ASSESSING THE OPERATIONS OF THE BULK OIL STORAGE AND TRANSPORTATION COMPANY LIMITED IN PETROLEUM PRODUCTS DELIVERY TO NORTHERN GHANA

BY

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(BSc. AGRICULTURE)

A Thesis Submitted to the School of Graduate Studies,

Kwame Nkrumah University of Science and Technology, Kumasi

In partial fulfilment of the Requirements for the degree of

MASTER OF SCIENCE

IN DEVELOPMENT POLICY AND PLANNING

Department of Planning

College of Architecture and Planning

September 2011

DECLARATION

I hereby declare that this work was produced as a result of painstaking field research by me except for where specific references have been made and duly acknowledged. The work has not been submitted for the award of any other degree or publication. I am therefore fully responsible for the views therein expressed, factual accuracy of the content and any flaws that it might contain.

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ABSTRACT

The government of Ghana realising the importance of petroleum products, established the Tema Oil Refinery (TOR) in 1961 in order to process crude oil into finished products for the Ghanaian market. Also knowing that the growing demand for petroleum products throughout the country was posing distribution challenges in the midst of a poor road network system, it established the Bulk Oil Storage and Transportation Company (BOST) with depots across the country.

The depots in northern Ghana are located in Buipe and Bolgatanga to store petroleum products not only for strategic reasons but also to serve the people there. Buipe lies close to the Black Volta River, and was strategically chosen to enable cost effective Lake Transportation of petroleum products to northern Ghana. But the use of road transport to convey products to the north continues while the area occasionally experience shortages of petroleum products.

The study adopted the case study method to find out the factors that hinder the smooth operations of BOST, Buipe, in the delivery of petroleum products to northern Ghana. The targeted units of analysis were BOST, Oil Marketing Companies (OMCs) in the Tamale Metropolis and Tanker drivers who lift products at the depot.

The study revealed that BOST, Buipe, has enough physical storage capacity. The major causes of products shortages in the north included shortages of products at the depot, breakdown of tankers, upfront payment for products by OMCs, and periods of change of government.

Recommendations such as full utilization of the storage capacity of the depot, strategically using Lake Transportation and transparency in contracts for the supply of crude or finished products have been made. These are meant to improve the operations of BOST, Buipe, in the delivery of petroleum products to northern Ghana in an effort to boost agricultural production and trade, alleviate poverty and better the living standards of the people.

ACKNOWLEDGEMENT

I will want to express my sincere thanks and gratitude to my supervisor, Dr K. D. Kessey of the Department of Planning, who stood his grounds to guide and support me when I almost dropped the topic.

I owe a debt of gratitude to all the Lecturers in the Department of Planning who have helped to mould and refine me during the course of my studies, and to all my classmates for sharing their knowledge with me.

My thanks also go to the manager of BOST, Buipe, for his invaluable contribution of information to this study and to my friend Mr Ibrahim Yussif Jnr. of Tamale Senior High School who not only offered me accommodation and transport during the administration of questionnaire for this study but sacrificed his invaluable time to assist me conduct the interviews. Finally, I wish to express my heartfelt gratitude to my wife and family for their support and prayers.

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
BPSD	Barrels Per Stream Day
BOST	Bulk Oil Storage and Transportation Company
CEPA	Center for Economic and Policy Analysis
CWIQ	Core Welfare Indicator Questionnaire
FAO	Food and Agriculture Organisation
HIV	Human Immunodeficiency Syndrome
LPG	Liquefied Petroleum Gas
MMDAs	Metropolitan, Municipal and District Assemblies
MDGs	Millennium Development Goals
NDPC	National Development Planning Commission
NPA	National Petroleum Authority
N/R	Northern Region
OMCs	Oil Marketing Companies
ODI	Overseas Development Institute
PHC	Population and Housing Census
RCC	Regional Coordinating Council
SONABHY	Société Nationale Burkinabè d'Hydrocarbures (Burkina Faso)
SONIDEP	Société Nigérienne de Dépôt d'Essence et de pétrole (Niger)
SSA	Sub Saharan Africa
TOR	Tema Oil Refinery
UN-DESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNIDO	United Nations Industrial Development Organisation
UE/R	Upper East Region
UW/R	Upper West Region
VLTC	Volta Lake Transport Company

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Prior to the commencement of crude oil processing at the Tema Oil Refinery (TOR), Ghana relied completely on imported refined petroleum products distributed by the local branches of multinational oil companies, i.e. Shell, Texaco, British Petroleum, Mobil and Total. TOR was established in 1961 with the maiden name Ghanaian Italian Petroleum Company (GHAIP) Ltd. "GHAIP" was how the Refinery was affectionately called, until 1991 when it was renamed "Tema Oil Refinery", to reflect the city where the Refinery is geographically situated. In September 1996, the state owned TOR acquired sole responsibility for importing crude oil and refined petroleum products into Ghana. TOR is able to meet only around 70 percent of Ghana's demand for petroleum products (The World Bank, 2006).

As the population of the country increased with a corresponding increase in the demand for petroleum products in the midst of bad roads, the government established the Bulk Oil Storage and Transportation Company (BOST) as a state owned company incorporated in 1993 as a limited liability company with the government of Ghana as the sole shareholder. BOST has the mandate to develop a network of Storage tanks and Pipeline infrastructure throughout the country and to keep strategic stocks for Ghana. It has depots across the country, most of which are linked to TOR or the Accra Plains depot by pipeline, to facilitate the transportation and distribution of petroleum products throughout the country.

Until May 2001, BOST was responsible for the distribution of petroleum products from its strategically located depots which could be found in the Accra Plains, near Tema; Mami Water, after the Adomi Bridge; Akosombo, Kumasi, Buipe and Bolgatanga. BOST was also made to announce revised petroleum prices on behalf of government. The company has storage facilities at these locations with plans to develop same at Takoradi and Wa in the long term (BOST, 2011).

Whereas the other depots receive petroleum products from TOR or the Accra Plains depot through pipelines, the Buipe depot receives its supplies either by Lake Transport (by barge) or by road (tanker transport) from where products are pumped through a pipeline to

the Bolgatanga depot. Buipe was strategically chosen for the location of a depot because of its closeness to the Black Volta River to enhance Lake Transportation of petroleum products to reduce the number of heavy duty tankers from carrying petroleum products from Tema to the north. Heavy duty vehicles do a lot of damage to roads apart from dangers such as accidents they pose to other users of the road.

The idea of Lake Transport of petroleum products to the Buipe depot has however not stopped the use of the busy Accra-Kumasi-Tamale road by heavy fuel tankers from transporting petroleum products to the Buipe depot and sometimes to Burkina Faso. Also there have been incidences of petroleum products shortages in the north affecting trade, agricultural and social activities. This research was therefore undertaken to assess the operations of the BOST depot located in Buipe in the Northern Region in the delivery of timely, adequate and reliable supply of petroleum products to the northern part of Ghana.

Petroleum products constitute around 30 percent of total energy demand in Ghana (ISSER, 2004). Ghana has little domestic supply of crude oil; most of its crude oil demand is met by imports from Nigeria, supplemented with imports from Europe. Until the offshore discovery of crude oil in commercial quantities in July 2007, Ghana's oil industry featured more prominently in the downstream sector. The downstream sector covers the refining, storage, internal transportation, marketing and sale of petroleum products.

According to the International Bank for Reconstruction and Development/The World Bank (2006), the liberalization of the petroleum sector has allowed private sector participation in the procurement of crude oil as well as the private import of refined products through tenders. Since the beginning of 2004, TOR ceased to have a monopoly on the importation of petroleum products, and from July 2004 it has been prohibited from importing petroleum products. In March 2004, private Oil Marketing Companies (OMCs) participated in the first competitive tender for gasoline with financing provided by a syndicate of banks.

The transport sector is the main consumer of petroleum products, accounting for over 80 percent of total consumption in 2003. Households accounted for 6.2 percent, industry 6.7 percent and agriculture 4.2 percent (The World Bank, 2006). Households use a variety of petroleum products: kerosene for lighting, and cooking; Liquefied Petroleum Gas (LPG) for cooking and gaining much use by vehicles in Ghana; and gasoline and diesel for

private and commercial vehicles as well as a source of power for tractors, irrigation pumps and generators.

Fuel is input for economic production. The distribution of commodities within and outside the regions in the north, just like elsewhere, depends on the availability of fuel. The majority of farmers and traders rely on transportation services to trade their goods in order to receive incomes for their livelihoods.

The delivery of services by the Bulk Oil Storage and Transportation Company in order to serve the people of the north and possibly the landlocked Sahelian countries in meeting their petroleum products demands depends among other things on their operational efficiency, considering the importance of petroleum products in the economy of the north.

1.2 Problem Statement

The Medium Term National Development policy framework- Ghana Shared Growth and Development Agenda (2010-2013) has one of its themes, Accelerated Agricultural Modernisation and Sustainable Natural Resource Management. The key focus area of accelerated modernisation of agriculture is to support commercial agriculture through the introduction of appropriate and improved technologies. Government has realised that one of the causes of low productivity in the agricultural sector is low level of mechanisation.

Mechanised agriculture cannot thrive without adequate and reliable supply of gasoline and diesel. The Bulk Oil Storage and Transportation depots in the north were established to reduce the haulage of petroleum products by numerous tanker vehicles from the Tema Oil Refinery in order to curb accidents and also to free our roads from the damage caused by heavy vehicles. It is also to ensure reliable and equitable distribution of petroleum products to the northern parts of the country which are far from the oil refinery. Some tanker vehicles are still seen hauling petroleum products from beyond the Buipe depot to some parts of the north. Again there have been incidences of shortages of these products in the northern regions during the farming season thereby disengaging majority of the people from productive activity. The situation is usually taken advantage of by ‘middle men’ who hoard and sell these products at exorbitant prices. Low levels of production result in shortfalls in food supply and the resultant consequence of hunger and malnutrition.

Effective distribution of foodstuffs and other goods within and outside the north is also affected during periods of petroleum products shortage. This again impedes commerce and results in reduced incomes of the majority of traders especially women, worsening the already high poverty levels in the north. Public service delivery in all fields is also disrupted anytime there is shortage of fuel.

1.3 Research Questions

The study sought to base its investigation on the premises of the questions posed below in order to arrive at answers or recommendations that could help facilitate the operations of BOST and thereby address the problem of petroleum products delivery to northern Ghana.

1. Are the incidences of petroleum products shortages in the north due to operational challenges by the Buipe depot or other factors outside the depot?
2. Is there a storage capacity problem at the Buipe depot and can that alone hinder in the delivery of timely and adequate petroleum products to the north?
3. What is the petroleum products usage pattern in the north and does the depot factor this into its operations?
4. Who are the major stakeholders of BOST and what is the relationship between them and BOST in the delivery of petroleum products to Buipe?

1.4 Objectives of Research

The broad objective of this research was to assess the operations of BOST in fulfiling its mission of providing adequate fuel security and facilitate an efficient and cost effective transportation and distribution service to its clients and the people of Ghana. Specifically the research sought to achieve the following objectives:

1. To examine the causes of petroleum products shortages in the north.
2. To assess the storage capacity of BOST.
3. To assess the petroleum products usage pattern in the north.
4. To examine the relationship between BOST and its stakeholders.
5. To make recommendations to improve the operations of BOST.

1.5 Justification of Research

All sectors of the economy can benefit from an efficiently managed downstream oil sector that delivers petroleum products in the quantity and quality required. Fuel shortages have had serious adverse effects on price levels in some parts of Sub-Saharan Africa (Kojima et.al, 2010). Fuel shortages raise the prices of not only petroleum products, but also their substitutes. For example, kerosene and LPG shortages in Uganda in late 2008 and early 2009 pushed up the prices of charcoal, used in cooking, as some shops ran out of kerosene and LPG (Namutebi, 2009). This is not different in the northern part of Ghana as the demand and use of charcoal increases any time there is fuel shortage. The resultant effect of increased charcoal use is deforestation. Also during periods of fuel shortage, households pay more for petroleum products they consume directly. Second, higher oil prices increase the prices of all other goods that have oil as an intermediate input. The most significant among them for the poor in low-income countries is food. For the poor who use transport services, higher transport costs also decrease effective income.

The government of Ghana established the Buipe depot not only primarily as a strategic reserve for petroleum products but also to enable storage of petroleum products to meet the fuel requirements of the north and to reduce the number of tankers that will have to travel from the north to Tema in order to transport fuel to the north.

Therefore over the longer term, ensuring sufficient fuel stocks is an often used mechanism to protect against supply disruptions. Assessing the costs and benefits of maintaining contingency stocks—and deciding how large, who maintains, and who pays—is important. The value of maintaining some contingency stocks is universally accepted. Globally, according to a report published in October 2009 by Global Markets Direct, oil storage capacity rose from 2.39 billion barrels in 2000 to 2.96 billion barrels—or about one-tenth of world annual oil consumption—in the first half of 2009 (Kojima, 2009).

An expanded refining capacity will position the country to take advantage of the inadequate refinery capacity in West Africa. Total consumption in non-refinery countries in West Africa has exceeded 80,000 barrels per day (about 4 million tons per annum). Ghana could quickly use its comparative advantage to revamp the Tema Oil Refinery to make it more efficient whilst it makes plans for expansion as well to construct a new refinery to meet local demand as well as targeting the countries within the sub region, particularly those without refineries and at least, capturing 50% of the market by 2020

(Energy Commission, Ghana, 2010). This will mean expanding the depots capacities in the north and ensuring adequate supply of petroleum products.

In Ghana, in spite of the deregulation of the petroleum sector allowing the private sector to participate in the importation, distribution and sale of petroleum products, the Buipe depot has been experiencing long queues of fuel tankers waiting, sometimes for days, for their turn to load fuel to various parts of the north. The delay in receiving fuel by these tankers creates fuel shortages in their service delivery areas in some occasions. Oil Marketing Companies in the northern part are supposed to first make their orders from BOST and if they cannot be served they are allowed to move outside the north to other depots.

About US$683.5 million is to be injected into the operations of BOST, in the medium term period up to 2015, to improve bulk transportation of petroleum products especially to the northern parts of the country (Emeafa and Seidu, 2010). But before this is actualised, this research looked at the operations of BOST, Buipe, in meeting the fuel needs of the people of the north.

The vast stretches of land in the north can be turned into productive and gainful enterprises to address the issue of food insecurity and malnutrition among the people. The many valleys that were used in growing rice in the 1970's can be put back to cultivation to cut down on the quantity of rice imported. The climatic conditions in the north also promote the production of cotton, an industrial crop, the cultivation of which can be used as a poverty reduction strategy.

The reliance on the traditional methods of food production in the face of an increasing population and deteriorating environment is not sustainable. Modern methods of cultivation through the use of tractors and related farm implements must be employed within the context of technical knowledge of the northern environment. This can be achieved with the reliable supply of the necessary amount of energy, in the form of petroleum products, to operate the machinery.

Improving bulk transportation of petroleum products to the north offers Ghana the opportunity to capture a large share of the market in the West African sub-region and also to enhance agricultural production and trade in the north which will go a long way in creating employment, minimise outmigration from the area, reduce poverty, and better the living standards of the people.

1.6 Scope of the Research

The research was limited to the operations of the Buipe depot, located in Buipe in the Northern Region of Ghana, in contributing to petroleum products distribution to northern Ghana.

Contextually, the research looked at the operations of BOST and its relationship with stakeholders within and outside the north, and the challenges they face in the delivery and distribution of petroleum products to northern Ghana. Recommendations were made as to how service delivery could be improved.

1.7 Limitation of the Study

Petroleum products are very important to the economy of every nation today. Their prices can distort economic policy statements and budgets of countries. In other words, petroleum products present sensitive political issues to governments. Seeking information therefore in the operation of a fuel depot that is owned by the government, as in the case of this study, encountered some difficulties and limitations.

Northern Ghana is a vast area occupying about 40% of the country's land mass. Investigating the issue of petroleum products delivery and requirement of such an area will require massive financial commitment and a longer time than what was available. The inadequacies of these two factors of funds and time therefore presented a challenge to this study.

Finally, the problem of exaggerations and distortion of information by people (respondents) when giving out information also impedes the extraction of facts for the purposes of inferences and generalisations. Despite these limitations to the study, it was carried out diligently to make it representative and useful for the purpose for which it was conducted in order to add or improve upon the knowledge base in this research area.

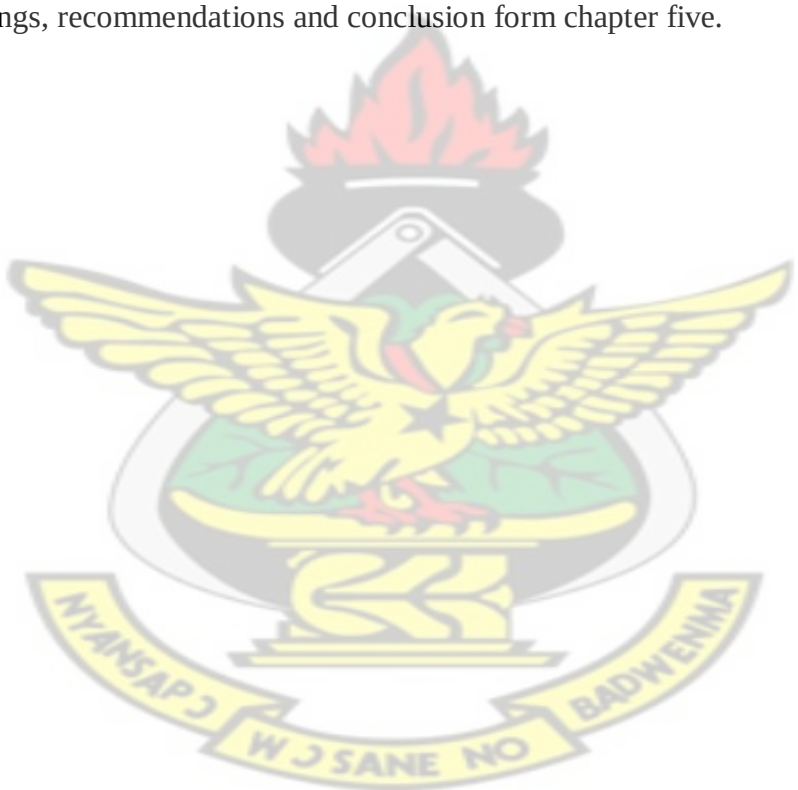
1.8 Organisation of the Study

The study is organised into five chapters. Chapter one gives the background to the study, the problem statement, research questions and objectives of the study, justification of the study, the scope of the study, and organisation of the study.

Related literature is reviewed in Chapter two. The review covers transportation of petroleum products, storage of petroleum products, distribution and pricing of petroleum products, petroleum products shortage, importance of petroleum products and policy intervention. A conceptual framework on the effect of efficient service delivery of the Bulk Oil Storage and Transportation Company is included in this section.

Chapter three gives the profile of the study area; this shows the geographical location of the depot, the purpose for its establishment, and the political, social and economic details of the research area.

