.

(4) Detailed EIA

After the review and approval of the TOR for EIA by EPA, EIA will be commenced to prepare the Environmental Impact Statement (EIS). The EIS for the proposed port development project should:

- describe the project (and analyze the need for the project);
- state the objectives of the undertaking;
- present options for carrying out the undertaking and alternatives to the undertaking;
- describe the current environment;
- describe the future environment (without the project);
- predict impacts (the future with the project);
- evaluate impacts;
- propose measures to mitigate impacts;
- propose an environmental management program (including a monitoring program) for all stages; and
- document the public participation program.

The present study prepared a draft EISs for short-term development plans of two (2) ports aiming to provide the technical methodology, according to the Scope of Study agreed in prior to the implementation of the Study between GPHA and JICA.

The actual EIA procedure for the planned port development projects will be carried out by a consultant that will be contracted by GPHA, since GPHA has no section or personnel specific to the environmental consideration.