

FINAL REPORT  
**SUMMARY**

# THE DEVELOPMENT STUDY OF GHANA SEA PORTS IN THE REPUBLIC OF GHANA

**February 2002**

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Short-term Development Plan - Takoradi Port -



Short-term Development Plan - Tema Port -

## PREFACE

In response to a request from the Government of the Republic of Ghana, the Government of Japan decided to conduct the Development Study of Ghana Sea Ports and entrusted the study to the Japan International Cooperation Agency (JICA).

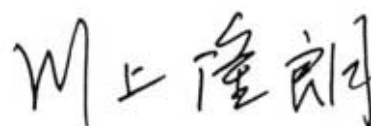
JICA selected and dispatched a study team headed by Mr. Takechiho TABATA of the Overseas Coastal Area Development Institute of Japan (OCDI) and comprised of OCDI and NIPPON KOEI CO.,LTD. to Ghana three times between November 2000 and December 2001.

The team held discussions with the officials concerned of the Government of Ghana and Ghana Ports and Harbours Authority (GPHA), and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Ghana for their close cooperation extended to the study.

February 2002



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Takao Kawakami

President

Japan International Cooperation Agency

## LETTER OF TRANSMITTAL

February 2002

Mr. Takao Kawakami  
President  
Japan International Cooperation Agency

Dear Mr. Kawakami:

It is my great pleasure to submit herewith the Final Report of The Development Study of Ghana Sea Ports in the Republic of Ghana (hereinafter referred to as 'Ghana').

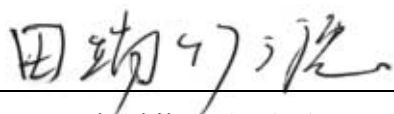
The study team of the Overseas Coastal Area Development Institute of Japan (OCDI) and NIPPON KOEI CO.,LTD (NIPPON KOEI) conducted surveys in Ghana over the period between November 2000 and December 2001 as per the contract with the Japan International Cooperation Agency (JICA).

The findings of this study, which are compiled in this report, were fully discussed with the officials concerned of the Government of Ghana and Ghana Ports and Harbours Authority (GPHA) to formulate the Development Study of Ghana Sea Ports.

On behalf of the study team, I would like to express my heartfelt appreciation to the Government of Ghana and GPHA for their diligent cooperation and assistance and for the heartfelt hospitality, which they extended to the study team during our stay in Ghana.

I am also greatly indebted to the JICA, the Ministry of Foreign Affairs, the Ministry of Land, Infrastructure and Transport and the Embassy of Japan in Ghana for giving us valuable suggestions and assistance during the preparation of this report.

Yours faithfully,



Takechiho TABATA

Team Leader for the study team  
The Development Study of Ghana Sea Ports in  
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## **List of Abbreviations**

AEC	Assumed Environmental Criteria
ASEAN	Association of Southeast Asian Nations
B/L	Bill of Lading
BOD	Biochemical Oxygen Demand
BOR	Berth Occupancy Ratio
BOT	Built-Operate-Transfer
BRV	Bulk Road Vehicles
BU	Bulk Carrier
C.D	Chart Datum
CEPS	the Customs Exercise and Preventive Service
CFS	Container Freight Station
CIF	Cost, Insurance and Freight
CM	Container/Multipurpose Carrier
CO	Container Cellular Vessel
COD	Chemical Oxygen Demand
CRMS	Computerized Risk Management System
CT	Container Terminal
CY	Container Yard
DO	Dissolved Oxygen
DO	Delivery Order
DR	Dock Receipt
DWT	Dead Weight Tonnage
EDI	Electric Data Interchange
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPZ	Export Processing Zone
FEU	Forty-foot Equivalent Unit
FOB	Free On Board
GAFCO	Ghana Agro-Food Company
GBC	Ghana Bauxite Company
GC	General Cargo Carrier
GDP	Gross Domestic Product
GEPC	Ghana Export Promotion Council
GFZB	Ghana Free Zones Board
GHATIG	Ghana Trade and Investment Gateway Project
GPHA	Ghana Ports and Harbours Authority
GRC	Ghana Railway Corporation
GT(GRT)	Gross Tonnage
H1/3	Significant Wave Height
HWL	High Water Level
IALA	International Association of Lighthouse Authority
IAPH	International Association of Ports and Harbors
JICA	Japan International Cooperation Agency