Chapter four covers the methodology that was used for the research and the analysis of results of the study after the data was collected, collated and processed. Then summary of the key findings, recommendations and conclusion form chapter five.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Petroleum products continue to occupy an important place in the world economy as a source of energy to drive economic activities. It is the most important source of energy in the transport industry all over the world, making it possible for the distribution of goods and services and enhancing the transfer of technologies among peoples around the globe as well as building cultural ties among different people. In the field of agriculture, petroleum products have provided the energy beyond the capabilities of human muscle power in the production of food to feed the growing human populations the world over; this is even more important in Africa that has to grow out of the use of less efficient methods of food production if the fight against hunger and malnutrition would be achieved in order to attain the Millennium Development Goal 1.

The downstream oil industry is crucial to the economy of Ghana. Oil-derived products, according to Emeafa and Seidu (2010), supply 70% of Ghana's commercial energy needs. Current consumption of petroleum products is in the region of 950,000 tons per annum. Increasing power demands by industry and domestic consumption and a need to reduce the reliance on hydroelectric power did not only fuel the search for oil and gas but also has set in motion projects relating to the importation of gas via a pipeline from Nigeria and La Cote d'Ivoire.

The delivery of adequate and reliable petroleum products to the northern parts of Ghana is therefore important to the socio-economic development of the north. Thus, the government of Ghana in 1993 incorporated the state owned Bulk Oil Storage and Transportation Company Limited with the subsequent establishment of the Buipe and Bolgatanga depots to ensure easy delivery of petroleum products to the three regions in the north.

Literature is reviewed in the various aspects of the petroleum products supply chain including products transportation, storage volumes, distribution and pricing, fuel shortages, the importance of these products to economic development and policy interventions in the petroleum industry.

2.2 Definition of Terms

It is necessary to define the terms petroleum and petroleum products and also limit the type of petroleum products that will be referred to in this study.

2.2.1 Petroleum

Petroleum, meaning literally "rock oil," is the term used to describe a myriad of hydrocarbon-rich fluids that have accumulated in subterranean reservoirs. Petroleum (also called crude oil) varies dramatically in color, odor, and flow properties that reflect the diversity of its origin. Although not directly derived from composition, the terms light and heavy or sweet and sour provide convenient terms for use in descriptions. For example, light petroleum (often referred to as conventional petroleum) is usually rich in low-boiling constituents and waxy molecules whereas heavy petroleum contains greater proportions of higher-boiling, more aromatic, and heteroatom-containing (Nitrogen, Oxygen, Sulphur, and metal containing) constituents. Heavy oil is more viscous than conventional petroleum and requires enhanced methods for recovery. Bitumen is near solid or solid and cannot be recovered by enhanced oil recovery methods (Speight, 2002).

Petroleum (also called crude oil), in the unrefined or crude form, like many industrial feedstocks has little or no direct use and its value as an industrial commodity is only realized after the production of salable products. Even then, the market demand dictates the type of products that are needed. Therefore, the value of petroleum is directly related to the yield of products and is subject to the call of the market (McKetta, 1993).

2.2.2 Petroleum Products

Petroleum products are any petroleum-based products that can be obtained by refining and comprise refinery gas, ethane, liquefied petroleum gas (LPG), naphtha, gasoline, aviation fuel, marine fuel, kerosene, diesel fuel, distillate fuel oil, residual fuel oil, gas oil, lubricants, white oil, grease, wax, asphalt, as well as coke.

Petroleum products are highly complex chemicals, and considerable effort is required to characterize their chemical and physical properties with a high degree of precision and accuracy. Indeed, the analysis of petroleum products is necessary to determine the properties that can assist in resolving a process problem as well as the properties that indicate the function and performance of the product in service.

Crude petroleum and the products obtained there from contain a variety of compounds, usually but not always hydrocarbons. As the number of carbon atoms in, for example, the paraffin series increases, the complexity of petroleum mixtures also rapidly increases. Consequently, detailed analysis of the individual constituents of the higher boiling fractions becomes increasingly difficult, if not impossible (Speight, 2002).

In Ghana, according to the Tema Oil Refinery (TOR) material refinery balance (1999-2006), petroleum products include the following; Premium Gasoline, Premix Gasoline, Liquefied Petroleum Gas (LPG), Diesel, Kerosene, Aviation Turbine Kerosene, and Residual Fuel Oil. Most of these products are sold in the Ghanaian market.

For the purpose of this study, petroleum products will include the products defined by TOR and specifically Gasoline and Diesel, which are the products stored and distributed by BOST, Buipe. The company serves OMCs in the north with these products but allows them to acquire some outside the north anytime the company runs out of stock.

2.3 Transportation of Petroleum Products

Transportation of petroleum products varies from country to country. According to Kojima et al. (2010), transporting crude oil to domestic refineries in countries with refining capacity, and petroleum products from refineries—whether domestic or overseas—to final destinations in all countries, represent a significant fraction of end-user prices, particularly in markets far from major refining centers. In terms of cost per liter of fuel transported over land, the least expensive— provided that the requisite economies of scale are achieved—is pipeline transport (except for fuel oil, which would need to be heated to be pumped), followed by rail, and finally by truck. Pipeline use as a means of fuel transport to the Buipe depot is minimal because much of the distance covered is on the Volta River by barge.

In Russia, about 95% of oil extracted is transported by trunk oil pipelines. All main pipelines are operated by the state owned Transneft Company founded by the Government of The Russian Federation. Transneft is operating about fifty thousand kilometres of trunk oil pipelines. In 2004 almost 450 million tons of oil was piped. Oil and petroleum products form up to 50% of the sea cargo. According to Bambulyak and Frantzen (2005), the

capacity of the Russian ports in six years perspective should be increased with 370 million tons a year. They added that railway transport of oil was about 18%.

Road transport is not allowed in Kenya for the domestic market or for exports if pipeline capacity exists. Road damage is proportional to axle weight raised to the fourth power; thus, the lower the axle weight of heavy-duty vehicles, the less damage to roads. Kenya introduced a three-axle weight limit for trucks in October 2008, constraining fuel tankers to about 35,000 liters of fuel instead of the 42,000 liters previously carried on four-axle trucks. The fuel supply to the neighboring countries was immediately reduced (Baguna et al, 2009). The operation of the pipeline system in Kenya has been disrupted by power outages. Repairing the pipeline has also reduced the volume of fuel shipped and caused shortages in the neighboring countries that import petroleum products from Kenya. The 30-year-old Mombasa-Nairobi section of the Kenyan oil pipeline on which they depend has at times operated at only 50% of capacity, partly because of erratic power supplies (Oluka, 2007).

Inadequate and unreliable supply of power is a chronic problem in Sub-Saharan Africa and adversely affects fuel supply by disrupting pipeline and refining operations. This is an example of problems outside the petroleum sector having serious negative effects on sector efficiency and costs.

There is scope for making greater use of rail. The line connecting Senegal and Mali requires investment to improve its physical state and quality of service. While the Dakar–Bamako railway line continues to be in poor state, road conditions from Dakar to Mali have improved, offering a viable alternative to rail and further shifting the mode of transport away from rail.

Pan-territorial pricing in Mali, whereby petroleum products sourced in the least-cost manner are simply taxed more to achieve the same price throughout the country, provides no incentive to press for rail rehabilitation and revival, or for cost reduction in general.
In Madagascar, the market-based rate for road movements is more than 50% higher than that using rail, yet only 28% was transported by rail and the rest by road in 2008. Madarail is now in a position to transport 40% or more of the volume moved and achieve cost savings (Kojima et al., 2010).

Poor road conditions, congestion, and, where cross-border trade is involved, slow border clearance in some situations hamper road transport. More effective enforcement of load limits across the road freight sector will benefit road transport in the long run by reducing road damage, enhancing traffic safety, and eventually enabling use of larger and more efficient trucks (which require much better road conditions). Although enforcing the three-axle rule in Kenya may have had short term costs, long-term benefits—if accompanied by road improvement as well as other enforcement measures—should outweigh these costs.

According to the Ghanaian Times (September 24, 2010), the conveyance of petroleum products from the Tema Oil Refinery (TOR) to northern Ghana by road was killing the business of the Volta Lake Transport Company. It attributed the claim to the Managing Director of the Company, Mr. Osei Sarpong, who said it did not make economic sense to abandon a pipeline constructed from TOR to the Akosombo Lakeside port to lift the products from where they were carried by vessels to Buipe and through other pipelines pumped to Bolgatanga. And that the usage of the pipelines would reduce transport cost by 40% besides easing the pressure on the roads through the use of heavy tankers. He said that the excuse by Bulk Oil Storage and Transportation that the pipes leaked was not tenable, adding that nothing had been done to rectify the situation.

The mode of transport of crude oil or finished petroleum products in Russia confirms the assertion by Kojima et al. (2010) that the cheapest means of oil transport is by pipeline. It also supports the claim by Volta Lake Transport Company that water transport is more cost effective than road. In this light, on the strategies to expand availability of petroleum products to northern Ghana, the government of Ghana has planned to complete the Debre – Buipe Pipeline Project by October 2011(Republic of Ghana, 2010).

There are medium-to-long term prospects for establishing a petroleum product pipeline system in Côte d'Ivoire, Burkina Faso, and Mali. Land transport infrastructure and equipment for bulk movement of oil products is only fair, with potential for improvements. There are prospects for product pipelining in West Africa with the state oil company Société Nationale d'Operations Pétrolières (Petroleum Operation National Company) in La Cote d'Ivoire engaged in the construction of an Abidjan- Yamoussoukro-Bouaké multi-product line with the possibility of future extensions to Bobo-Dioulasso in Burkina Faso and to Mali (Kojima et al., 2010).

Literature points to the fact that pipeline transportation of petroleum products, even though expensive in terms of initial investment, provides the cheapest form of transportation. Pipeline transportation however requires reliable supply of electricity. Ghana should make good use of the Volta Lake transport system in delivering petroleum products to the Buipe depot which is comparatively cheaper than road transport. The situation where road levies entice governments to neglect pipeline and rail infrastructure as in Senegal and Mali should be discouraged. It will be economical to use pipeline transportation in delivering petroleum products to the planned depot to be established in the Upper West region. Already there is a pipeline connection between Buipe and the Bolgatanga depots. This form of transportation will help reduce road deterioration and accidents by heavy fuel tankers not only in the three northern regions but in the country at large.

2.4 Storage of Petroleum Products

Once refined, petroleum products of the required amount and quality are transported to storage facilities close to the final markets. This activity entails coordination of procurement and transport logistics, including considerations of volumes required, procurement methods, price, location, contracting terms, and supply reliability (Kojima et al., 2010).

Storage capacity, which exists at every point in the supply chain, is important because stocks can be used to help reduce the magnitude of sharp price spikes due to physical disruptions to supply (Bacon and Kojima, 2008). Such protection against supply shortages may be particularly important for landlocked countries. Storage capacity is expensive to build and holding stocks within this capacity also incurs substantial additional financial costs. As a result, companies hold contingency stocks to avoid stock-outs but use just-in-time inventory management just as in any other business; they strive to optimize their capacity with other links in their supply-and-delivery chain. Maximum cost efficiency is achieved when this optimization is achieved and contingency stock levels are the result of a careful risk assessment. The optimal level is situation-specific with no typical standard.

Globally oil consumption and strategic reserves are increasing, leading to hikes in the prices of petroleum products. According to Zhou (2008), China's plans to build its strategic petroleum reserves to at least 100 million barrels by 2010 could have added more pressure to crude prices which have already been at record highs. The world's second-

largest oil consumer already has built two underground storage reserves in east China and will put into use two more storage bases soon. China's goal was to build strategic oil reserves equivalent to 30 days of imported oil by 2010. China's move followed similar steps in the United States, the world's top oil consumer. By 2010, China's reserve amount will still be only about one seventh of the U.S. level, but China is likely to increase its reserves at a faster pace, thus adds more impact on world's oil demand. Oil reserves are often built in a period of tens of years with a slow pace to avoid rattling the oil market. The United States, which has the world's biggest reserve, started its crude storage in 1975. China's reserve-building could add one more pressure to oil prices, which have moved sharply higher on global supply concerns, the weak dollar and increased investment flows.

In Haiti total petroleum product storage capacity is 1,688,451 barrels (bbl). Of this total storage capacity, diesel accounts for 852,405 bbl, gasoline for 369,000 bbl, fuel oil for 178,095 bbl, kerosene for 139,200 bbl and LPG for 23,271 bbl. Comparing this storage capacity to the total annual consumption of petroleum products, including the fuel consumption of power plants, it seems to be sufficient for 5-6 months of petroleum products consumption. In terms of storage capacity it is quite sufficient but it is important to know how much of this capacity holds all the time a strategic reserve of petroleum products to decrease the country's vulnerability to oil product disruption. As an example, European Union countries are obliged to maintain an oil products stock to cover 90 days of consumption (Government of Haiti, 2006).

Almost every country is making an effort to increase its capacity of petroleum whether crude or finished products because of the increasing demand for petroleum. India is building strategic crude oil storage facilities to contain a total of 5 million metric tonnes (about 35 million barrels, equivalent to 12 days of 2008 consumption) at three locations. Indian Strategic Petroleum Reserves Limited was established for this purpose; it is owned by the Oil Industry Development Board of the Ministry of Petroleum and natural gas underground rock caverns will be used for the storage, and the plan is to complete the three sites by 2012 (ISPRL, 2009).

Likewise the government of Rwanda announced in January 2009 that 7 million liters of gasoline and 5 million liters of diesel had been ordered to supplement strategic reserves containing 1.3 million liters at the time, and that construction of additional fuel storage tanks were under way (BBC, 2009).

Not long ago, the government of Uganda announced a plan to build a fuel depot in Kampala with a capacity of 150 million liters. It started building strategic fuel reserves at four locations in the 1970s, but only the fuel depot in Jinja was completed. Restocking this depot has encountered financing difficulties. In 2008, for example, the energy ministry attempted several times, unsuccessfully, to refill the reserves in Jinja. The government recently handed the depot over to a private firm as part of the Kenya-Uganda pipeline project (Among, 2009).

In Zambia, the Ministry of Energy and Water Development has been tasked with establishing national petroleum strategic reserves. The ministry issued a tender to rehabilitate government-owned depots at three locations; four more locations were to be rehabilitated in 2009, and a 40-million-liter storage facility to be constructed in Ndola to store strategic diesel stocks. Thus, before the end of 2009, the country envisaged to have strategic reserves equivalent to 30 days of consumption (Zambian Parliament, 2008). The Energy Regulation Board, through its licensing system, requires fuel suppliers to maintain a 15-day stock. Full compliance had not been achieved as of end-2008 because of the high costs of holding stocks.

The National Oil Corporation of Kenya was charged in April 2008 with maintaining strategic stocks equivalent to 30 days of consumption and eventually to reach 90 days over the coming years (Anyanzwa, 2008). The Tanzanian minister for energy and minerals stated in 2007 that the government would establish strategic petroleum reserves, but little progress appears to have been made.

The Democratic Republic of Congo (DRC) that is rich in mineral resources especially copper and cobalt saw the need to build depots for petroleum products because of the important contribution of oil to the national economy. According to Resistance Oil watch Network Bulletin Number 31 – August 2002, all products, except fuel oil are pumped about 350 km by pipeline to three Kinshasa depots. From Kinshasa, petroleum products are barged to various river ports (Mbandaka, Bumba and Kisangani) on the Congo (Congo) River for further distribution either by road or rail and that product storage is considered to be adequate for both crude and finished products. The state refinery provides a large portion of the country's total storage capacity and the government is looking to upgrade this refinery in order to increase production.

A proposed bulk fuel storage facility for the National Petroleum Corporation of Namibia (NAMCOR) will consist of ten (10) different storage tanks. The facility will be able to store 118,000m³ of five different products and provision is made to expand the storage capacity of the facility up to 238,000m³. The facility will have a throughput capacity of at least 520,000m^3/yr to either road loading or rail loading. The throughput capacity will be more if both road loading and rail loading are used simultaneously. Allowance is made to expand this capacity to 1,100,000m^3/yr. The storage tanks will all be above ground and will consist of fixed and floating rooftop tanks (Botha, 2008).

The national oil company, GEPetrol, in Equitorial Guinea is building gasoline stations around Equatorial Guinea, the third largest crude oil producer in sub-Sahara Africa. The company built a 33,000m^3 storage plant in Mbome to lay the groundwork for the opening of the service stations. The network of service stations that GEPetrol is building is aimed at meeting the growing local demand, which is a direct consequence of the recent population growth (OIN, 2010).

Equatorial Guinea has a population of about 676,273 as at 2009 and territorial area of 28,050 Km^2 as compared to the population of the Northern Region of Ghana alone of about 1,820,806 and a land area of 70,384Km^2. Total available storage capacities for petroleum products at the six facilities of the Bulk Oil Storage and Transportation, Ghana, as at 2009 are; Gasoline-140,000m^3, Gas oil-193,000m^3, and Kerosene –10,000m^3 making a total of 343,000m^3. Two of these facilities are in northern Ghana (BOST, 2011).

The fact cannot be over emphasised that petroleum products storage is very important to every country. This does not only ensure easy access to the products by consumers but also serve as security and helps to absorb price fluctuations in the international market. The general trend in oil prices is an upward adjustment. Increasing storage in Ghana will therefore be welcome investment despite the huge capital investment at the beginning. This is even more imperative now that Ghana has found Oil in commercial quantities.

2.5 Distribution and Pricing of Petroleum Products

Once landed and sent to a bulk oil terminal, petroleum products incur additional costs, including storage, transport, retailing, and wholesalers' and retailers' profit margins.

Oil marketing companies usually act as the wholesale distributors. Wholesale marketing involves the acquisition from the bulk supply link of petroleum products of the quality and

in the volume appropriate to the market. Products are delivered by road tanker to the oil marketing companies' affiliated (branded) retail service stations, as well as to bulk consumers such as power generation plants, industry, large commercial customers, government agencies, and transport fleet operators such as trucking companies and bus operators. In some markets, oil marketing companies may also deliver petroleum products to independent retailers under supply contract sales arrangements. Oil marketing companies may own the assets used in their operations or outsource most of the road transport activities to independent owner operators and use storage depots owned by others under throughput fee arrangements.

Retail marketing involves selling gasoline, diesel, and lubricants at service station outlets and selling kerosene and LPG through other shops. Depending on the arrangements with dealers, oil marketing companies have varying degrees of ownership of the assets of their own network. LPG, which is stored under pressure, has special requirements. LPG can be sourced from a refinery or a natural gas processing plant. Worldwide, 60% of LPG comes from natural gas. LPG is transported by large carriers, pipelines, or trains to storage terminals, which may be underground, refrigerated, or pressurized. From storage terminals, LPG is delivered by train, road, coastal tanker, or pipeline to cylinder filling plants and intermediate-size storage areas where it is generally stored in pressurized vessels or spheres. Cylinders are filled with LPG at bottling plants. Trucks transport LPG cylinders from the bottling plant to retailers, as well as to bulk customers. LPG is available to end-users through cylinder sales points such as commercial stores and service stations (Kojima et al., 2010).

For a given price of a petroleum product on the world market, a number of factors affect end-user prices net of tax. Some are under the control of the government to varying degrees; others are outside the control of the government and, in some situations, outside the control of any actor in the country (Kojima et al. op. cit). In the last two months of 2008, even as world oil prices were falling, fuel prices in Uganda rose. Diesel shortages there have forced fuel rationing and disrupted power supply. In May 2007, Uganda's president blamed the Kenya Revenue Authority for causing fuel shortages in his country that began in March. Technical problems with the Mombasa- Eldoret pipeline in Kenya caused supply disruptions at first. Uganda negotiated for its trains and trucks to load fuel directly in Mombasa, but the Kenya Revenue Authority authorized only five oil companies under this arrangement and required them to pay a refundable deposit before loading fuel

to ensure that they do not offload the fuel within Kenya (KBC, 2007). Rising charcoal prices in Uganda have led to higher demand for alternative cooking fuels, resulting in LPG and kerosene shortages in October 2008 which worsened in the subsequent months (Namutebi, 2009).

According to Schultz (2007), taxi fares in Dakar, Senegal's capital city, have almost doubled since 2005 and blackouts occurred frequently in 2006 because state owned utilities could not afford to pay for fuel. The country relies on oil imports to power its diesel-fired generators.

If there is a national oil company or an oil company with some state involvement that is also a price-setter (because it controls a large share of the market), the government may send signals to the company to keep prices low. Petrobras, the national oil company in Brazil, plays such a role. Gasoline producer prices in Brazil remained essentially the same between September 2005 and June 2009; diesel producer prices also remained stable until May 2009, except for a 10 % increase in May 2008. LPG prices for small consumers have remained frozen since December 2002. On the other hand, fuel prices were not lowered after August 2008 because Petrobras was still recovering the losses incurred earlier (Kojima, 2009).

In the Philippines, when oil companies raised diesel prices in July 2008, President Arroyo intervened and persuaded Petron—the largest oil company in the country and of which the Philippine National Oil Company owned a 40 % share until December 2008—to roll back half of the price increase. Other oil companies followed suit (Gatdula, 2008).

Various mechanisms by which a state can influence the pricing of its national oil company were demonstrated by Kenya in 2008. Civil society organizations in the country in September 2008 threatened mass action to force the government to intervene over high fuel prices (Xinhua News Agency, 2008). Around the same time, the president appealed to fuel marketers to lower their prices, while the Energy Regulatory Commission made a similar request of the oil companies.

The subject of petroleum products pricing has always been a contentious one. Ghana like all developing countries is always faced with the problem of a pricing scheme that will be acceptable to the population but which will not also cripple the economy. This notion has therefore influenced all pricing regimes for petroleum. Particularly, there have been times

one wonders whether politics or economics are the main pillars behind our pricing policies. As a result of the problems in the petroleum sector, government embarked on a deregulation process in 1996. A process for publishing and applying an Automatic Adjustment Formula for pricing petroleum products to ensure full-cost recovery was also completed in 2001. The National Petroleum Tender Board (NPTB) was set up to regulate pricing based on the formula.

Since October 2005, the deregulation of the petroleum sector was pushed further leading to the establishment of the National Petroleum Authority (NPA) which replaced the Tender Board and which is responsible for monitoring and publishing 'import parity' cost of refined petroleum products into Ghana based on a transparent pricing formula. The main factors that affect petroleum pricing in Ghana are crude oil prices, the exchange rate, taxes and levies and margins. Now under the enhanced phase of deregulation, the OMCs are responsible for importing crude oil and refined petroleum products (Adam, 2009).

It is important for every government to put in place distribution mechanisms that will enable consumers of petroleum products have easy access. As these are necessary, availability is of paramount importance. Even in countries where crude oil is produced prices are not sold below the cost of production and so in countries such as Ghana where some vulnerable groups should enjoy some price subsidies, it should be carefully done in order not to allow those who can pay to take undue advantage of such subsidies. Products such as kerosene and premix gasoline for the poor farmers and fishers should be deliberately targeted to avoid adulteration and diversion. The fight against deforestation can be enhanced through proper distribution of the commodity throughout the country. Distribution problems have led to the continuous use of fuel wood and charcoal with the resultant degradation of the environment.

2.6 Petroleum Products Shortages

Over the longer term, ensuring sufficient fuel stocks is an often used mechanism to protect against supply disruptions. Establishing such stocks is expensive. As a result, a plan to establish security storage capacity, even if developed, may not necessarily be implemented for lack of financing. But fuel shortages also carry economic costs. Assessing the costs and benefits of maintaining contingency stocks—and deciding how large, who maintains, and who pays—is important.

The value of maintaining some contingency stocks is universally accepted. Globally, according to a report published in October 2009 by Global Markets Direct, oil storage capacity rose from 2.39 billion barrels in 2000 to 2.96 billion barrels—or about one-tenth of world annual oil consumption—in the first half of 2009 (Kojima, 2009).

The fuel price rise in China in November 2007—which was the first increase since May 2006—followed increasing fuel shortages, which sparked violent clashes at filling stations and resulted in at least one death (Ling, 2007).

Keeping retail prices low through political means in Argentina has discouraged investment in the oil sector in recent years, resulting in diesel shortages among other consequences. In response, the government postponed the deadline for lowering sulfur in diesel from 0.15 percent to 0.05 percent by three years to 2012 (Cronista, 2008) a lag of 18 and 16 years, respectively, compared to the United States and the European Union. This delay in turn will adversely affect public health caused by outdoor air pollution.

Demand is price elastic, and price levels as well as inter-fuel price differences affect demand for different petroleum products. In Indonesia, the apparent consumption of subsidized gasoline has correlated strongly with the size of the subsidy per liter: data between January 2004 and July 2008 showed consumption rising with the gap between domestic and international prices, presumably because of greater out-smuggling and consumers shifting from unsubsidized to subsidized gasoline (IMF, 2008).

The *Data monitor News and Comment,* 2008, stressed that countries which do not align their domestic with world prices and not providing adequate compensation deter investment in the oil sector. It cited an example that in May 2008, following months of static retail prices, oil companies in Honduras threatened to stop investing in the sector altogether unless the government raised fuel price ceilings.

Rumors that fuel price hikes are imminent can lead to hoarding, causing fuel shortages. Perhaps partly to avoid such a situation, the government of Syria shut down all fueling stations in the country just prior to making the announcement that the per liter price of diesel would be increased from LS 7 ($0.14) to LS 25 ($0.49) on May 2, 2008 (BBC, 2008). Cheap LPG for household use has led to illegal conversion of cars to LPG in Syria.

Thailand, which keeps LPG prices artificially low—retail prices in Bangkok rose a mere 16 percent between January 2004 and July 2008 (EPPO, 2009) against the tripling of world prices during the same period—was hit by LPG shortages in mid-2008 due to a rising number of cars converting to LPG.

According to the African Development Bank (2009), Africa faces an energy crisis. As late as January 2008, South Africa, for instance, faced its worst energy crisis, believed to be the result of inadequate forward planning for energy supply relative to economic growth (and corresponding energy demand) in the country and in the region.

The establishment of a bulk storage company is the strategy of many countries in Africa to hold stocks of petroleum products for purposes of energy security. Several governments have assigned agencies in charge of security stocks: SONABHY in Burkina Faso, Société de Gestion des Stocks de Sécurité in Côte d'Ivoire, the National Oil Corporation of Kenya, Office National des Produits Pétroliers (National Office for Petroleum Products) in Mali, SONIDEP in Niger, the Central Energy Fund in South Africa, and the Tanzanian Petroleum Development Corporation.

Fuel shortages have had serious adverse effects on price levels in some parts of Sub-Saharan Africa. Landlocked countries such as Uganda in particular has repeatedly suffered from prolonged fuel shortages and price spikes—including the last three months of 2008 and the beginning of 2009, even as world oil prices fell sharply—due to disruptions in the supply chain from Kenya. Fuel shortages raise the prices of not only petroleum products, but also their substitutes. For example, kerosene and LPG shortages in Uganda in late 2008 and early 2009 pushed up the prices of charcoal, used in cooking, as some shops ran out of kerosene and LPG (Namutebi, 2009).

Fuel rationing is one possible immediate response to a shortage. Rwanda, which also imports petroleum products from Kenya, used fuel rationing effectively in January 2008 in response to supply disruptions following the Kenyan elections. The government limited gasoline sales for small cars to 10 liters and for jeeps to 20 liters a day (BBC, 2008). Fuel rationing was ordered again at year's end, this time because of a regional fuel shortage again originating in Kenya. Gasoline sales were limited to an equivalent of 20 liters per vehicle (Gahamanyi, 2008). These steps appear to have helped avoid the large price fluctuations observed in the neighboring countries.

Malawi's minister of natural resources, energy, and environment reported recently that the government planned to establish a national oil company aimed at ensuring the security of supply of petroleum products (Xinhua, 2009).

According to Kojima et al., 2010, Senegal has a 1998 decree fixing the modalities for maintaining security stocks and Botswana sub-contracts maintenance of contingency stocks to two oil marketing companies. They also indicated that the government of Uganda announced a plan in early 2009 to build a fuel depot in Kampala with a capacity of 150 million liters to maintain security stocks in the country.

Fuel shortages create black markets, especially in rural areas, so that the poor for whom price subsidies are intended often do not benefit from them. Chronic fuel shortages in Nigeria have pushed up prices on the black market; the Petroleum Products Pricing Regulatory Agency told a senate committee in February 2009 that the actual price paid was much higher than the official subsidized prices even in Port Harcourt, a major coastal city (Ojeifo, 2009).

Price differences for fuels that are strongly substitutable lead to adulteration and illegal diversion. In Ghana, premix is gasoline used for fishing boats. It is specially formulated for two-stroke engines, and its price is much lower than that of automotive gasoline. Adulteration of automotive gasoline with premix is reported to be rampant, decreasing the research octane number (RON) to as low as 86 and causing damage to car engines (Attenkah, 2006).

When plans are not put in place to ensure enough fuel storage as strategic reserves and for distribution in areas far from refineries or shipped finished products, there is bound to be fuel supply shortages and its related problems. In 2007, there were reports of difficulties in reaching 20,000 flood victims with relief items in the Saboba/Chereponi district in northern Ghana because of inadequate fuel and means of transport (Ghana News Agency, 2007).

Just as large storage capacity can be a measure in mitigating the effects of shortages of petroleum products in the market, it is incumbent on governments not to unnecessarily intervene in fuel price adjustment as this can encourage hoarding of the commodity by dealers resulting in artificial shortages. Wide price disparities in our neighbouring countries can also lead to smuggling, thus causing shortages.

2.7 Importance of Petroleum Products

Petroleum products are used across the entire economy in every country. Gasoline and diesel are the primary fuels used in road transport. Oil is used in power generation, accounting for eleven percent of total electricity generated in Africa in 2007 (IEA, 2009). Adequate and reliable supply of transport services and electricity in turn are essential for economic development. The private sector that is seen as the engine of growth cannot operate without adequate and reliable supply of petroleum products.

The African Development Bank (2009) stated that energy insecurity undermines human development and institutional capacities and lowers economic growth. Energy security is correspondingly closely linked with social, economic, political, and environmental development, thus making it a cross-cutting issue rather than one of simply finding geological energy resources.

Households use a variety of petroleum products: kerosene for lighting, and cooking; liquefied petroleum gas (LPG) for cooking and use by vehicles; and gasoline and diesel for private and commercial vehicles as well as captive power generation. Fuel and other price increases effectively reduce household income. For those who are already below the poverty line, this could mean forgoing such essential goods and services as food, housing, primary healthcare, and education. Effective income reduction could also force some previously non poor households into poverty (Kojima, 2009).

According to UNIDO and FAO (2008), in a world where agriculture is increasingly a commercial activity, Sub-Sahara Africa (SSA) exhibits historical patterns of subsistence farming in a deteriorating physical environment. Agricultural communities are thereby locked into poverty, food insecurity and excessive reliance on food imports. Increasingly, rural youth, who associate subsistence and even potential commercial farm activities with hard physical labour and drudgery, are disenchanted with the meager opportunities for a rural livelihood, worsening an already marked tendency to rural–urban migration.

Farm power in African agriculture, especially SSA, relies to an overwhelming extent on human muscle power, based on operations that depend on the hoe and other hand tools. Such tools have implicit limitations in terms of energy and operational output in a tropical environment. In general, animal and tractor power have both declined in African agriculture in the past few years, making agriculture yet more reliant on manual methods in a continent where constraints such as severe health problems and demographic shifts

make manual labour a scarce and weak resource. These methods place severe limitations on the amount of land that can be cultivated per family. They reduce the timeliness of farm operations and limit the efficacy of essential operations such as cultivation and weeding, thereby reducing crop yields.

Agricultural mechanisation is the application of mechanical technology and increased power to agriculture, largely as a means to enhance the productivity of human labour and often to achieve results well beyond the capacity of human labour. This includes the use of tractors of various types as well as animal-powered and human-powered implements and tools, and internal combustion engines, electric motors, solar power and other methods of energy conversion.

Average agricultural value added per worker is low in many countries, reflecting a low degree of mechanisation and limited penetration of improved seeds and inputs such as fertilizers (Economic Commission for Africa, 2009).

Mechanisation also includes irrigation systems, food processing and related technologies and equipment. Productivity growth will require an expansion of area irrigated (less than four percent of cultivated land is irrigated (The World Bank, 2008).

The above literature points to the importance of mechanisation in agricultural production in Sub- Sahara Africa. The crucial fact is however that no mechanized agriculture can be successful in our part of the world, especially with the use of tractors without adequate and reliable supply of petroleum products. In Ghana over sixty percent of the population depends on Agriculture for their livelihood (Al-Hassan and Diao, 2007), particularly northern Ghana where majority of the population is in Agriculture.

The northern parts of Ghana comprising Northern, Upper East and Upper West Regions have been described as the most poverty stricken and hunger spots in Ghana (GSS, 2000). The high incidence of poverty in northern Ghana has been attributed to exclusion from trade and the slowdown of growth in the staple crop sub-sector. Northern Ghana can also be a conduit for trade from landlocked Sahelian countries to ports in the south, increasing its role in the region as well as exporting to neighbouring countries (Aryeetey and Mckay, 2004; ODI and CEPA, 2005).

This again justifies the importance of petroleum products, especially diesel and gasoline which are used by vehicles for the transportation of people, goods and services. Majority of the people in northern Ghana derive their livelihood from agriculture and trade.

The development of domestic and inter-country land transport linkages provides the opportunity for countries to promote their integration into the multilateral trading system through the development of economic corridors and growth poles which are located away from the traditional coastal cities. Agricultural growth will deliver the broadest based growth. However, the fastest growth is likely to come from tourism and trade, and possibly mining (ODI/CEPA, 2005).

Energy is a necessity in all stages of agricultural production. The energy needs for agricultural production in rural areas range from intensive power use in transport, water lifting and pumping, land preparation, primary and seedbed cultivation, to weed control, planting, transplanting and harvesting (UN-DESA, 2004).

There appears to be a close link between per capita commercial energy consumption in Africa and daily per capita calorie intake – a key indicator of food security (FAO, 1995). Low per capita commercial energy consumption is almost always matched by low daily per capita calorie intake. This correlation is particularly strong in countries with less than 500 kilogramme oil equivalent (kgoe) per capita modern energy consumption – the per capita figures for the majority of African countries (particularly sub-Saharan Africa) is significantly lower than the aforementioned 500 kgoe figure (FAO, 1995). For African countries such as South Africa, with high per capita modern energy consumption, the link is much more tenuous.

Deforestation rates in Ghana are amongst the highest in Africa, with current levels of wood-fuel consumption far exceeding forest growth. The challenges are therefore to reverse the decline of the wood-fuel resource base of the country by encouraging wood-fuel forestry and promoting the use of alternative fuels such as LPG as substitute for wood-fuel (UNESCO, 2010).

Indirectly petroleum products are very important for governments, essentially because they are a source of revenue through tax contributions. Furthermore, both downstream and upstream industries and associated services employ a significant number of people (African Development Bank, 2009).

BOST is much more than Ghana's emergency petroleum lifeline and is responsible for implementing government policy to ensure stability in supply and price levels of petroleum. The provision of reliable and affordable petroleum products plays a vital role in the sustainable economic growth of nations globally. In the mid-1990s, Ghana initiated a development plan aimed at transforming the economy from a low-income level to a middle-income status by the year 2020. Under this plan, a forecasted average real GDP growth of 7-10 percent and a per capita income increase from about US $400 to US $1,000 for the period 2001 to 2015 have been targeted. This is expected to change the economy from the current subsistent agriculture base to a new status based on modern industries and services.

To achieve these goals, adequate and reliable supply of fuel is required to drive the economy. This is due to the economic impact of energy production and the nexus between energy and development (Asamoah, 2008).

2.8 Policy Intervention

According to Kojima, (2009), at the peak of high oil prices, nearly all developing countries intervened with price-based policies to mitigate the price increase on the world market for at least one fuel. Policy reversals and postponement of price reform were common—governments that had earlier deregulated fuel prices or adopted automatic price adjustment mechanisms froze and subsidized retail prices, while others that had announced fuel price subsidy removal postponed price reform. Colombia in May 2008 postponed the removal of gasoline and diesel subsidies by a year. Both Jordan and Vietnam were to eliminate subsidies by 2007 but postponed. Several governments have taken steps to move away from universal price subsidies, most of them after world oil prices began to come down.

It is the Government of Ghana intention to ensure increased local refining capacity to meet both domestic demand and exports. Currently, about 60 % of domestic demand can be met by the TOR. To bring refining capacity to acceptable levels, there is the need to expand the capacity of TOR and also improve its operations. The Government intends to invest US$300 million in TOR to increase its capacity by about 100,000 barrels per stream day from its current level of 45,000. About US$683.5 million is to be injected into the operations of the Bulk Oil Storage and Transportation Company Limited (BOST), in the medium term period up to 2015, to improve bulk transportation of petroleum products

especially to the northern parts of the country (Emeafa and Seidu, 2010 and UNESCO, 2010).

According to the Ghana Energy Sector Strategic Plan, 2010, the diagnosis of the problems in the petroleum downstream sector has been that;

- The Tema Oil Refinery (TOR) has high levels of debt owing to a combination of factors including under-recovery of costs, inadequate working capital and poor management.
- The refinery also has inadequate local refining capacity.
- There is inadequate storage capacity, bulk transportation and distribution infrastructure for petroleum products including LPG.

The Policy responses therefore seek to;

- Ensure competitive procurement of crude oil and petroleum products.
- Open up the refining business to both public and private sector participation.
- Ensure strict adherence to implementation of full-cost recovery principles in petroleum pricing.
- Improve regulatory regime for petroleum products transportation, distribution and sale.