KIA	Kotoka International Airport
KN	Kilo Newton (=0.102 tf)
L0	Wave Length
LOA	Length Overall
LWL	Low Water Level
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWN	Mean Low Water Neap
MLWS	Mean Low Water Spring
MOF	Ministry of Finance
MOFA	Ministry of Food and Agriculture
MOL	Mitsui O.S.K Line
MORT	Ministry of Road and Transport
MPa	Mega Pascal (=N/mm <sup>2</sup> )
MR	Mate's Receipt
NCA	National Communication's Authority
NCP	New Container Platform ( at Takoradi Port)
NEAP	National Environmental Action Plan
OCDI	Overseas Coastal Area Development Institute of Japan
OECD	Organization for Economic Co-operation and Development
OECE	The Overseas Economic Cooperation Fund
PIANC	International Navigation Association
RO	Ro-Ro Vessel
Ro/Ro	Roll on / Roll off
RTG	Rubber Tyre mounted Gantry crane (= Transfer crane)
S.F.	Safety Factor
SAPS	Special Assistance for Project Sustainability
SO	Shipping Order
SS	Suspended Solids
T1/3	Significant Wave Period
TDC	Tema Development Cooperation
TEU	Twenty-foot Equivalent Unit
TFCC	Tema Food Complex
TG	Tugboat
TK	Tanker
TMA	Tema Municipal Assembly
TOR	Tema Oil Refinery
UNCTAD	United Nations Conference on Trade and Development
VALCO	Volta Aluminium Company Limited
VLTC	Volta Lake Transport Company
VRA	Volta River Authority
WAG	West Africa Gas
WTO	World Trade Organization

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## EXECUTIVE SUMMARY

### 1 Background of the Study

In Ghana there are two major ports: Tema Port and Takoradi Port. These two ports have fulfilled important roles, Tema Port as a main import port of whole Ghana and an export port of the East Ghana and Takoradi Port mainly as an export port of the West Ghana. However, a lack of deep berths, low working rate of cargo handling equipment and physical and functional decrepitude of port facilities have made it difficult for those ports to efficiently handle the rapidly increasing volume of cargoes.

In this context, GOG requested GOJ to conduct the development study of Ghana seaports. In response to the request, GOJ entrusted the Study to JICA. On July 20th, 2000, both sides agreed on the Scope of Work for the Study.

### 2 Objectives of the Study

- ◆ To provide a master plan for the development of Ghana Ports: Tema Port, Takoradi Port and / or a possible new third Port (hereinafter referred to as “Ghana Sea Ports”) up to the year 2020,
- ◆ To provide a short-term development and improvement plan for the Ports to meet demand up to the year 2010,
- ◆ To identify institutional development measures and provide an improvement plan for port management and operation to achieve competitive operational efficiency, and
- ◆ To carry out relevant technology transfer.

### 3 Study Implementation

#### 3.1 Study Period

November 2000 – February 2002

#### 3.2 Organization of the Study

(1) Counterpart Agency in Ghana

Ghana Ports and Harbours Authority

(2) Organization of the Study Team

Name	Assignment
Takechiho TABATA	Team Leader / Port Policy
Yoshihisa FUJITA	Port Planning / Investment Planning
Hideki YOKOMOTO	Regional Development
Koji ESAKI / Kei KUROSE	Port Management and Operation / Port Promotion
Masashi MURAYAMA	Financial Analysis
Fujio SAIGUSA	Demand Forecast / Economic Analysis

Syojiro KOGA  
 Yushi ANDO  
 Kazuhiko DOHI  
 Shane REID

Engineering Design / Construction Program / Cost Estimation  
 Natural Conditions  
 Environmental Consideration  
 Coordination