2.8.1 Increasing Domestic Production of Petroleum Products

With only about 60% of the national petroleum product requirement being met from domestic production at the Tema Oil Refinery (TOR), the balance of product requirements is imported. There is also the need for Ghana to build adequate capacity to enable it become not only self sufficient in the production of petroleum products but also the "Petroleum Hub" of the West African Sub-region. Feasibility studies have shown that the expansion of TOR is economically justified and its capacity can be increased from 45,000 Barrels Per Stream Day (BPSD) to 145,000 BPSD. The Government has already initiated the process of building new refineries. These projects are to be fully developed and financed by the private sector (Republic of Ghana, 2010).

2.8.2 Increasing National Access to Petroleum Products

According to the Energy Sector Strategic Plan, 2010, access to petroleum products in the rural areas is inadequate due to limited infrastructure for storage and equipment for distribution and use. The situation has led to the rural population having to purchase

kerosene and LPG at higher prices than the official prices. The medium term strategic objective is to increase access to petroleum products particularly LPG and kerosene in rural areas by continuing to finance the development of rural kerosene storage and supply infrastructure nationwide. The Ministry of Energy is giving further impetus to the Rural Kerosene Promotion Programme.

BOST is expanding existing bulk petroleum products storage capacity and there will be expansion in marine related facilities on the Volta Lake for bulk transportation to ensure year-round supply of petroleum products to Northern Ghana and to facilitate the availability of more petroleum product distribution outlets in deprived areas to increase access density (number of persons per sale outlet). The policy also aims at promoting a more efficient licensing regime for sales outlets to ensure optimal economic benefits to both investors and consumers, and support the rehabilitation and expansion of rail infrastructure to enhance the transportation of petroleum products.

With regard to LPG, it is intended to increase access from the current level of 6% of households to 50% by 2015. This will be achieved through the development of LPG infrastructure and pricing incentives to encourage distributors to expand their operations to especially the rural and deprived areas. The following measures will be implemented in that regard:

- Speed up the establishment of a Natural Gas Processing Plant to produce LPG from the associated gas to be produced from the Jubilee Oil and Gas Field. It is estimated that 10,000 barrels (1,340 tonnes) a day of LPG could be produced from the gas from the Jubilee Field.
- Re-capitalise the Ghana Cylinder Manufacturing Company to expand production capacity. The production of cylinders will focus on small sized cylinders that will be affordable to households in rural communities.
- Construct LPG Storage and supply infrastructure in all regional and district capitals in the long term. In the medium term, it is intended to develop district capital LPG infrastructure and increase the LPG distribution margin.

2.9 Summary of literature review

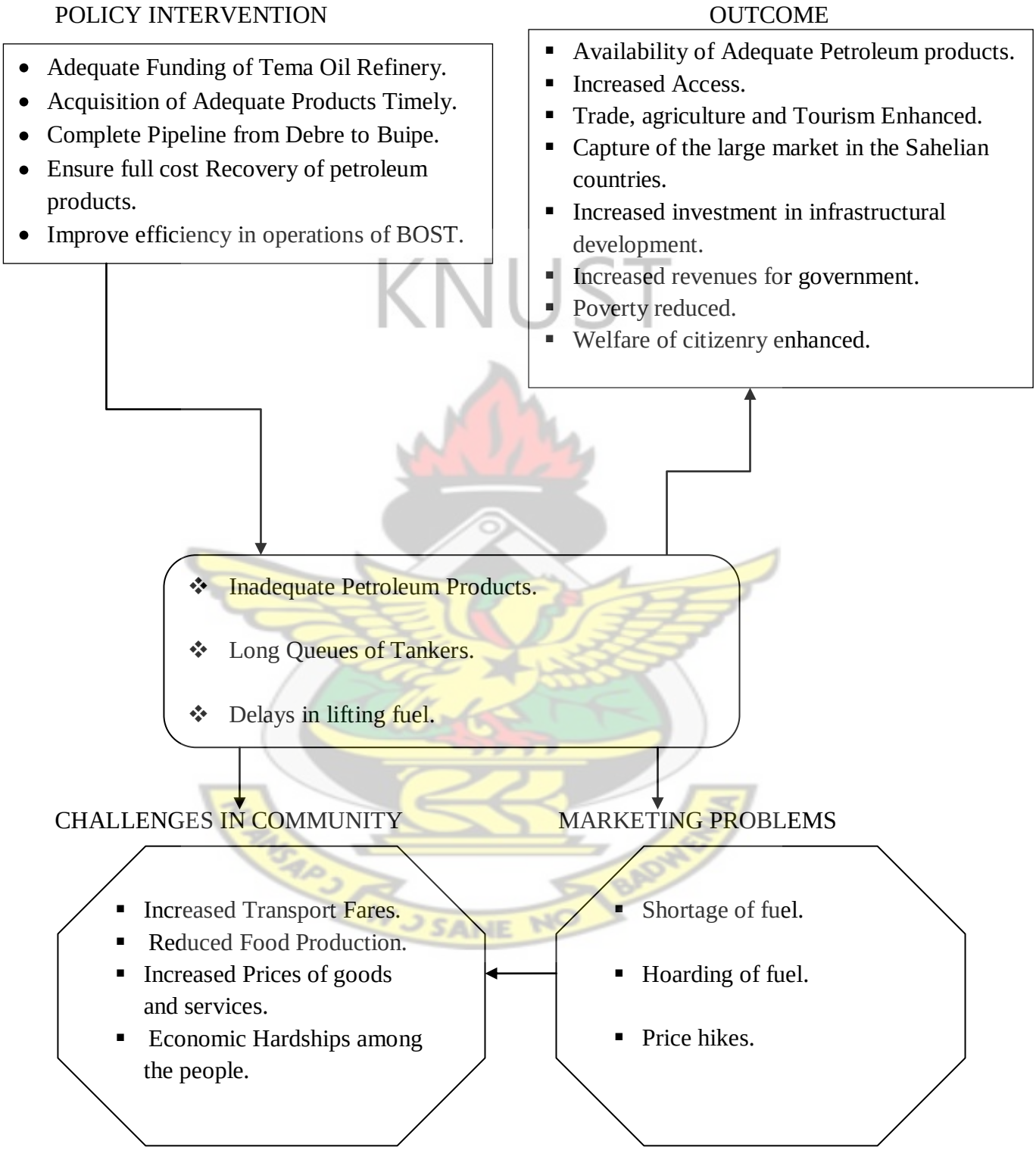
Literature has revealed the different types of transportation channels used in delivering petroleum products to the final consumer. It indicates that pipeline transportation is the

cheapest followed by water/marine, rail and then road. Storage of petroleum products is also important as a strategy for stock reserves and for distribution to consumers. Almost every country is making an effort to store adequate products in the face of financial constraints to avoid the repercussions of shortages.

Petroleum products prices are influenced by many factors such as government intervention for political expediency, speculation and hoarding, smuggling, and infrastructural difficulties and sometimes conflict situations.

Governments attempt to involve the private sector in the importation and building of depots and the improvement of operations of the public sector. Literature emphasizes the importance of energy as closely linked with social, economic, political, and environmental development, thus making it a cross-cutting issue rather than one of simply finding geological energy resources. The necessary policy environment should be created to enable the private sector to find space in the petroleum industry to participate. There have been complaints of the limited facilities at Tema and Takoradi ports for the discharge and storage of petroleum products by private operators engaged in the Bulk acquisition and distribution of petroleum products.

Fig 2.1 Conceptual Framework



Author's construct, 2011

The conceptual framework of this study envisages the Bulk Oil Storage and Transportation depot in Buipe to have problems with petroleum products acquisition leading to congestion and long queues of fuel tankers at the depot. These finally result in the delay of lifting products to the various destinations in three northern regions, bringing about shortages of the commodities with the resultant consequences of price hikes, and hoarding.

The consequences of petroleum products shortages translate into increased transport fares bringing about increased prices of goods and services thereby worsening the living conditions of an already poverty stricken people as indicated by the Ghana Statistical Service in the 2000 Ghana Living Standards Survey.

It is hoped that policy interventions in the form of improving the infrastructural, financial and operational base of the company together with the political will to stick to the automatic formula of adjustment of petroleum prices to move in tandem with world market prices, there can be security and reliable delivery of petroleum products to northern Ghana.

Literature has it that over 60% of the people in northern Ghana depends on agriculture and trade for their livelihood. A reliable supply of petroleum products will therefore boost mechanized agriculture, a key focal area in the Ghana Shared Growth and Development Agenda, Policy Framework- 2010 to 2013(NDPC, 2010). It will also in no doubt facilitate trading activities domestically and inter-country that comes with improvement in the economic fortunes of the people.

As indicated by the African Development Bank (2009), energy insecurity undermines human development and institutional capacities and lowers economic growth. Energy security is correspondingly closely linked with social, economic, political, and environmental development, thus making it a cross-cutting issue rather than one of simply finding geological energy resources. The availability of opportunities to wealth creation and improved living conditions can help bring about peace and stability in the northern part of Ghana.

CHAPTER THREE

PROFILE OF THE STUDY AREA

3.1 Introduction

Knowledge about the area where research is carried out is important to the relevance of the research. It informs the researcher on the appropriate method that should be used for the conduct of the research.

3.2 Profile of Northern Ghana

Northern Ghana comprises the Upper West, Upper East and Northern Regions of Ghana. It has a land area of approximately 98,000 km^2 which is about 41% of the total land area of Ghana. By contrast its share of the total population is under 20% (17.5% per the 2000 Population and Housing Census). Northern Ghana lie roughly north of the Lower Black Volta River, which together with other tributaries the White and Red Voltas and the Oti and Daka rivers drain the area that comprises it. It shares international boundaries with the Burkina Faso to the North, Togo to the East and Cote d'Ivoire to the lower Southwest. To the South, northern Ghana shares regional boundaries with the Brong Ahafo Region and the Volta Region.

It lies within the rather fragile Guinea Savannah agro-ecological zone except in the extreme northeastern corner where the Sudan Savannah takes over as the dominant bio-climatic type. The main vegetation is classified as vast areas of grassland, interspersed with the guinea savannah woodland, characterised by drought-resistant trees such as the acacia, baobab, shea nut, dawadawa, mango, and neem.

Rainfall which is the major climatic element has a strong influence on animal and plant life and since it comes seasonally and variably from year to year it gives rise to a cycle of agricultural activity. These climatic conditions get worse towards the extreme northern frontier with Burkina Faso as the amount of rainfall reduces in these areas.

The economic base of the area hinges on smallholder agriculture with over 80% of the population depending on it for their livelihood. Agriculture and agro-based industries still remain the main stay of the peoples of this zone. Varieties of cereal crops and legumes such as millet and sorghum, cowpea, groundnuts as well as rice are cultivated. Rice cultivation in the low lying areas close to the banks of the Volta and its tributaries is of

some commercial importance. The rice industry may have declined somewhat from what it used to be in the 1970s but it still remains an important local industry. Tubers are cultivated as staples in the middle and southern parts of the area which today supplies the bulk of the country's requirement for yam. Animal husbandry has since traditional times been an integral feature of agriculture in these parts of Ghana. The industry is declining however. In addition to agriculture, trade and craft production are important to the people of the northern zone. Many families in the north survive on trade both outside and within the north. Women especially trade in agricultural produce, local craft, and textiles to make a living for their families while a lot of men transport livestock to the south.

3.2.1 The People of Northern Ghana

Northern Ghana today is home to a number of different peoples speaking a variety of related languages and exhibiting considerable cultural similarities. Some of these peoples claim to be autochthonous while others like the dominant or aristocratic lineages among the Dagomba, Mamprusi and Gonja claim descent from warrior immigrant groups that invaded the area and imposed their rule over the indigenous peoples. They intermarried with these peoples whose daughters they took as wives and whose languages and social norms they eventually adopted. Their traditions of foreign origin and the associated exploits remain and are recited by professional court drummers and fiddlers. These have been recorded by modern historians. Thus, in the traditional states of northern Ghana migrant groups and indigenes coexist.

On ritual occasions the differentiation may be dramatised in rituals which highlight complementation and opposition. Migrant groups, usually the conquering minority have often adopted the local languages and absorbed the social features of the indigenes among whom they found themselves. The integration has in many cases been so effective that a visitor, unless told, could not possibly guess the differences. However, in some parts the differences between royals and commoners still matter in local affairs.

Many northern people, though not all, had until recently facial markers that were either for ethnic and clan identification or for therapeutic and aesthetic purposes. By these marks it was possible to tell an individual's ethnic origin. Though a few old individuals still spot facial features these marks are now rare and out of vogue. In some communities traditional leaders are campaigning against facial marks (Awedoba, 2006).

3.2.2 Political and Administrative Structure

The regions are administered politically from the regional capitals; Tamale for the Northern Region (N/R), Bolgatanga for the Upper East Region (UE/R) and WA for the Upper West Region (UW/R). The main administrative structure at the regional level is the Regional Co-ordinating Council (RCC), headed by the Regional Minister. Other members of the RCC include representatives from each district assembly, regional heads of decentralised ministries, and representatives of the Regional House of Chiefs. The three regions have one (1) Metropolitan, four (4) Municipal and thirty-three (33) district assemblies.

Each assembly is administered by a Metropolitan/Municipal/District Assembly headed by a Chief Executive nominated by the President in consultation with the traditional leaders and approved by a two-thirds majority of the Assembly Members present and voting. Two-thirds of the members of the Assembly are directly elected. The other one-third is appointed by the Central Government. Members of Parliament are ex-officio members of the Assemblies in which their constituencies are located.

The assemblies are autonomous with regard to the planning, budgeting and implementation of projects. The assemblies are further subdivided into Zonal/Area and Town Councils with Unit Committees at the grassroots.

With their own designated roles, there is also effective traditional leadership and vibrant Youth Development Associations to facilitate efficient and effective mobilization of local resources. The decentralisation process is thus empowering the District Assemblies and the local people to take their destiny in their own hands. Local economic development is championed with the participation of the people within the context of sustainability.

3.2.3 Human Development

In terms of human development indicators, although the northern savannah regions account for a mere 20% of the national population the incidence of poverty is about 60% in this zone as compared to a national figure of 28.5%.

Table 3.1 shows an assessment in 2009 of Metropolitan, Municipal and District Assemblies (MMDAs) which reveals that the ten top poorest MMDAs were all from northern Ghana. This situation calls for measures to bring about improved living conditions in those areas and the north in general. Agriculture which is the dominant

occupation should be seriously mechanized as one of the measures to the poverty issue. Reliable and adequate petroleum products are therefore an important component in tackling the problem.

Table 3.1 Top Ten poorest MMDAs in Ghana in 2009

MMDAs	Region	Poverty Incidence 2009	Ranking 2009
Nadowli	Upper West	0.851	1
Jirapa Lambussie	Upper West	0.824	2
Sisala East and West	Upper West	0.818	3
Lawra	Upper West	0.817	4
Bawku West	Upper East	0.796	5
Wa	Upper West	0.790	6
Bongo	Upper East	0.783	7
Builsa	Upper East	0.767	8
Bawku East	Upper East	0.743	9
Kassena Nankana	Upper East	0.688	10

Source: NDPC, 2009

The health and nutrition conditions of its people are among the worst. The regions for example have the worst doctor/population ratios; 1:56940 for N/R, 1:37603 for UE/R and 1:47932 for UW/R as compared to the next worse of 1:33623 in the Western Region (NDPC, 2009).

Similarly as a result of colonial educational policies, northern Ghana had both the highest levels of illiteracy and lowest levels of school enrolment. According to the Census of 2000, nearly half (46%) of the population in Ghana is illiterate. Moreover, there are marked regional disparities: the proportion of the population that is illiterate in Greater Accra is 21%, whereas in Ashanti it is 40%, in Brong Ahafo it is 54%, and in the three northern regions it is 76% and over. These wide disparities follow similar trends in other development indicators, including poverty, child mortality, maternal mortality, and malnutrition. Whilst all regions other than those of the northern sector had over 70% of six year olds in school in 1984/85 the percentage of six-year olds in school was 31%, 36% and 38% for the Northern, Upper East and Upper West Regions respectively.

The situation in these enrolments however has changed; in 2008/2009 the Gross Enrolment Ratio at the primary school level was 93.5%, 94.1% and 100% for the Northern, Upper East, and Upper West Regions respectively.

3.2.4 Labour Migration and its Consequences

The relative wealth of the forest zone in terms of gold-mining, timber and cocoa have created an important magnet for surplus labour in the savannas ever since the 1920s onwards when cheap transport made possible seasonal migration (Hilton 1961; Hunter 1965; Caldwell 1969; Riisøen et al. 2004). A pattern developed of young males travelling south towards the goldfields and cocoa plantations of the south of Ghana. The usual strategy was to return for the wet season and assist with farm work. Another aspect of migration, however, was that it took pressure off food and other resources in areas where the human population density was high. There were fewer mouths to feed in the hungry season and the migrants sent back cash which could be used to buy food. As pressure on the land has increased this element has become of major structural importance in household strategies.

Labour migration however has its disadvantages as the young energetic men in the family leave for a long time without remittances going back to the aged and women they leave behind. Clearing of land which is the traditional role of men is forced onto women in addition to their numerous household chores. The drudgery and less paid farming activities in the north become a push factor for most of these young men and of late women.

Farm power in agriculture in the north is largely dependent on human muscle power, which has limitations in terms of energy and operational output. Timely and essential farm operations such as land preparation and weeding are delayed resulting in low food production, food insecurity and poverty. Mechanized agriculture could turn things around for the better but this will succeed with reliable and adequate supply of petroleum products that are needed to power farm machinery and even other vehicles.

3.2.5 Human Population: Nutrition and Disease

Settlement pattern in northern Ghana is dispersed nucleated compounds making delivery of centralised services problematic. The low investment in agricultural labour and hence in soil and water conservation also reflects the poor state of health of many individuals in this region. The low output from the farming system is responsible for marked seasonal hunger, low bodyweights and systematic malnutrition of all sections of the population

(Hunter 1967; Tripp 1978, 1981, 1992; Benneh 1985). This makes the populations particularly susceptible to the epidemics of cerebro-spinal meningitis that sweep through the region every dry season, often with considerable mortality. Much effort has been made to rid the north of the debilitating guinea worm disease which has been a major cause of farm labour loss. Even though the number of cases has reduced the disease still exist. Table 3.2 gives some welfare indicators of the three regions in the north which are all below 50%, apart from improved water source. Improved incomes from agriculture through agricultural mechanization could help improve these indicators.

Table 3.2 Selected Welfare Indicators (in percentage)

Indicator	Northern Region	Upper East	Upper West
Adult Literacy	22.6	23.0	24.4
Youth Literacy	35.7	45.0	46.2
Health Access	35.0	26.7	30.4
Child Nutritional Status			
Stunted	39.0	28.8	25.0
Wasted	10.7	16.6	9.7
underweight	25.5	21.1	16.2
Difficulty in Food needs	8.7	40.3	23.3
Improved Water Source	54.4	79.4	90.0
Safe Sanitation	23.5	10.7	23.3
Non-wood Fuel Used in Cooking	1.8	34.6	1.6

Source: GSS, 2003

3.2.6 Sources of Fuel

Wood fuel is the main source of fuel in northern Ghana leading to unsustainable harvesting of trees. Today in the Upper East region fuel wood is scarce to the extent that dried stems of sorghum and millet are used for that purpose. The demand and use of Liquefied Petroleum Gas (LPG) is therefore increasing especially among regular salaried workers. There is also demand for gasoline and diesel to power farm machinery and transport vehicles. These are acquired from OMCs dotted around the three northern regions. The concentration of these OMCs is in the Tamale Metropolis in the Northern Region.

It is believed that at the beginning of the last century, woodland covered about 9.4 million hectares of the northern savanna zone, producing mainly wood fuel and a small amount of

building poles for local use. About 70% of Ghana's total supply of firewood and charcoal, estimated at 16 million m^3, comes from savanna zones, which also provide medicinal plants (the primary source of healthcare to residents), roofing grasses, fencing poles, bush meat and fruits. The savanna zones are under tremendous pressure from growing human and livestock populations, agricultural expansion and inappropriate farming practices, deforestation, and annual bush fires (Country, 1994).

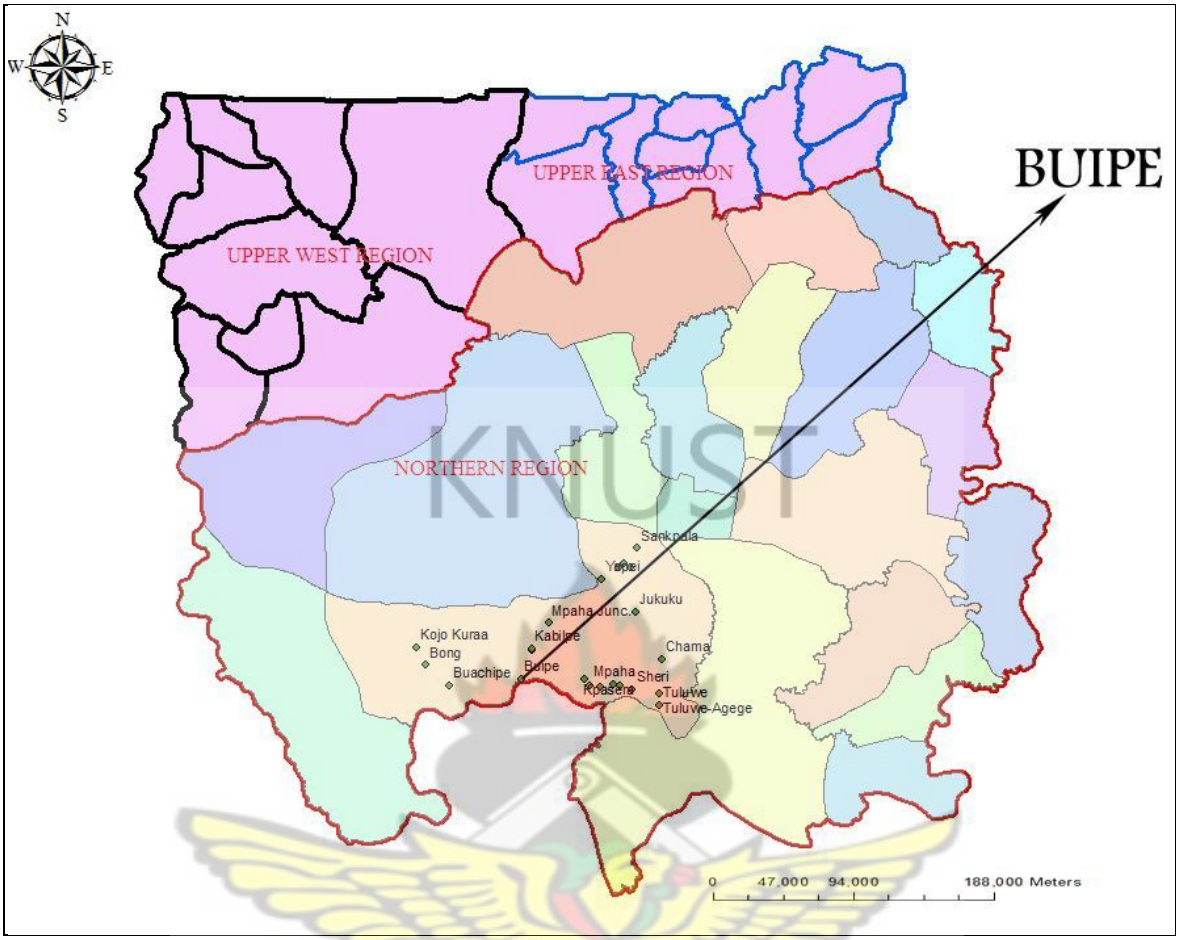
The demographic characteristics shown in table 3.3 indicate that the three northern regions are predominantly rural with the private informal sector providing employment to majority of the people, especially in the agricultural sector. The dependency ratio in the zone is almost 1:1; which is one economically active person taking care of one dependent person. The low agricultural output and low prices for produce however put a lot of strain on parents in taking proper care of their dependents. The average house size is still large and poses economic challenges to the actively working population. The number of households headed by women on the average is more than 12% and this has serious socio-economic implications for such families considering the custom of patrilineal inheritance of the people of northern Ghana.

Table 3.3 Demographic Characteristics

	Northern Region	Upper East Region	Upper West Region
Total Fertility Rate	4.9	4.7	6
Child Mortality	171/1000	48/1000	115/1000
Dependency Ratio	103%	99.2%	98.2%
Household Size	7.4	6.4	7.2
Female Household Head	14.1%	12.2%	18.4%
Employment Sector			
Private informal	83.4%	74%	_
Private formal	11.5%	21.2%	_
Public sector	4.3%	0.2%	_
Rural/Urban	Rural	Rural (84.3%)	Rural (82%)
Population Growth Rate	2.8%	1.1%	1.7%

Source: GSS, 2000

Fig 3.1 A MAP OF NORTHERN GHANA SHOWING THE STUDY AREA



Source: Adopted from the Centre for Remote Sensing and Geographic Information Systems, 2011.

3.3 Profile of Bulk Oil Storage and Transportation Company

The Bulk Oil Storage and Transportation Company Ltd was incorporated in 1993 as a private Limited Liability Company with the Government of Ghana as the sole shareholder. BOST has the mandate to develop a network of Storage tanks and Pipeline infrastructure throughout the country and to keep strategic stocks for Ghana. It has been given an additional mandate as the Natural Gas Transmission Utility (NGTU) to develop the Natural Gas infrastructure throughout Ghana. Until May 2001, BOST was responsible for the distribution of petroleum products from its seven strategically located depots. These depots could be found in the Accra Plains, near Tema, Mami Water, after the Adomi Bridge, Akosombo, Kumasi, Buipe, Bolgatanga, and Takoradi. BOST was also made to announce revised petroleum prices on behalf of government.

BOST has storage facilities at six locations within the country namely; Accra Plains, Mami-Water, Akosombo, Kumasi, Buipe and Bolgatanga with plans to develop same at Takoradi and Wa in the long term. Total available storage capacities for petroleum products at these facilities according to BOST, 2011 are;

- Gasoline – 140,000m^3
- Gas oil – 193,000m^3
- Kerosene –10,000m^3

These storage facilities are complemented by a network of pipelines linking the Accra Plains to Mami Water and Akosombo, as well as, Buipe and Bolgatanga in the northern sector of the country. The Accra Plains facility is also linked by a twin 6-inch pipelines to the Tema Oil Refinery and an 18-inch pipeline to the offshore Conventional Buoy Mooring (CBM) (BOST, 2011).

The vision of the BOST is to become a preferred provider of Oil and Gas logistics in the West African sub- region and the mission to ensure provision of adequate fuel security and natural gas transmission through the development and maintenance of appropriate infrastructural network that would facilitate an efficient and cost effective transportation and distribution service to its clients and the people of Ghana.

The objectives of the company are;

To own, manage, maintain and develop a national network of oil pipeline and storage depots.

To acquire, rent, lease any storage depots that will enhance the operations of the national network.

The company's core values are to be leaders in best industry practices in corporate governance and environmental safety. BOST implements the Government's policy to ensure stability in the supply and the price levels of petroleum products in Ghana. The people of Ghana through their freely elected government as well as business industry and commerce are the main stakeholders in the business of BOST. The major partners BOST deals with are Tema Oil Refinery (TOR), Oil Marketing Companies (OMCs), Volta Lake Transport Company (VLTC), and the National Petroleum Authority (NPA).

The Buipe depot of BOST is located in the Central Gonja district capital of Buipe. It is strategically located close to one of the tributaries of the River Volta, the Black Volta, so that it could make use of Lake Transport in conveying its products. There are pipelines from the Accra depot of BOST linking Akosombo where petroleum products can be pumped into a barge to be transported to Buipe. On reaching Buipe there are also pipelines that are connected to the storage tanks at the depot to facilitate easy discharge of the products.

The Buipe depot is also located close to the main Kumasi-Tamale highway to enable easy access of the fuel tankers that either deliver petroleum from the southern part of the country by road to the depot or tankers that come from various parts of the northern sector to lift petroleum products for onward distribution to numerous Oil Marketing Companies.

The depot enjoys virtual monopoly in the distribution of petroleum products to the Oil Marketing Companies in the northern sector as it faces no competition by any other Bulk Distribution Company. It distributes mainly diesel and petrol and Oil Marketing Companies can only lift products from depots in the southern sector when the product is not available at Buipe.

CHAPTER FOUR

RESEARCH METHODOLOGY, DATA ANALYSIS AND DISCUSSION

4.1 Research Methodology

A successful research depends on three basic elements in the course of the research. These are the source of the data for the research, the method(s) used in collecting the data, and how the data are finally analysed, interpreted and presented (Kumekpor, 2002). In this research the concern is on finding out how the operations of the Bulk Oil Storage and Transportation Company Limited (Buipe) ensure reliable supply of petroleum products to northern Ghana. It was therefore a matter of cause that the company (BOST) at the centre of this study and stakeholders in the petroleum products business such as bulk transporters and Oil Marketing Companies in the north became the source for data collection. The case study method was used with questionnaire as a means of collecting the data and descriptive analysis of the data carried out.

4.2 Research Design and Method

The design of this research was informed by the definition of the problem to be investigated (the unreliable supply of petroleum products to northern Ghana leading to periods of product shortage that affect economic activities of the people). The objective was therefore to assess the operations of Bulk Oil Storage and Transportation Company in the delivery of petroleum products to northern Ghana. The Bulk Oil Storage and Transportation Company has the mandate to ensure petroleum products supply to the area.

Frankfort-Nachmias and Nachmias (1992) explain that the scientific methodology is a system of explicit rules and procedures on which research is based and against which claims of knowledge are evaluated. They however contend that this system is neither closed nor infallible but that the rules and procedures are constantly being improved for new means of observation, inference, generalisation, and analysis.

Kumekpor (2002) describes the case study method as one which enables the investigator to grasp and understand an individual, a group, a community, a social situation or an issue in order to make decisions that take into consideration the special and peculiar circumstances surrounding the case investigated.

The study therefore adopted the cross-sectional design for this research considering the special situation of BOST and the other players in the transportation and distribution of petroleum products to northern Ghana. The cross-sectional design allows research to be carried out in a natural setting and also for statistical inferences and generalisations to a broader population. It will be very difficult to take the views and opinions of all the stake-holders who deal in petroleum products. The case study was the specific approach adopted as it allowed the researcher to investigate and understand the dynamics of a particular phenomenon and involves procedures and techniques usually, but not exclusively based on interviewing. The research found this approach appropriate as observations and information gathered beyond the use of questionnaire were used.

4.3 Population and Targeted Units

The population for the purpose of this research constituted the staff of BOST, Tanker drivers who lift petroleum products from the BOST, Buipe; and representatives of Oil marketing Companies from the Tamale Metropolis. These three entities formed the targeted units for data collection and were selected based on purposive sampling. They were purposely selected because they deal directly with the acquisition and distribution of petroleum products in the north and will be appropriate for the requirements of the study.

4.4 Sample Frame and Sample Size Determination

Table 4.1 Sampling frame and sample size for the research.

Name of group	Membership	Sample interviewed
BOST	10	8
Tanker Drivers	100	82
Representatives of Oil Marketing Companies	25	21
Total	135	111

Source: Field Survey, 2011

Table 4.1 represents the sampling frame and the sample size that was interviewed during the study. They three groups had a population of 135 members and the sample size interviewed was 111.

The Bulk Oil Storage and Transportation had a staff of 10 and 8 of them were interviewed. The tanker drivers had a membership of one hundred who come from various parts of

northern Ghana to lift petroleum products from Buipe. All of them were not present in Buipe at any particular time. As some of them got their consignment and were leaving some also arrived. There were twenty-five representatives of Oil Marketing Companies in the Tamale Metropolis as at the time the research was carried out. The representatives of the Oil Marketing Companies were taken from the Tamale Metropolis because Tamale has oil companies that are not in the other regions and will therefore give a better representation of the views of the Oil Marketing Companies. Apart from that it has more vehicular and human population than any other area in the north.

The Mathematical formula below was used in calculating the sample size from which data were collected.

$$n = \frac{N}{1+N(\propto)^2}$$

Where n = Sample size, N= Sample Frame (list of population) and α = confidence interval. In this case N = 135, and α = 0.04 (96% significance level).

Therefore, $n = \frac{135}{1+135(0.04)^2} = \frac{135}{1.216} = 111.$

Proportionally the following formula was used to get the number of respondents from each group; $\frac{Total\ membership\ in\ population}{population} \times$ Sample size

Example: $\frac{10}{135} \times 111 = 8$ for the staff of BOST.

4.5 Sampling Techniques

According to Frankford-Nachmias and Nachmias (1992), empirically supported generalizations are usually based on partial information. This is because it is impossible, impractical, or extremely expensive to collect data from all the potential units of analysis encompassed in the research problem. Yet precise inferences can be drawn on all the units based on a relatively small number of units when subsets accurately represent the relevant attributes of the whole set. In this research it was realized that there were different segments from which information was needed to ascertain the facts relating to the research problem. Combining the separate groups into one population and drawing a sample might not give a good representation of all the groups and this could lead to increased information variability.

4.5.1 Stratified Sampling

According to Kumekpor, (2002), an advantage of stratification is that each stratum of the population is more homogeneous with reference to the characteristics under investigation compared to the whole population, meaning sampling units in each stratum have more in common and less variable as compared to units in the population as a whole. The various groups were therefore stratified to collect information from them. The stratification was based on the common characteristics within a group, thus BOST, the tanker drivers and the Oil Marketing Companies who perform distinct functions.

4.5.2 Simple Random Sampling

The Simple random sampling using the lottery method was used in selecting the respondents for BOST and the representatives of the Oil Marketing Companies (OMCs). For each stratum numbers were written on pieces of paper and shuffled any time a draw was made. So for instance, numbers one to ten written on pieces of paper were used to select the eight (8) respondents in the BOST Company and likewise numbers one to twenty-five for the OMCs. Anytime a number is drawn the numbers are mixed up for the next draw. For BOST those who chose numbers one to eight were interviewed and numbers one to twenty-one for the OMCs. This method allowed the opportunity for each member in the stratum to have an equal chance like any other to be chosen for interview.

4.5.3 Accidental Sampling

The accidental sampling was used for the tanker drivers. This is because the tanker drivers were not all at the depot at the same time. They kept leaving the depot anytime they received their consignment. It was also difficult to get the sample required on one particular day. The only way out was therefore to interview them as they arrived and were ready for interview.

Therefore both probability and non-probability sampling methods were used for the research.

4.6 Key variables

A variable is an empirical property that takes two or more values. If a property can change in value or kind, it can be regarded as a variable (Frankford-Nachmias and Nachmias, 1992). The key variables that were measured in this research included storage capacities, sales and usage patterns of petroleum products, mode of transportation of products, source

of products, criteria and frequency of lifting products and relationships between stakeholders.

4.7 Data Requirement

The data required from the BOST included;

- the storage capacity at the establishment of the depot and the current capacities for their products and causes of periods of product shortages.
- how the depot finances its operations and the cheapest mode of transporting petroleum products to the depot.
- whether there is political interference in their work and in what form.
- whether the depot could be better managed under privatization.
- the criteria used in supplying products to the Oil Marketing Companies.

For the Tanker drivers, the data required included;

- whether it was easier lifting products from the Buipe depot and how fast that was.
- ownership of the tankers they use and if that affected acquisition of products from the depot.
- and whether they lifted petroleum products from outside Buipe and why?

Data requirement from the Oil Marketing Companies included;

- whether they experience petroleum products shortages and why?
- the peak petroleum products demand and the products highly demanded.
- the storage capacities of the Oil Marketing Companies.
- what suggestions they have for BOST to ensure reliable supply of petroleum products.

4.8 Instruments and Techniques for Data Collection

The data required were obtained from two major sources; primarily through questionnaire administration interview and observations. A secondary source from the records of the tanker drivers' union was also used as well as information from books, journals, newspapers and the internet related to the research area.

4.8.1 Interviews

The main tool that was used to collect data was through interviews of the three targeted units. Designed questionnaires were used to interview the staff of BOST, members of the tanker drivers, and the managers or supervisors of the Oil Marketing Companies. The

questionnaires included both closed and open ended questions. The open ended questions were used mainly as follow-up questions that allowed respondents to express their opinions without much restriction as in the closed questions.

4.8.2 On-Site Observation

Observation was also used as another tool in obtaining the information required. This was carried out by physically observation of the structures and arrangements at the depot. On first sight one would think that all the tankers present at the depot come to lift petroleum products but some have really brought products all the way from Tema Oil Refinery to discharge. There is a demarcation for the tankers that come to lift and those that bring products meant for the company. The drivers are provided a place to sleep and water for bathing and washing at a fee.

4.8.3 Triangulation

Information collected from all the sources was used against each other to cross check or triangulate the data gathered. The importance of this is to authenticate the data that was collected to improve its reliability. Information included the interviews from the three targeted units, the observation, and records from the drivers' union.

4.9 Data Processing

The data collected were then processed by editing to remove undesirable information that was given by respondents and to check for completeness, accuracy and uniformity. They were then coded for easy grouping into the various variables. The Statistical Package for Social Sciences (SPSS) and Excel were used for the analysis. A descriptive method was then used to make a quantitative and qualitative analysis of the data generated on all the variables with some of the information presented in tables and charts.

4.10 Data Analysis and Discussion

The analysis and discussing of the data that were collected in the field with both the questionnaires and observations are treated in this chapter. Information from the profile of northern Ghana also informs part of the discussion and where necessary secondary information from literature is used to support information that was gathered.

The data analysis and discussion are treated in four parts so as to provide answers to the research questions and to meet the objectives that were set for undertaking the research. In

these various parts, the different categories of data were harmonised to bring out the dimensions involved in the study.