### 3.3 Flow Chart of Study

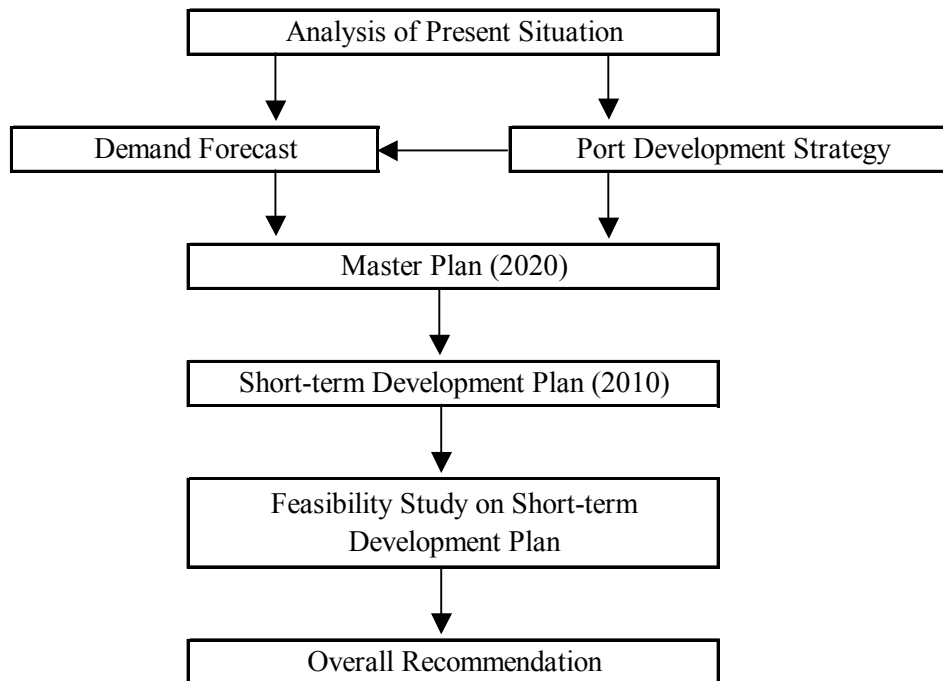


Figure Flow Chart of the Study

## 4 Development Plan of Takoradi Port

### 4.1 Development Principle

- ◆ Functioning as the main export port of commodities produced in West Ghana such as manganese, bauxite, cocoa and timber.
- ◆ Functioning as an import port of commodities consumed in West Ghana such as foodstuff and consumer goods. (Appropriate role sharing with Tema Port will be important in this regard.)
- ◆ Supporting industrial development and agriculture by providing necessary facilities for import of materials and export of manufactured goods and crops.

### 4.2 Future Cargo Demand Forecast

Future Cargo Demand Forecast

	1991	2000	2010	2020
All Cargo (tons)	1,639,468	3,056,516	5,124,256	9,198,434
Container Cargo (TEUs)	9,112	39,805	136,196	407,742

### 4.3 Master Plan

#### (1) Scale of Berths

Scale of Berths for Master Plan of Takoradi Port

Facility	No.	Dimension / Capacity
Container Berths	2	Length 300m, depth 12m
Multipurpose Berths	3	Length 300m, depth 12m
Manganese Berth	1	Length 200m, depth 12m
Clinker Berth	1	Length 260m, depth 13m
Bauxite Berth	1	Length 260m, depth 13m

#### (2) Cost estimates

The total estimated cost for the implementation of the Master Plan is US\$ 249,7 millions.

### 4.4 Short-term Development Plan

#### (1) Main Facilities

List of Main Facilities in the Short-term Development Plan of Takoradi Port

Facility	No.	Dimension / Capacity
Container Berth	1	Length 300m, depth 12m
Multipurpose Berth	1	Length 300m, depth 12m
Manganese Berth	1	Length 200m, depth 12m
Bauxite/Clinker Berth	1	Length 260m, depth 13m
Berth for small craft	1	Length 150m, depth 5m
Navigational aids	1	1 Light beacon, 5 Buoys
Tug boat	1	2,420 Hp
New approach channel	1	One way, width 160m, depth 13m
Turning basin 1	1	Radius 220m, depth 12m
Turning basin 2	1	Radius 200m, depth 13m
Container yard	1	10.5 ha
Breakwater extension	1	400m
Revetment	1	480m, 270m, 160m
Access road improvement	1	1 set
Inner harbour road	1	1 set
Container crane	2	45 tons
Multipurpose crane	1	45 tons
Transfer crane	6	40 tons, 1 over 4
Top lifter	3	35 tons, 15 tons

Tractor head	16	For container cargo
Trailer	16	For container cargo

## (2) Cost Estimates

The total estimated cost for the implementation of the Short-term Development Plan is US\$ 136.5 millions, of which the foreign portion is US\$ 116.4 millions (85.2%) and local portion is US\$ 20.1 millions (14.8%).

## (3) Appraisal of Short-term development Plan

### Economic Appraisal

The economic rate of return (EIRR) for the project are 22.7% and consequently the project is considered to be economically feasible from the viewpoint of the national economy of Ghana.