The first part of the analysis and discussion looks at the causes of petroleum products shortages in the north from the perspective of the representatives of Oil Marketing Companies and the tanker drivers who form almost the final part of the distribution network of petroleum products to consumers. It also analyses the consequences of the management style of the Bulk Oil Storage and Transportation Company (BOST) in this regard.

The second part discusses the capacity of BOST from its inception until now and the views of the management of the Buipe branch on future expansion programmes. This part also includes the source of finance of the operation of the company.

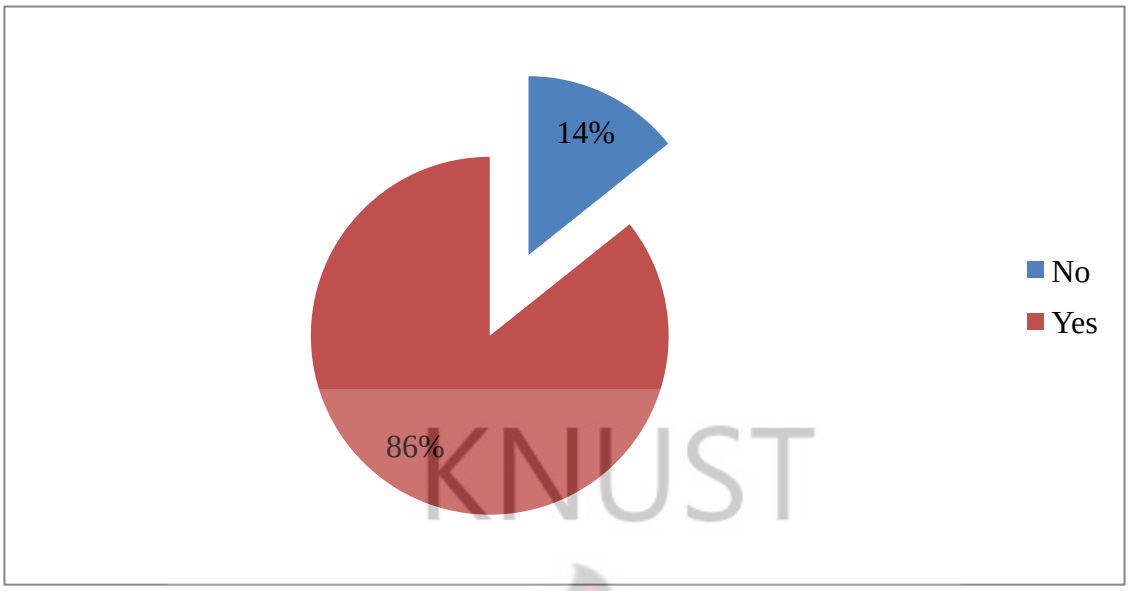
The third part of this analysis looks at the usage pattern of petroleum products in northern Ghana and whether BOST takes this into consideration in their acquisition of petroleum products.

The final part assesses views on the relationship between BOST and its stakeholders especially the tanker drivers and the Oil Marketing Companies as well as the Volta Lake Transportation Company (VLTC) and the National Petroleum Authority (NPA).

4.11 Causes of Petroleum Products Shortages

The data collected from the twenty-one representatives of the Oil Marketing Companies indicate that they sometimes experience petroleum products shortages as is shown in figure 4.1. About 86% of respondents interviewed said they experience product shortages.

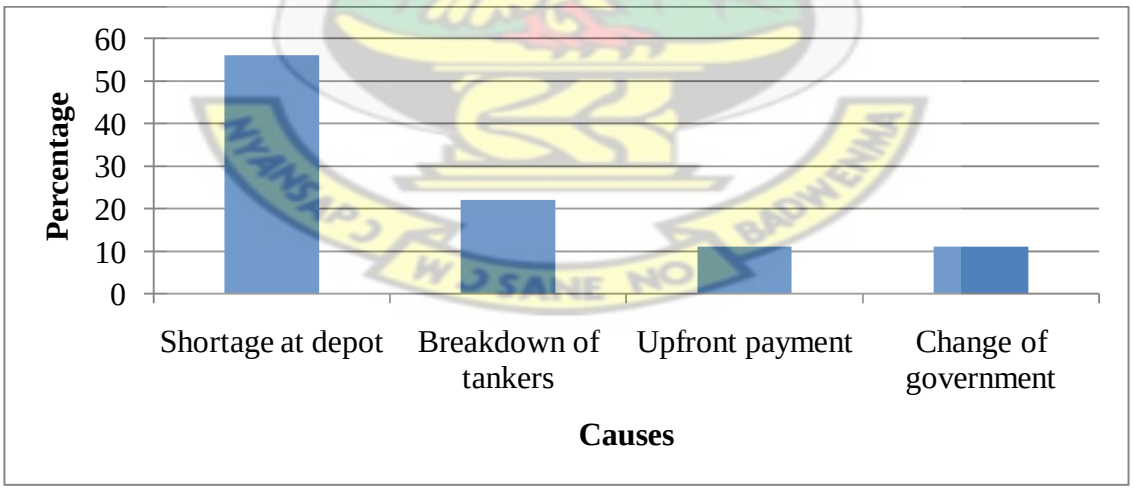
Fig. 4.1 Experience of Petroleum Products Shortages



Source: Field Survey, 2011

Different reasons were given for the petroleum products shortages by the different respondents. There were four main reasons why they experienced fuel shortages. These are shortages at the depot, breakdown of tankers, inadequate funds to make upfront payment, and during periods of a change of government.

Fig. 4.2 Causes of Fuel Shortages



Source: Field Survey, 2011

With reference to figure 4.2 about 56% of respondents attributed shortages at their stations to lack of petroleum products at the depot at Buipe, in which case they have to travel either to Kumasi or Tema to acquire their request. They argued that travelling out of the

north to other depots does not only increase the distance but delays the acquisition of petroleum products. They go to meet other tankers from different parts of the country, thereby prolonging the acquisition time. The implication of this situation is that if a fuel station does not lift products as planned it would run out of products for sale. When many fuel outlets face this problem the demand for fuel exceeds what the market can supply resulting in shortages. This is likely to happen because the storage capacity of most of the fuel outlets in the north cannot serve consumers for one month. Thus, within a month, Oil Marketing Companies have to make request for products more than once from the depot. Tanker drivers testified to this when 79% of them said they lift products from the depot once every two weeks as captured in table 4.2. Frequent lifting of products results in long queues which delay the conveyance of products to the OMCs.

Table 4.2 Frequency of Lifting Fuel at Buipe

Frequency of lifting products	Frequency	Percentage
Once every two weeks	65	79
Once in a month	17	21
Total	82	100

Source: Field Survey, 2011

The other causal factor is the unfortunate breakdown of the tankers that are supposed to deliver petroleum products to the Oil Marketing Companies. There have been times when a tanker gets a breakdown rendering the Marketing Company without products. These are unforeseen situations outside the control of the Marketing Companies. Those respondents who complained about this situation were 22%. The lack of maintenance culture in our society results in these situations.

The policy on the acquisition of petroleum products from the depot has been reviewed. At first an Oil Marketing Company could place an order for petroleum products without making upfront payment. The Oil Marketing Company could then make payments after sales before the next lifting of products from the depot. This arrangement was however abused by some Oil Marketing Companies and in the process hindering the smooth running of BOST. It therefore became necessary that upfront payment is made for products before they are lifted. Oil Marketing Companies that were not sufficiently resourced could therefore not meet the fuel requirements of their customers, leading to shortages in the market. It also implies that anytime a substantial amount of fuel is not sold

it would be difficult for the marketer to acquire some more. It does not also make economic sense to put in orders for products in smaller bits. It is for these reasons that 11% of the respondents said the cause of petroleum products shortages is the lack of enough funds to make upfront payment.

The issue of upfront payment was confirmed by BOST (Buipe) when they indicated that they do not bar any Oil marketing Company from lifting products only if they have followed the procedure of Pay and Lift. This is to make sure OMCs do not frustrate the operations of BOST.

The issue of a change of government also came up as one of the causes in petroleum products shortages. About 11% of the respondents alluded to this and gave an instance as the first quarter of the year 2009 when a new government came to power. This may be as a result of the new government trying to investigate, streamline and get an understanding of agreements that were entered into by the previous regime with multinational companies or countries that supply crude or finished products to the country.

It could also be the case of funds, as around 2009 it was published that the Tema Oil Refinery was hugely indebted to the Ghana Commercial Bank and could therefore not raise Letters of Credit from the Bank in order to import crude oil. These are excerpts from Ablorddepey, 2010 that attest to this fact under the title 'Government Bails out TOR'. "Government has paid GH¢445 million to the Ghana Commercial Bank (GCB) on behalf of the Tema Oil Refinery (TOR) to help reduce the indebtedness of the state-owned refinery to the bank. The amount is more than half the GH¢598 million that the refinery owes the GCB in overdrafts. At a press conference in Accra yesterday, the Minister of Finance and Economic Planning, Dr Kwabena Duffour, said the amount would go to increase the government's equity (value of ownership) in TOR and help the refinery to raise more letters of credit to import more crude oil for processing. The Chief Executive of the National Petroleum Authority, Mr Alex Mould, said the long-awaited bailout was to blame for the struggle to supply petroleum products to the market last year."

Apart from these causes that were pointed out, there are others which come into play as far as petroleum products shortages in the market are concerned. When the Oil marketing Companies were asked whether they suspect fuel smuggling as a cause to occasional fuel shortages in the north, 35% of the respondents answered in the affirmative while 78% of

them agreed that such activities could lead to fuel shortages. Smuggling is seen to be a problem to Ghana anytime petroleum products prices are lower than those in the neighbouring countries. This is a phenomenon in most African countries because of differences in natural resource endowment, economic management and political considerations. Cross border smuggling activities usually thrive under situations of attractive price differentials between countries with porous borders.

The management style of BOST in the acquisition of the different petroleum products could also lead to product shortages. The research revealed that by the estimation of BOST, 7.5 million litres/month of gasoline (petrol) and 10 million litres/month of diesel is consumed in the north and yet they had in storage 10 million litres each of these products. It implies that in the case of diesel there is no room to accommodate the slightest increase in demand and this may lead to shortage in the market. While this research was being conducted, it was realised that from the 23rd to 27th of May there was no lifting of diesel from the depot and so Oil Marketing Companies were directed to the Kumasi Depot for their consignment.

BOST agrees that the cost effective mode of transporting their products is by the barge (Lake Transport), but its services are complemented by tankers because the barge transport is not as fast as that of the road transport in delivering their products. The barge delivers diesel for now while petrol is transported by tankers. Again, according to BOST, during certain periods of the season when the level of the Lake goes down barge transportation is not possible hence both the diesel and petrol are transported by road. These uncertainties contribute to the unreliable supply of petroleum products to the depot with the resultant effect being fuel shortage.

Another factor, though minor, that could lead to fuel shortage in some marketing companies is the delay in lifting products from the depot. When the tanker drivers were asked as to how long it took them to lift fuel from the depot, 79% of them said from 1-3 days while 21% said from 4-7 days. Delays in lifting are mostly as a result of the processes that have to be followed to ensure that the Oil Marketing Company requesting for a particular product has duly deposited the right amount in the account of BOST. In addition to that is the number of tankers already in queue to lift products and the number that has brought products for discharge at the depot. This number of tankers therefore become so many during periods of the season when the barge is not able to carry

petroleum products to the depot. The reasons for the delay in lifting fuel at the depot as given by the tanker drivers are captured in table 4.3. About 20% of them said the cause is the unavailability of fuel, 49% blamed it on the many tankers in queue for fuel while 31% alluded to the fact that discharging tankers are the cause of delay.

Table 4.3 Delays in lifting fuel at the depot

Reason	Frequency	Percent
No fuel	32	20
Many tankers in queue	79	49
Discharge problems	51	31
Total	162	100

Source: Field Survey, 2011

Table 4.4 depicts the effect of the delay in lifting fuel. The tanker drivers complained that the longer they stayed at the depot the more they spent money that could have been used to finance certain basic needs of their families. About 38% of the drivers attested to this while 29% of them mentioned long period of waiting and wasting man hours as an effect on them. The remaining 33% said it could lead to shortages at the sales points of the OMCs.

Table 4.4 Effect from Delay in Lifting Fuel on Tanker Drivers

Effect	Frequency	Percent
Higher Expenditure	68	38
Long period of waiting	59	29
Shortage of Fuel at OMC	78	33
Total	205	100

Field Survey, 2011

What is not mentioned is the social effect of possible disease transmission from them travelling from many areas of the country to Buipe and spending an average of three days anytime they came there. The launch of the Abidjan-Accra-Lagos Corridor programme on HIV and AIDS was because of the fear that long distance drivers are a potential source of transmitting the disease. This problem cannot be ruled out in Buipe as the drivers spend days in the community. This can lead to the spread of the HIV virus which the nation is committing so much resource to address. It is important to take these cross-cutting issues

into consideration in all spheres of national activities in order to achieve holistic development.

The consequences of petroleum products shortage in the north are enormous. When shortages occur during the farming season, agricultural activities are hampered and food production is affected. Planting of food crops is not done on time and at the same time hindering the movement of agricultural extension agents to deliver services to farmers. The level of malnutrition that is already high among children in the north then becomes worse favouring the rise in infectious diseases as a result of weak immunity.

Health service delivery in the north is carried out mostly through the use of vehicles, especially motorbikes, during periods of mass immunization exercises. Without reliable and adequate supply of fuel the Expanded Programme on Immunisation against the six childhood diseases will be a failure. The vast nature of the Northern Region in particular and the dispersed settlements pattern demands long distant travels in order to deliver services to the people. Teachers depend on fuel for their motorbikes to reach their schools every day.

Trade in all types of commodities, within and outside the north, is facilitated with reliable supply of petroleum products. On daily basis many women in the north are seen boarding vehicles to markets to trade in order to eke a living. Fuel shortages hit hard on the economy of such vulnerable people as increase charges on fares directly affect them. The ripple effects of fuel scarcity also affect all households when increased prices, especially of food and charcoal are passed onto them. Fuel shortage therefore affects every facet of life in the north just like any other economy. Its reliable supply must be a matter of concern not only to BOST but to all policy makers.

4.12 Capacity of the Bulk Oil Storage and Transportation Company, Buipe.

In view of the problems related to petroleum products shortages at certain times in the north, it became imperative to assess the capacity of BOST given its mandate to deliver petroleum products to the people of northern Ghana. Northern Ghana inhabits close to 20% of the population of the country and the major occupation being agriculture. This presupposes that quite a large amount of petroleum products would be consumed especially during the farming season. Apart from agriculture, trade within and outside the

north is facilitated by the availability of petroleum products. The ability of BOST to meet the demand for petroleum products in a vast area like northern Ghana invariably depends on its storage capacity. The upward trend in the movement of petroleum prices in the world market has pushed all governments around the world to build or increase their storage capacity in the face of a high consumption of petroleum products, especially by the developed countries such as China and the United States of America.

According to BOST (Buipe), the company had a capacity of 2 million litres when it started in 1993. However as the population of the north increased the capacity was increased in order to meet the petroleum products requirement of the people. From a capacity of 2 million litres it increased to 50 million litres. Out of this the Company can hold 13 million litres of gasoline (petrol) and 37 million litres of diesel. These are acquired from TOR and other Bulk Distribution Companies with financing from the government of Ghana, the sole shareholder, through the Ministry of Energy.

The petroleum products are kept for both strategic reasons and for distribution to Oil marketing Companies in the north. The Company however declined to provide a breakdown of what quantities are held for strategic purposes and for lifting citing security reasons. It is however clear that 17.5 million litres/month is the estimated consumption in the north while they hold 20 million litres of both petrol and diesel. In effect, the Company has an 'idle capacity' that can accommodate increased demand and especially if Ghana will cease the opportunity of the large demand for petroleum products in the land locked Sahelian countries. One also wonders why BOST (Buipe) does not hold stocks of kerosene that is used by almost every household especially among the poor in the north. This product is transported mostly from Kumasi and Tema.

BOST has been given the mandate to develop the natural gas infrastructure throughout the country. For now all LPG consumers in the north receive this product from the south. The "idle capacity" can be used to address this need in the north so that a very inflammable product such as LPG will not be transported over longer distances in order to minimize the effects of accidents.

Again, BOST (Buipe) has been given the mandate to supply all Oil Marketing Companies in northern Ghana with their petroleum products requirement. According to the Oil Marketing Companies they are not allowed to lift any petroleum product from any part of the country unless the particular product is not in Buipe. This is an opportunity which can

be fully utilized by the Buipe depot to prevent many fuel tankers that sometimes travel to Kumasi and Tema to lift products.

In table 4.5, 68% representing all the OMCs interviewed receive products from the Buipe depot but as many as 32% of the respondents say they have to go outside the north to receive their petroleum products which they cannot sometimes get at the Buipe depot. The depot can maximize its operations by taking advantage of this demand.

Table 4.5 Source of Petroleum Products

Source	Frequency	Percent
Buipe	21	68
Outside the North	10	32
Total	31	100

Source: Field Survey, 2011

In reference to table 4.6, 95% of the respondents agreed that it is easier lifting petroleum products from Buipe because of the shorter distance and faster services as compared to the south where they meet a lot of other tankers competing for the same products.

Table 4.6 Ease of Lifting Fuel at Buipe

Response	Frequency	percentage
Yes	20	95
No response	1	5
Total	21	100

Source: Field Survey, 2011

What however remains to be done in order to capture the West African market in the face of the oil find in Ghana is not just the capacity of the BOST in the north but the mode of transportation of petroleum products to the depot. If there are problems with serving northern Ghana adequately partly as a result of a slow means of barge transport and stumps in the Lake that prevent access during the peak of the dry season, this dream by the Energy Ministry will not come to fruition.

Road infrastructure development is capital intensive and the damage to roads and the reported accidents as a result of heavy tankers transporting petroleum products from TOR

in Tema to the north and beyond is not economically prudent. Heavy tankers from Burkina Faso bypass Buipe to lift petroleum products at Tema.

According to BOST there are no plans in the near future to expand their capacity considering what they have now. Increasing their capacity now will really not be a good investment but as the dynamics in the market change adjustment could be made.

The problems associated with petroleum products shortage are not therefore the lack of physical space to store these products at the BOST depot in Buipe but could be attributed to the management style of the company. In all of this one cannot rule out the inadequate inflow of funds from the sole shareholder, the government of Ghana. When the question was asked as to whether the company would operate more efficiently under privatization other than the government, some of the workers responded in the affirmative while others wanted it to remain with the government as the sole shareholder.

There is a limited liability company incorporated as "FuelTrade" in 2007. It is an affiliate of Bulk Ship and Trade Limited also registered in 2002. The company is licensed by the National Petroleum Authority (NPA) to do business as bulk distributor of refined petroleum products. This company also aims at capturing the West African market because they know that the Sahelian countries are landlocked, and have all their petroleum products coming through the coastal countries. The Sahelian countries, being francophone, had most if not all their imports going through La Côte d'Ivoire. However, due to the recent unrest in that country the focus has shifted on products coming through Tema. This company believes there is already a chain system that gets products up to the north and has expressed interest to work closely with BOST to store petroleum products, which makes it unnecessary for people from Burkina Faso, Niger and Mali to come all the way to Tema to lift products. Since one of the objectives of BOST is to rent or lease its storage depots to enhance operational efficiency, this could be a venture in the right direction.

4.13 Petroleum Products Usage Pattern in the North

The economic base of northern Ghana hinges on smallholder agriculture with over 80% of the population depending on it for their livelihood. Agriculture and agro-based industries still remain the main stay of the people of this zone. The introduction of agricultural mechanisation centres by government to boost agricultural production and the acquisition

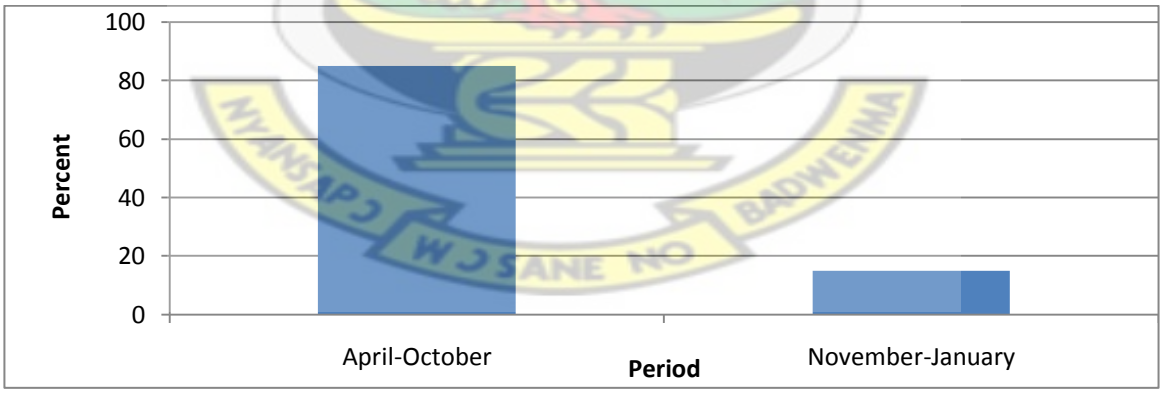
of tractors, combined harvesters and other farm implements by farmers has brought about an increased demand of fuel to power these machines.

The dry season experiences a comparatively reduced usage of petroleum products but this period nevertheless demands reliable supply of fuel because traders and all workers' mobility is greatly facilitated by fuel for their vehicles. Health workers in particular carry out mass immunization programmes during the dry season when accessibility to most of the communities becomes possible. A lot of construction works by public or private entities is also usually undertaken during this time of the year.

The research gathered from Oil Marketing Companies that even though they enjoy good sales throughout the year, consumption goes up during the farming season. At this period much diesel is consumed by farm machinery for the preparation of land, harvesting and carting of food produce.

On the question of when they experience high demand of their products there were 20 respondents. Figure 4.3 indicates 85% of them record higher demand between April and October while 15% indicate between November and January. The period between April and October was backed by BOST when they were also asked the same question. This period coincides with the farming season in the north.

Fig. 4.3 Period of High Demand for Petroleum Products in the North



Source: Field Survey, 2011

The increased consumption level of petroleum products during the farming season in the north calls for a reliable supply of these products to help boost agricultural production and to fight hunger and poverty in this part of the country. The vast arable lands in northern Ghana should be turned into productive fields that will offer gainful employment to the

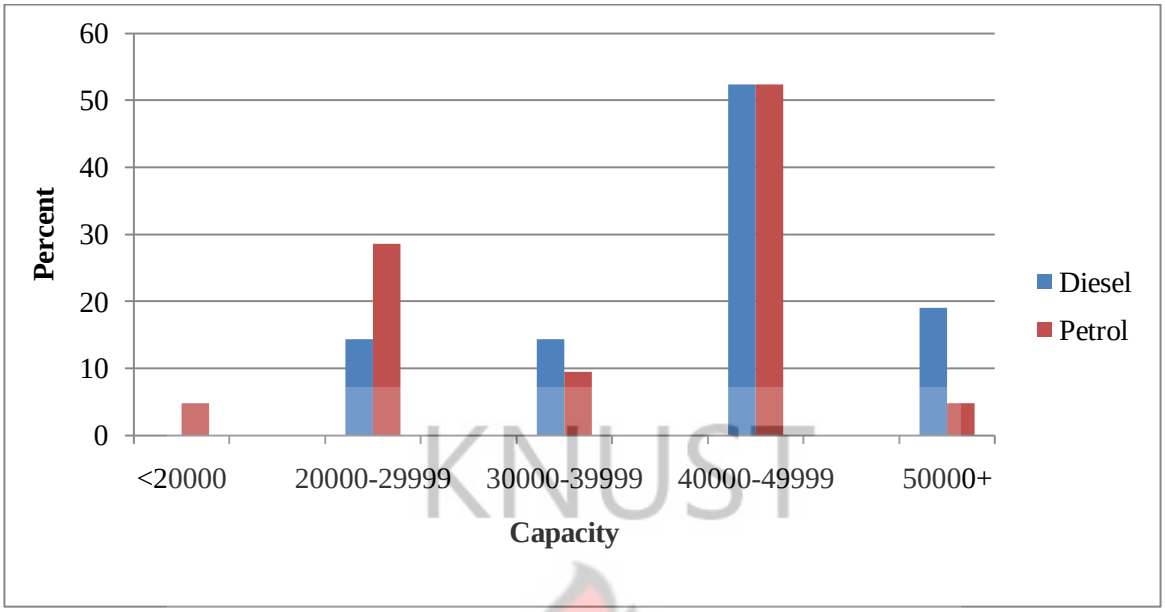
youth who continuously drift to the Southern sector to pursue 'greener pastures'. If Ghana is to achieve the Millennium Development Goal of eradicating extreme poverty and hunger (MDG 1) and the objective of her own Savanna Accelerated Development Authority (SADA), then the issue of reliable energy needs of the agricultural sector must be addressed.

The top ten poorest District Assemblies according to the NDPC, 2009 are from the three northern regions. The incidence of poverty in the rural savanna north is about 60% in contrast to a national figure of 28.5%. And as according to Tripp, 1981 the low investment in agricultural labour and hence in soil and water conservation reflects the poor state of health of many individuals in this region. The low output from the farming system is responsible for marked seasonal hunger, low bodyweights and systematic malnutrition of all sections of the population. Concerted effort must be made not only in the provision of reliable supply of enough petroleum products to the north but also ensure that land and water management, and appropriate mechanisation practices are encourage in order not to degrade further the fragile nature of certain soils in the north.

The study also assessed the fuel storage capacities of the Oil Marketing Companies in order to find the relationship between their storage capacities and the frequency of lifting products from the depot. The study revealed that even from the sample area of the Tamale Metropolis, the most populated and busiest of all the areas in terms of vehicles in the three northern regions, less than 20% of the companies had storage capacity up to 50000 litres for diesel and less than 10% of them also had storage capacity of 50000 litres for petrol as is shown in figure 4.4.

Storage infrastructure is costly to build but it will work to the advantage of the Oil Marketing Companies if they could invest more in the building of storage tanks to match up with the consumption pattern of petroleum products in the north. One of the managers of a company disclosed that those with large storage capacities benefit any time there is an upward adjustment of oil prices because if the adjustment comes shortly after they have lifted products they have a wider margin from their sales.

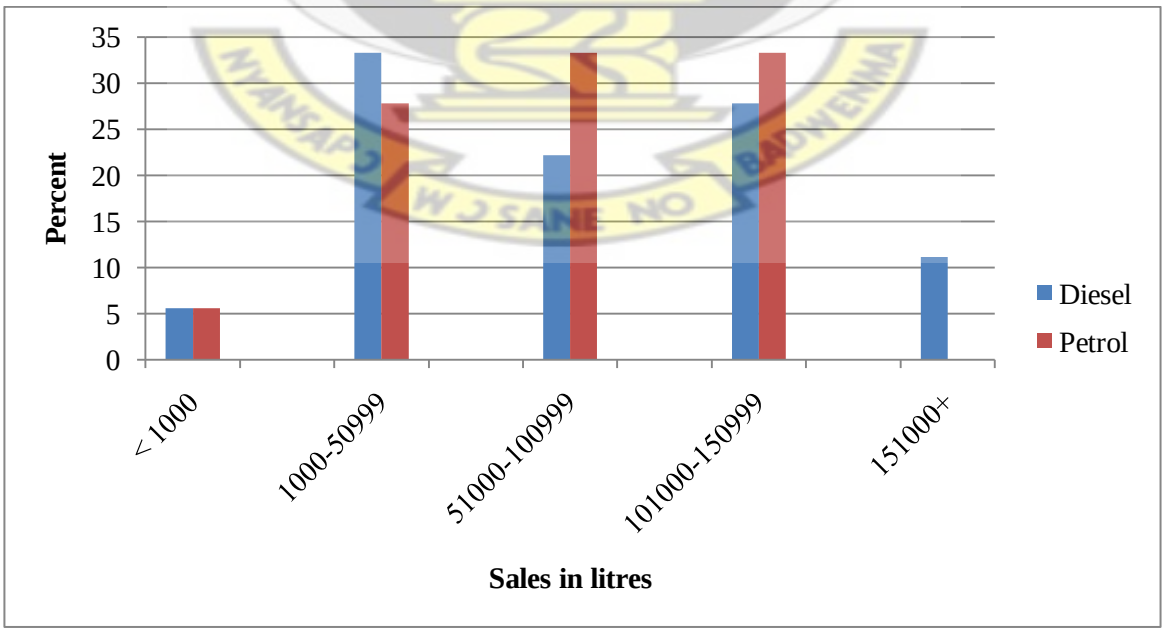
Fig. 4.4 Fuel Storage Capacities (Litres)



Source: Field Survey, 2011

In contrast, an assessment of the monthly sales of products as shown in figure 4.5 indicate that about 61% of them sell over 50000 litres of diesel and 66% also sell over 5000 litres of petrol every month. This might be the reason for a lot of fuel tankers going back to the depot to replenish their stocks. This ultimately leads to many fuel tankers at the depot creating the long queues and delays in lifting products.

Fig. 4.5 Monthly Sales of Fuel Products



Source: Field Survey, 2011

The study also showed that most of the Oil Marketing Companies do not own tankers. As captured in table 4.7, the OMCs owned 23% of the tankers out the 82 drivers interviewed while the rest are owned by private people. This further delays lifting as arrangement must first be made with tanker services. Most of the companies are however making efforts to own tankers because of the ease with which they can acquire their products. The disadvantage will be putting a lot of private tanker owners out of business. This might explain why many private tankers still engage in the delivery of petroleum products form TOR to Buipe.

Table 4.7 Tanker Ownership

Ownership	Frequency	Percentage
Self	1	1
My master	62	76
Company	19	23
Total	82	100

Source: Field Survey, 2011

4.14 The Relationship between the BOST and its Stakeholders

The success of any business entity depends to a large extent on the relations it establishes with its stakeholders or collaborators. Participation and satisfaction of stakeholders in the day to day running in the businesses they engage in cannot be taken for granted as these constitute the pillars on which any business will continue to exist or break away from a partnership.

The Bulk Oil Storage and Transportation Company Limited does not exist in a vacuum but is able to carry out its activities with the collaboration and participation of other entities. The major stakeholders of BOST are the Tema Oil Refinery (TOR) and Bulk Distribution Companies, the National Petroleum Authority (NPA), the Volta Lake Transport Company (VLTC), the Oil Marketing Companies (OMCs) and the Tanker drivers.

The BOST does not import its own petroleum products and for that matter depends on other companies for its products. It has therefore established relations with TOR which is also owned by the government of Ghana for the supply of its products. TOR was indeed performing the same functions just as BOST until it was directed by the government to concentrate on the refining of crude oil for the Bulk Distribution Companies. BOST

therefore obtains most of its petroleum products from TOR either by road or by Lake Transport through a barge. The research revealed that there exist cordial relations between BOST and TOR. This is good to ensure that products are acquired timely and in the right quantities required.

The interference of government in the operations of the Tema Oil Refinery (TOR) has however weakened the financial position of the refinery to regularly import and refine crude oil for the domestic market through companies such as BOST. For political expediency government subsidises the products from TOR but mostly defaults in making payments to the refinery.

The difficulty confronting the Tema Oil Refinery (TOR) in acquiring crude oil because of inadequate funds limits the operations of BOST. Fortunately the deregulation of the petroleum sector in the country has allowed other companies to import finished products into the country. BOST has links with some of these companies that supply it with products anytime the Tema Oil Refinery is unable to meet its demands. BOST therefore maintains good working relations with these Bulk Distribution Companies in order to ensure supplies. The policy of deregulation of the petroleum sector was therefore important as it allows space for the private sector to participate.

The Bulk Oil storage and Transportation Company collaborates with the National Petroleum Authority (NPA) which is mandated by government to regulate and monitor the activities of all players in the oil industry. It ensures that BOST complies with all safety and environmental regulations as directed by the Environmental Protection Agency (EPA). BOST however said that it is the Ministry of Energy (MoE) that fixes its petroleum products prices and not the NPA. There is however a cordial relationship between BOST and the NPA.

Relations between BOST and the Volta Lake Transport Company became stalled around 2006 when BOST terminated its agreement with the Volta Lake Transport Service, which use to convey its petroleum products and entered into agreement with another company.

A Government Act (263) of 1970 which established the Volta Lake Transport Company mandated it to supply fuel and transport goods and people from Akosombo to Buipe through ports at Krachi in the Volta Region and Yeji in Brong Ahafo Region.

According to the Daily Guide of Friday, 11 May 2007 the workers of the Volta Lake Transport Company (VLTC) blamed the Bulk Oil Storage and Transport (BOST) Limited for engineering a ploy to take over their fuel transportation duties. The VLTC argued that usage of the pipelines to pump petroleum products to be transported by barge would reduce transport cost by 40% besides easing the pressure on the roads through the use of heavy tankers.

The strained relations have however been patched following intervention by the Ministry of Transport. Abbey(2010) reported in March 26, in the Daily Guide that the Bulk Oil Storage and Transportation Company Limited (BOST) was set to commence the transportation of petroleum products on the Volta Lake to the northern parts of the country after four years break. The research again revealed that Lake transportation of petroleum products have really resumed even though transportation by road is also going on.

Unlike the fuel tankers that come to queue at the depot to discharge petroleum products, the barge pumps its content of petroleum products through a pipeline from the banks of the Black Volta, where it docks, straight to the depot.

The interaction between Oil Marketing Companies (OMCs) and tanker drivers, and BOST is almost on daily basis. Hardly a day passes without lifting of petroleum products from the depot by tankers to the various OMCs in the northern part of the country. Interactions of this nature demand cordial relations between the actors to facilitate and enhance smooth operations. It was therefore satisfying that both the OMCs, Tanker drivers and BOST disclosed that they enjoy cordial relations.

Tables 4.8 and 4.9 capture the response of the relations of OMCs with BOST and suggestions they have for BOST. Twenty responses were received on the question of relationship with BOST from the OMCs as captured in table 4.8. About 95% of them said they have cordial relations with the depot staff. This is good for any organization and its stakeholders for a smooth running of business. Strained relations with stakeholders can derail the prospects and aspirations of any business as there will be no mutual trust and cooperation between stakeholders.

Table 4.8 Relationship with the Staff at the Depot

Relationship	Frequency	Percentage
Cordial	19	95
Not good	1	5
Total	20	100

Source: Field Survey, 2011

As shown in table 4.9, seventeen operators of the OMCs made suggestions to BOST and they were more concerned with unreliable supply of petroleum products by BOST and therefore suggested that the company should endeavour to ensure regular supply of products. About 94% of the respondents gave this suggestion while 6% suggested expansion of storage infrastructure.

Table 4.9 Suggestions to the Bulk Storage Depot

Suggestion	Frequency	Percentage
Ensure regular supply of products	16	94
Expand storage capacity	1	6
Total	17	100

Source: Field Survey, 2011

On the fixing of petroleum products prices the OMCs said it was the National Petroleum Company that was responsible for coming out with retail prices. All of them testified to this, but there were variations as to whether fixing of prices by the NPA affect their operations. The NPA uses a formula that takes into consideration the crude oil prices and the cost of importation of petroleum products into the country. It also factors into the retail prices of petroleum products taxes and levies to generate revenue for government as well margins for the retailers. The effects of adjustment in prices are therefore borne by consumers. However, some of the retailers believe that beyond the margins they are affected in one way or the other by the fixing of prices by the NPA.

Table 4.10 shows the response of OMCs to fixing of prices by the NPA. Only fifteen responses were got out of the twenty-one people interviewed. In their response about 60% of respondents said their operations are not affected by the fixing of petroleum products prices by the NPA, arguing that it does not affect their profit margins because they only

pass on the changes to consumers. On the other hand 40% of respondents said fixing of the prices by the NPA affects them.

Table 4.10 Effect of fixing of prices by the NPA

Response	Frequency	Percentage
No	9	60
Yes	6	40
Total	15	100

Source: Field Survey, 2011

About 80% of the respondents, who alluded to the fact that their operations are affected as shown in table 4.11, argued that anytime there is an upward adjustment of the prices of petroleum products they experience reduced sales because consumers tend to reduce the quantity of products they buy. This is rational consumer behaviour. Even though consumers cannot find a substitute for these products, they will limit unnecessary movement with private vehicles and use more of public vehicles for long distance journeys in order to cut down on cost.

Table 4.11 Effect on Operations

Effect	Frequency	Percentage
Reduced sales	4	80
Shortages	1	20
Total	5	100

Source: Field Survey, 2011

In the northern part of Ghana, a lot of motorbikes are owned by the youth most of whom are not in gainful employment. This segment of consumers is therefore likely to reduce their fuel consumption in the event of fuel price increases which goes a long way in reducing the sales of OMCs. The respondent who complained of shortages argued that when there is a hint that the NPA will adjust prices upwards OMCs with large storage capacities try to hoard their products in order to take advantage of the new high prices and make higher profits while there is always panic buying by consumers in order to save money.

The Petroleum Pricing Formula by the NPA

i. Ex-pump Price = Ex-refinery Price + Taxes/Levies + Margins
ii. Ex-refinery Price = CIF + Related Charges
iii. CIF = Cost (FOB) + Insurance + Freight
iv. Related Charges = Off-loading Cost + In-transit Losses + Inspection + Landed Cost + Financial Cost + Storage Cost + In-plant Losses + Rack Loading Cost + Operating Margin.

*Note- FOB is Free On Board

Looking at the price formula used by the NPA it is therefore true that under normal circumstances the OMCs will not be affected by any price adjustment by the NPA because the margins which form a component of the Ex-pump price is computed into the formula for the OMCs. It is also true that consumers make rational choices in goods and services they consume. They will therefore react to increases in prices of commodities in various ways, ranging from reducing the quantity of a commodity consumed when its price increases to looking for alternative ways of obtaining the same satisfaction at a cheaper price. This behaviour of consumers will affect sales of a commodity.