### Financial Appraisal

The financial rate of return (FIRR) for the project is 10.4% and the project is considered to be financially feasible.

## (4) Environmental Impact Assessment (EIA)

EIA is conducted in accordance with Ghana EDI system. It is noted that there is no decisive factors to rule out the implementation of the project if adequate mitigation measures are taken in such matters as disposal of contaminated sea bottom sediment, dust dispersal, noise nuisance and waste management.

## **5 Development Plan of Tema Port**

### **5.1 Development Principle**

- ◆ Sustaining and developing physical distribution of Ghana as the largest port.
- ◆ Functioning as a leading container port in West Africa.
- ◆ Functioning as a main import port of commodities consumed in Ghana such as foodstuffs, consumer goods and materials.
- ◆ Functioning as an export port of commodities produced in the east part of Ghana such as aluminum, petrol products, other manufactured goods, cocoa products and other foodstuffs.
- ◆ Supporting industrial development and agriculture by providing necessary facilities for import of materials and export of manufactured goods and crops.

## 5.2 Future Cargo Demand Forecast

Future Cargo Demand Forecast

	1991	2000	2010	2020
All Cargo (tons)	3,647,010	6,001,643	10,126,771	18,334,847
Container Cargo (TEUs)	70,923	166,149	485,313	1,049,940

## 5.3 Master Plan

### (1) Scale of Berths

Scale of Berths for Master Plan of Tema Port

Facility	No.	Dimension / Capacity
Container Berths	4	Length 300 – 350m, depth 13-14m
Multipurpose Berths	2	Length 280m, depth 11.5m
Valco Berth	1	Length 190m, depth 11.5m
Oil Berth	1	Dolphin, depth 11.5m

### (2) Cost Estimates

The total estimated cost for the implementation of the Master Plan is US\$ 365.2 millions.

## 5.4 Short-term Development Plan

### (1) Main Facilities

List of Main Facilities in the Short-term Development Plan of Tema Port

Facility	No.	Dimension / Capacity
Container Berths	2	Length 300m, depth 13m
Navigational aids	1	2 Light beacons, 2 Buoys
Tugboat	1	2,500Hp
New entrance channel	1	One way, width 160m, depth 15m
New turning basin	1	Radius 290m, depth 14m
Container yard	1	25ha
New breakwater	1	1,350m, 200m
Revetment	1	630m
Access road development	1	1 set
Inner harbour road	1	1 set
Parking space	1	12,200m <sup>2</sup>
Container crane	4	45 tons
Transfer crane	12	40 tons, 1 over 4
Tractor head	16	For container cargo

## (2) Cost Estimates

The total estimated cost for the implementation of the Short-term Development Plan is US\$ 171.8 millions, of which the foreign portion is US\$ 145.0 millions (84.4%) and local portion is US\$ 26.7 millions (15.6%).

## (3) Appraisal of Short-term development Plan

### Economic Appraisal

The economic rate of return (EIRR) are 16.3% and consequently the project is considered to be economically feasible from the viewpoint of the national economy of Ghana.

### Financial Appraisal

The financial rate of return (FIRR) for the project is 10.3% and the project is considered to be financially feasible.

## (4) Environmental Impact Assessment (EIA)

EIA is conducted in accordance with Ghana EDI system. It is noted that there is no decisive factors to rule out the implementation of the project if adequate mitigation measures are taken in such matters as waste management and noise nuisance.

## **6 Management and Operation Plan**

### **6.1 Takoradi Port**

#### A new dedicated container terminal

As a common users berth, the terminal is operated by a single private company. Equipment including quayside gantry cranes is provided by it. As the cargo handling system of the terminal, the transfer crane system is selected because of its high operation efficiency, low maintenance cost and high working safety.

#### A new multipurpose berth

As a common users berth, the berth is operated by stevedoring companies. Equipment except multipurpose cranes and top lifters is provided by them.

#### New bulk berths

New bulk berths are leased to and operated by related private companies. Equipment is provided by them.



## **6.2 Tema Port**

### A new dedicated container terminals

As a common users berth, each container berth is to be leased to and operated by a single private company. Equipment including quayside gantry cranes is provided by it. As the cargo handling system of the terminal, the transfer crane system is selected because of its high operation efficiency, low maintenance cost and high working safety.

## **6.3 Proposals for Port Management and Operation**

### (1) Proposal for Improvement of Port Operation and Management

- ◆ Monitoring system by GPHA on the performance of operators and recommend the improvement of productivity.
- ◆ Introduction of 3 shift working system to enhance the utilization of facilities and to achieve more effective cargo handling operation.
- ◆ Introduction of port EDI system to realize efficient document transaction. It is worth considering that GPHA or a community of port related companies jointly establish a governing body of the port EDI system.

### (2) Proposals for Efficient Port Promotion

- ◆ To emphasize the high stability and reliability of Ghana Sea Ports.
- ◆ To improve efficiency through facility development and institutional change.
- ◆ To have periodic meetings with port users.
- ◆ To carry out port promotion activities both in Ghana and to foreign countries.

## RECOMMENDATIONS

Ghana is located at the geographical center of the ECOWAS region and functions as one of the leading countries of the region, particularly in terms of port activities. Together with the economic development of Ghana, cargo throughput in ports has been increasing year by year, with container cargo showing remarkable growth in recent years. However, physical layouts of port facilities 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.

Seaports of Ghana have played an important role not only in the economic activities of Ghana but also those of landlocked countries such as Mali, Burkina Faso and Niger. And because of the recent political unrest of neighboring countries, transit cargoes to landlocked countries through Ghana seaports have been increasing rapidly. Therefore, development of Ghana seaports is indispensable not only to the economic development of Ghana but also to that of the ECOWAS region as a whole. And since neighboring countries are hampered by a political instabilities, now is a good opportunity for Ghana seaports to acquire leading positions in the region.

Based on the results of the Study, it is recommended that the Government of Ghana implement the short-term development plans of Takoradi Port and Tema.

### 1 Short-term Development Plan

The objectives of the short-term development plans are to efficiently handle the estimated future cargoes in 2010 and to promote the economic development of Ghana. The main components of the plans are summarized as follows:

List of Main Facilities in the Short-term Development Plan of Takoradi Port

Facility	No.	Dimension / Capacity
Container Berth	1	Length 300m, depth 12m
Multipurpose Berth	1	Length 300m, depth 12m
Manganese Berth	1	Length 200m, depth 12m
Bauxite/Clinker Berth	1	Length 260m, depth 13m
Berth for small craft	1	Length 150m, depth 5m
Navigational aids	1	1 Light beacon, 5 Buoys
Tug boat	1	2,420 Hp
New approach channel	1	One way, width 160m, depth 13m
Turning basin 1	1	Radius 220m, depth 12m
Turning basin 2	1	Radius 200m, depth 13m
Container yard	1	10.5 ha
Breakwater extension	1	400m
Revetment	1	480m, 270m, 160m
Access road improvement	1	1 set
Inner harbour road	1	1 set
Container crane	2	45 tons

Multipurpose crane	1	45 tons
Transfer crane	6	40 tons, 1 over 4
Top lifter	3	35 tons, 15 tons
Tractor head	16	For container cargo
Trailer	16	For container cargo

#### List of Main Facilities in the Short-term Development Plan of Tema Port

Facility	No.	Dimension / Capacity
Container Berths	2	Length 300m, depth 13m
Navigational aids	1	2 Light beacons, 2 Buoys
Tugboat	1	2,500Hp
New entrance channel	1	One way, width 160m, depth 15m
New turning basin	1	Radius 290m, depth 14m
Container yard	1	25ha
New breakwater	1	1,350m, 200m
Revetment	1	630m
Access road development	1	1 set
Inner harbour road	1	1 set
Parking space	1	12,200m <sup>2</sup>
Container crane	4	45 tons
Transfer crane	12	405 tons, 1 over 4
Tractor head	16	For container cargo

## 2 Enhancement of Cargo Handling Productivity

Measures to enhance the cargo handling productivity such as privatization of the cargo handling business, introduction of actual competition in the business and introduction of port EDI system are required. On the occasion of privatization of the cargo handling business, adequate measures should be taken to deal with workers of GPHA who will lose their jobs.

## 3 Enhancement of Communication with Port Users

To function and be prosperous as gateways of West Africa, Ghana Sea Ports should be become user-friendly ports. Port users' interests and opinions should be listened to carefully at frequent intervals and improvement measures should be taken quickly.

## 4 Operation of Dedicated Container Terminals

The dedicated container terminals which are proposed in the short-term development plans are the most important facilities for Ghana Sea Ports. To operate them efficiently, each terminal should be leased to a single operator and operated by it. The lease contracts should be well balanced in risk and responsibility between GPHA and the operator.