The Tanker drivers also agreed that they have a cordial relationship with BOST. About 81% said they received the amount of products they request for. The rest did not respond to the question but it is assumed that they all receive the quantities they request for because of the policy of Pay and Lift. The depot is obliged to supply any OMC that has paid for products it has requested for.

Again 65 of the 82 respondents representing 79% said they lifted their product within 1-3 days from the day of arrival. They said this was faster than any time they went outside the Buipe depot to lift petroleum products. It is on this basis that the Tanker drivers agreed that it was easier lifting products from the Buipe depot. The remaining 21% said they lifted products within 4-7 days.

Generally, the Bulk Oil Storage and Transportation Company enjoys cordial relations with its collaborators or stakeholders. It has managed to resolve its differences with the Volta Lake Transport Company after a stalemate of about four years. They are both government companies and should complement the efforts of each other to keep Ghanaians in employment.

The chapter has brought out the different impediments that lead to the shortage of petroleum products in the north and the capacities of BOST and the Oil Marketing Companies showing implications of the management of BOST and the demand for petroleum products from Oil Marketing Companies. It has also looked at the petroleum products usage pattern in the north which points to higher demands during the farming season, a confirmation of the need for reliable supply of petroleum products to northern Ghana, if agricultural production is to be enhanced in this part of the country in order to augment the food security programmes of government and reduce malnutrition and poverty among the people. Last but not least, the relationship between BOST and its collaborators/stakeholders has been assessed in relation to its operations in the delivery of petroleum products to northern Ghana.

CHAPTER FIVE

SUMMARY OF KEY FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

This final chapter recapitulates the analysis and findings that have been made in the previous chapters and to make recommendations to the issues that have been raised with the view to helping improve the process of delivering regular supply of petroleum products to northern Ghana. The final curtain would be drawn at the end of this chapter to the study that has been conducted.

5.2 Major Findings of the Study

5.2.1 Causes of Petroleum Products Shortages.

The study has established that a mixture of factors is involved in the shortage of petroleum products in the market in northern Ghana. These may be divided into major and minor factors on the basis of the frequency of response from the Oil Marketing Companies.

With the Oil Marketing Companies 86% of them disclosed that they experience shortage of petroleum products. Among the major factors which the Oil Marketing Companies (OMCs) identified are;

- Shortage of the products at the Buipe depot.
- Breakdown of tankers that supply products to the OMCs.
- The issue of upfront payment for products before lifting.
- During periods of change of government.

Also 56% of the respondents attributed the problem to shortage at the depot in Buipe, thus requiring of them to travel to either Kumasi or Tema for their consignment on such occasions. The long distance to travel and congestion problems at these depots outside the north, delays lifting of products culminating into depletion of stocks at points of sale.

Others think it is the breakdown of tankers that are supposed to supply products upon request. This might seem insignificant but 22% of the respondents alluded to this point. The absence of the culture of maintenance may be the cause of this.

The abuse of trust between BOST and OMCs led to the removal of credit sales of petroleum products to the OMCs. This has been replaced by the policy of Pay and Lift.

OMCs with little financial muscle therefore are unable to lift as much as they would have liked. A shortage situation results when demand outstrips supply.

The last respondents in this category put the cause of petroleum products at the doorsteps of government. And that during the first few months of an incoming government there is always the problem of petroleum products shortage as it takes some time for the new government to settle down.

The minor factors that have been revealed are the issue of smuggling, the management of BOST, and the inability of Volta Lake Transport Company (VLTC) to transport products at certain periods of the season.

Ghana shares boundaries with countries that have different pricing systems for petroleum products. Anytime that there are shortages in our neighbouring countries and/or the prices of petroleum products are cheaper in Ghana, there will be smuggling of products outside the country. This activity may lead to product shortages.

The research also got information that the VLTC is unable to transport petroleum products to Buipe during some seasons. This being the cheapest form of transportation of products therefore results in difficulties in securing adequate supplies for onward transmission to the market.

5.2.2 Storage Capacity of BOST.

One is tempted to think that the problem of petroleum products shortage in the market in the north is due to inadequate storage capacity of BOST. The research however revealed that from a capacity of 2 million litres at the inception of the depot, the storage capacity has increased to 50 million litres, storing 10 million litres of petrol and 10 million of diesel.

OMCs however travel out of the north to acquire petroleum products when BOST has the capacity and monopoly to serve them. At the time of the research that coincided with the farming season there was no diesel at the depot and OMCs were to either wait or get their consignment from outside the depot.

It is not therefore the physical storage space that is lacking but other factors including management. There were mixed reactions from the workers whether the company would perform better under other forms of privatisation other than the government being the sole

shareholder since Fuel Trade, a Bulk Distribution Company, has interest in the storage capacity of BOST in order to reach out to the landlocked Sahelian countries to the north of Ghana.

5.2.3 Petroleum Products Usage Pattern in Northern Ghana.

Northern Ghana experiences two major seasons, the dry season and the rainy season. Farming activities however vary from place to place depending on the vegetative and soil characteristics. In the Northern Region and some parts of the Upper West Region where yam is cultivated, farming activities begin after the last rains in a season when the soil is still wet enough to prepare fallow lands for the next season. The advent of tractors is fast replacing the hoe and cutlass in preparing vast lands for farming activities. It is therefore not surprising that the study revealed that petroleum products consumption is higher from April to October, a period that coincides with the farming season. About 85% of the OMCs attested to this trend.

The issue however has to do with the storage capacity levels of the OMCs in relation to their monthly sales. The study shows that most OMCs have storage capacities that do not hold products to satisfy a month's demand. This has been inferred to contribute to the demand for products from BOST resulting in the long queues and delays at the depot.

5.2.4 Relationship of BOST with Stakeholders.

Apart from a misunderstanding with the Volta Lake Transport Company which has been resolved leading to the transportation of petroleum products to Buipe, BOST enjoys cordial relations with its collaborators/ stakeholders. The OMCs and Tanker drivers in particular wish to lift petroleum products from Buipe than other depots because of the ease of lifting products and the short distance. On the other hand the study shows the mix reaction of OMCs in relation to the fixing of petroleum products prices by the NPA, those who see no effect on their operations and those who think otherwise citing reduced sales during upward adjustment in prices.

5.3 Recommendations

5.3.1 The capacity gap of BOST should be fully utilized.

The capacity gap of 30 million litres should be utilized in storing more petroleum products to reduce, if not totally eliminate, the number of tankers that ply the roads to Kumasi and Tema to lift petroleum products. The thinking that went into expanding the capacity from 2 million to 50 million litres should be made to come to fruition in meeting the demand of the market and to ensure reliable and regular supply of products to northern Ghana.

5.3.2 Storage of Liquefied Petroleum Gas and Kerosene for domestic use.

The Company should venture into the storage of other products like kerosene and LPG instead of the two products currently in storage. The issue of desertification can be better addressed if enough LPG is readily available in the north. The demand for LPG is increasing in northern Ghana especially in the Upper East Region where fuel wood availability has reduced drastically. Many women have to resort to the use of the stems of millet and sorghum, and by-products after the extraction of shea butter as well as cattle dung as their source of energy for cooking.

5.3.3 Expand financial base and Operations through other Partners.

BOST could do better in entering into partnership with other Bulk Distribution Companies interested in capturing the market in West Africa, especially in the landlocked countries to the north of Ghana. TOR which supplies most of the petroleum products needs of BOST has of late been in financial difficulties. Government should therefore sell some of its shares in BOST to improve its operations in order to pool resources from the private sector to enable BOST meet the demand in the north and eventually the West African market.

5.3.4 Strategically use Lake Transportation for Petroleum Products.

Since BOST agrees that Lake transportation of its products is the most cost effective but faces challenges such as exposure of stumps when the level of the Lake goes down during certain periods of the year, thus impeding the movement of the barge, calls for a strategy to make good use of the barge when its movement is unimpeded. With the large capacity of BOST and history pointing to the fact that petroleum products prices are always appreciating, BOST should store enough products during periods that the barge can transport products on the Lake. There is minimal risk in such a venture.

5.3.5 Removal of Stumps on the Volta Lake.

To enhance transportation of all year round of petroleum products and other items on the Volta Lake, it is recommended that stumps on the lake that form part of the problem for easy Lake Transport, be removed. Government should make the necessary investment in equipment and training of the youth to remove these stumps to enhance Lake Transport.

5.3.6 Future OMCs Should Expand Storage Capacities.

The study showed that most of the OMCs have storage capacities below their monthly sales and as a result make frequent request for products. Increasing storage capacity will reduce the rate at which tankers ply the roads with these inflammable products. This can be through deliberate savings towards building new tanks over time where there is space.

5.3.7 Transparency in the Signing of International Contracts.

To avoid suspicion and cancellation of contracts for the importation and delivery of crude or finished petroleum products, all governments should involve the parties in opposition and civil society in such contracts to allow for continuous flow of products in the event of a change of government. Petroleum products as a source of energy are vital to the smooth running of the economy at all times and their shortages have serious economic implications on the lives of the citizenry. Agriculture is being mechanized and there is the need for reliable supply of petroleum products.

5.3.8 Allow Independence of National Petroleum Authority.

Following the deregulation of the petroleum sector, the independence of the NPA is important for the sustainability of the downstream petroleum sector. Even though government has the duty to intervene in the market in order to protect the interest of the poor and vulnerable in society, the intervention of government leaves much to be desired. Fuel price subsidies favour the rich more than the poor, especially of petrol and diesel. Even LPG has been taken advantage of by vehicle owners thereby eroding the intention for its subsidy of minimizing deforestation.

The NPA should be allowed to operate independently to avoid large debts owed by government because of subsidies of some petroleum products. The Tema Oil Refinery and BOST will be better off under an independent NPA.

5.3.9 Further studies.

Further studies should be conducted on consumers' views on the effect of fuel shortages.

5.4 Conclusion

Energy insecurity undermines human development, institutional capacities and lowers economic growth. Energy security is correspondingly closely linked with social, economic, political, environmental and institutional development, thus making it a cross-cutting issue rather than one of simply finding geological energy resources. Petroleum products constitute economic input and play important roles in the lives of people.

In a world where agriculture is increasingly a commercial activity the northern parts of Ghana still exhibits historical patterns of subsistence farming in a deteriorating physical environment. Agricultural communities are thereby locked into poverty, food insecurity and malnutrition in vast arable lands which if properly managed can become a bread basket for the country. Increasingly, rural youth, who associate subsistence and even potential commercial farm activities with hard physical labour and drudgery, are disenchanted with the meagre opportunities for a rural livelihood, worsening an already marked tendency to rural–urban migration.

The research has revealed that the Bulk Oil Storage and Transportation Company Limited, Buipe branch, has the capacity and potential in delivering adequate and reliable supply of not only diesel and petrol but also LPG and Kerosene to the northern part of Ghana.

It must be reiterated that the success of the Savanna Accelerated Development Authority (SADA) and the achievement of the MDG 1 cannot be realized without adequate and reliable supply of petroleum products to the northern part of Ghana. Hence the problem should be addressed seriously by SADA.

It is hoped that the recommendations made will be considered in policy formulation to improve the operations of BOST in achieving its mandate. Ghana cannot develop without its northern part which still lags behind in most of the human development indicators of sanitation, housing, health and food security.

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APPENDIX A

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF PLANNING

ASSESSING THE OPERATIONS OF THE BULK OIL STORAGE AND TRANSPORTATION COMPANY LIMITED (BOST) IN PETROLEUM PRODUCTS DELIVERY TO NORTHERN GHANA.

This research instrument is designed to solicit for empirical data for the conduct of academic exercise on the above mentioned topic for the award of MSc degree in Development Policy and Planning, KNUST. Your support and cooperation is very much anticipated as information given will be treated as confidential.

QUESTIONNAIRE FOR BOST

Position of respondent……

1. When was the depot established and what was the initial capacity? Year……. Capacity: ……..
2. What is the management style of your company?
   a) Public unit
   b) Corporate Organisation
   c) Joint company
3. What are the capacities for the various products?
   a).....
   b)……
   c)……
4. Has the capacity increased since then? Yes [ ] No [ ]
   If Yes, to what level? ……
   ……
   ……
5. Does your present capacity allow you to meet demands from Oil Marketing Companies in the Northern regions? Yes [ ] No [ ]

6. What type of fuel products do you have in storage and their capacities?

   a)……

   b) ……

   c)……..

7. What quantity of stock is kept as strategic reserve and for lifting by Oil Marketing Companies?

	Strategic	Lifting
2005	……	…….
2006	……	…….
2007	……	……..
2008	……	…….
2009	……	……...
2010	……	……

8. Why and where do you keep strategic reserves?

   …….....

   .... ……

9. What is the mandate of BOST?

   ……

   ……

10. Who finances your operations?

    .....

11. Do you have the required staff for your operations? Yes [ ] No[ ]

    If No, how does it affect your operations?

    ..... ……

    ……

12. How do you acquire these petroleum products?

    ……

    ……

13. How do you transport the products to your depot? Road [ ] Barge [ ] Both [ ]

14. What informs the choice of transportation?

    ……

15. Which mode of transportation is cost effective? Road [ ] Barge [ ]

16. Do all oil companies qualify to lift petroleum products from your depot? Yes [ ]

    No [ ] If No, why? ……=

17. What criteria are used in serving oil companies?

    ……

    ……

18. Do you experience fuel shortages? Yes [ ] No [ ]

    If Yes, what are the causes?

    ……

    ……

19. What are the challenges you face in getting petroleum products to your depot?

    .....

    .....

20. Are you facing any competition in the supply of petroleum products? Yes [ ] No [ ] If Yes, from whom?

    ……

21. Do you face high demand challenges from the landlocked Sahelian countries?

    Yes [ ] No [ ]

    If Yes, how do you cope with this demand?

    ..... ……..

    ……

22. Are there plans for further expansion? Yes [ ] No[ ]

23. What is government's policy in your company?

    ……

    ……

24. Is the policy achievable? Yes [ ] No [ ]

    If No, why? .....

25. Who are your collaborators?

    .....……

    ……

26. How do you estimate the demand for petroleum products in the North and how much is this demand?

    ……

    ……

    Gasoline……. Diesel…….

    Kerosene…….. Others…….

27. Do you face political interference in your operations? Yes [ ] No [ ]

If Yes, in what form.....

……

28. What period of the year do you experience high demand from your customers?

……

29. Who fixes the prices of the products you distribute?.....

……

30. Do the prices affect your operations? Yes [ ] No [ ]

If Yes how? .....

31. Do you think the company will operate more efficiently under privatization?

Yes [ ] No [ ] If Yes, why? ....

32. What is your relationship with OMCs and Tanker owners? Cordial [ ] Not good [ ]

33. Does your company distribute petroleum products directly to consumers?

Yes [ ] No [ ]

THANK YOU FOR YOUR RESPONSE.

APPENDIX B

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF PLANNING

ASSESSING THE OPERATIONS OF THE BULK OIL STORAGE AND TRANSPORTATION COMPANY LIMITED (BOST) IN PETROLEUM PRODUCTS

DELIVERY TO NORTHERN GHANA.

This research instrument is designed to solicit for empirical data for the conduct of academic exercise on the above mentioned topic for the award of MSc degree in Development Policy and Planning, KNUST. Your support and cooperation is very much anticipated as information given will be treated as confidential.

QUESTIONNAIRE FOR OIL MARKETING COMPANIES

Position of respondent……

1. What is the name of your company? ....
2. When did your company start operation? .....
3. Where is it located in the North? ……..
4. Where do you receive your products? Buipe [ ] Bolga [ ] Outside the North [ ]
   If within the North, is it easier lifting from Buipe? …… ……..
   Give reasons……..
5. Do you experience fuel shortage? Yes [ ] No [ ]
   If yes, what are the causes and which product is usually in shortage?
   ……
   ……
6. Do you own tankers? Yes [ ] No [ ]
   If No, do you determine where the tankers lift your products?……

7. What type of petroleum products do you trade in?

   a)……

   b)…….

   c)……..

8. Which period of the year do you experience high demand for your products?

   ……

9. What is your total storage capacity?

   Diesel……..

   Petrol……..

   Kerosene……

   Others……

10. Who fixes the prices of your products? Self [ ] National Petroleum Authority(NPA) [ ]

    If NPA, does it affect your operations and how? .....

    ……

11. Do you think enough petroleum products are brought to your place of supply? Yes [ ] No[ ]

    Give reasons for your answer above…….

    ……..

12. Is there suspicion of fuel smuggling in the North?

    ……

    ……

13. Do you think these activities can cause fuel shortages? Yes [ ] No [ ]
14. How is your relationship with the staff of the depot? Cordial [ ] Not good [ ]
15. What are your suggestions to the Bulk oil storage depot (Buipe) in the North?

    ……

    ……

16. What is your monthly sale of the various petroleum products? Tick the one highly demanded after the sale figures are given.

    Diesel……..

    Petrol……..

    Kerosene……

    Others……

THANK YOU FOR YOUR RESPONSE

APPENDIX C

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF PLANNING

ASSESSING THE OPERATIONS OF THE BULK OIL STORAGE AND TRANSPORTATION COMPANY LIMITED (BOST) IN PETROLEUM PRODUCTS DELIVERY TO NORTHERN GHANA.

This research instrument is designed to solicit for empirical data for the conduct of academic exercise on the above mentioned topic for the award of MSc degree in Development Policy and Planning, KNUST. Your support and cooperation is very much anticipated as information given will be treated as confidential.

QUESTIONNAIRE FOR TANKER DRIVERS

Position of respondent……

1. Who owns your tanker? Self [ ] My master [ ] Company [ ]
2. For how long have you been lifting fuel from Buipe depot? ....
3. What type of products do you lift? Diesel [ ] Petrol [ ] Kerosene [ ]
4. Do you always receive the amount of fuel you request for? Yes [ ] No [ ]
5. How long does it take to lift fuel from the day of arrival?
   a) 1 – 3 days [ ]
   b) 4 – 7 days [ ]
   c) More than a week [ ]
6. What is the reason for any delays?
   a) No fuel at depot [ ]
   b) Presence of many tankers [ ]
   c) Problem of discharge [ ]

7. How does the delay affect your work and the company you serve?

   ……

   …….....……..

8. How often do you lift fuel from Buipe?
   a) Once every 2 weeks [ ]
   b) Once every month [ ]
   c) Twice a quarter [ ]

9. Do you lift from other depots? Yes [ ] No [ ]
   If yes why and where? .....

10. Is it easier lifting fuel at other depots than Buipe? Yes [ ] No [ ]
    If Yes give reasons……..

11. How is your relationship with the staff of the depot? Cordial [ ] Not good [ ]

12. Which Oil Marketing Company do you supply your products?
    Name of Company ……
    Location ……

THANK YOU FOR YOUR RESPONSE