## PART I PRESENT CONDITIONS

## **Chapter 1 Socio-economic Conditions of Ghana**

### **1.1 Population**

In accordance with the provisional results of the 2000 Population and Housing Census, the total head count of the population was 18,412,247. The most significant increases occurred in Greater Accra (103%), Ashanti (53%), Northern Region (59%) and Western Region (59%) compared to the results of the 1984 Population and Housing Census.

Ghana-Vision 2020 aims to reduce the rate of population growth to 2% per annum by 2020 in order to achieve the objectives of human development.

### **1.2 Gross Domestic Products (GDP)**

GDP growth rate in 1994 – 1999 was 4.4% per annum on average. The growth rate of agricultural GDP was 4.4% per annum on average from 1994 to 1999. That of industrial was 4.7% per annum on average from 1994 to 1999. That of the service sector was 5.3% per annum on average from 1994 to 1999.

Ghana-Vision aims to transform Ghana from a low-income to a middle-income country by achieving a long-term average rate of GDP growth of over 8% per annum.

### **1.3 Trade**

Total merchandise trade was valued at US\$5,344.7 million in 1999. Merchandise exports amounted to US\$2,116.6 million, while merchandise imports totaled US\$3,228.1 million.

Cocoa, gold and timber exports contributed to the major export commodities and together accounted for approx. 68% of total export earnings in 1999. In order to establish an economy less influenced by seasonal variation in crops and market price of a single product, the diversification of exports to non-traditional products has been developed and promoted since 1985. The export of non-traditional products increased remarkably from US\$62 million in 1990 to US\$404 million in 1999.

The main import items are machinery and transport equipment for non-oil imports which account for about 40% of the total imports. Oil imports increased sharply on account of the steep rise in oil prices in the second half of 1999.

The main trading partners are OECD countries for both import and export. The main trading partners in Africa are Togo, Cote d'Ivoire and Nigeria. Most crude oil is imported from Nigeria.

### **1.4 Agricultural Sector**

Agriculture, which has for a long time contributed more than 40% of both GDP and foreign exchange earnings with a source of livelihood for about 60% of the Ghanaian population, is a dominant sector of the economy in Ghana.

The agricultural sector consists of 5 sub-sectors: crops, cocoa, livestock, fisheries and forestry.

For many years, the Ghanaian economy recorded positive growth rates as a result of the high growth rates of the agricultural sector.

The agricultural sector grew at an average rate of 1.1% from 1990 to 1994 and 4.6% from 1995 to 1999.

### **1.5 Industrial Sector**

The industrial sector, which contributes least to national output behind agriculture and service, consists of four sub-sectors; manufacturing, mining and quarrying, electricity and water, and construction.

The sector contributed 27.7% (based on 1993 constant prices) to GDP.

### **1.6 Services Sector**

The services sector consists of: transport, storage and communication; wholesale, retail trade, restaurants and hotels; finances, insurance, real estates and business services; government services; community, social and personal services; and producers of private non-profit services

The real growth in the services sector slowed down in the 1990s with its contribution to GDP averaging about 38% in the first half of the 1990s. From the mid-1990s, the contribution of services sector declined further and is recently stable at about 29% per annum.

## **Chapter 2 Present Conditions of Transportation**

### **2.1 Railways**

The railway system consists of a triangular network connecting Accra, Kumasi and Sekondi-Takoradi. The network is divided into Western, Eastern and Central lines for operational purpose.

The national railway network covers a track distance of 1,300 km with branch lines serving mining areas.

### **2.2 Roads**

According to the government statistics, road transport is the principal domestic carrier, accounting for around 98% of freight moved. The road infrastructure of the country consists of about 13,250 km of trunk roads, 24,000 km of feeder roads and 2,913 km of urban roads, and there is a total road network of about 41,000 km.

### **2.3 Sea Transport**

Ghana has two commercial sea ports located at Tema, a distance of about 30 km east of Accra, and Takoradi, a distance of about 250 km west of Accra. The two ports handled over 90 % of the country's import and export trade.

### **2.4 Inland Waterway**

The Volta Lake is owned by the Volta River Authority (VRA). The infrastructure consists of a navigable waterway of about 415 km extending from Akosombo to Buiepe.

### **2.5 Air transport**

Ghana has one international airport, the Kotoka International Airport (KIA) in Accra, and three domestic airports in Kumasi, Tamale and Sunyani. There are a military airport in Takoradi and airstrips at Obuasi and Paga.