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Evolution of Water Systems and its Challenges in the Wa Municipal of Ghana

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Abstract
Despite the numerous studies on urban water supply, there seems to be a dearth of knowledge on how the urban water supply systems have evolved over the years. This study therefore attempts to fill this knowledge gap and further discusses the challenges that have bedeviled this activity and process in the study area. This was based on the review of relevant literature on the evolution and nature of potable water supply in Ghana. In addition, key informant interviews were conducted to generate first hand information on the operation and challenges of the mandated company (Ghana Water Company Limited) in the provision of potable water in the study area. The paper further discussed the major challenges which include: inadequate funding and infrastructure; prolong power outages and inadequate staffing that confront the company in the delivery of their services. It is therefore recommended that adequate financial and human resources should be made available to the company to enhance efficient delivery of service to consumers.
Key words: Evolution, Urban water supply, Wa municipal, Challenges, Ghana

1.0 Introduction

Water issues are given exclusive attention on government's development agenda, public discourse and at international conferences. As a cardinal target, the Millennium Development Goal 7c seeks to reduce by half proportion of people without sustainable access to safe drinking water. This owes to the fact that safe water is a necessary ingredient in maintaining human beings, animals and vegetative life. Oxman and Oxer (2000) argue that, potable water can remedy the incidence of diseases which brings down global health costs, increases over all productivity and contributing to political stabilization. However, making potable water accessible to all continues to present a challenge to cities globally (Acey, 2012) as 130 million urban dwellers still lacks any kind of access to safe water (UNICEF and WHO, 2012). Lack of potable water, occurrence of drought or floods expose people, especially women and children, to water-borne and sanitation-related diseases as well as relocation problems including the risk of contracting HIV/AIDs. To this end, access to potable water is considered as a fundamental human need and basic right (Momba et al, 2006; MWRWH, 2007). To a large extent, most studies on urban water supply have focused on its availability, accessibility and provision to the neglect of how the water systems have evolve over the years. Retrospective exercise such as urban potable water supply can help to shed light on present day circumstances. Understanding the history behind issues as important as social services provides the impetus to improve on the prevailing situation. To this end, the paper attempts to discuss how potable water supply in urban areas of Ghana has evolved over the years and its associated challenges with focus on Wa municipality.

2.1 Methods and Material

The study made use of methods and materials. They are as follows;

2.1.1 Methods

This paper surveyed and reviewed some relevant literature on the global and national perspective of evolution of water treatment. It also discussed some associated challenges that confront the provision of potable water as it pertains to the study area. A descriptive, qualitative design was adopted. In addition, key informant interviews were conducted to generate empirical data based on the afore mentioned areas of interest of this paper.

2.1.2 Materials

Study Area

Wa Municipal was created out of the then Wa District in 2004 with legislative instrument (LI) 1800 in pursuant of the policy of decentralisation which started in 1988. It is one of the eleven (11) assemblies in the Upper West Region and Wa is the municipal as well as the regional capital. It lies within latitude 1°40' and 2°45'N and longitude 9º32' to 10º20'W, thus covering an area of approximately 23,474 square kilometers. This is about 32%

and 2.56% of the total land area of the region and the country respectively. It shares administrative boundaries with; the Nadowli District Assembly to the North, the Wa East District Assembly to the East and South, and Wa West District Assembly to the West and South (WMA, 2010 - 2012).

Maps of Study Area

Figure 1, 2, 3 are maps of the study area.

3.0 Findings and Discussions

3.1 Global Historical Overview of Potable Water Provision

The cardinal role of water can be traced as far as back as the existence of mankind on the planet earth. It is documented that, when human settlements started developing; thus human civilization, water featured prominently in their sustenance as it still pertains now. It is in this vein that access to drinking water informed ancient civilizations to establish themselves around water sources. During this era, prominence was given to ample water quantity for drinking and other purposes. However, no understanding of drinking water quality was well documented (US-EPA, 2000).

Evolution of water treatment emerged as early as 4000 B.C. At the time, water treatment focused on improving the taste and odour of drinking water. In view of this, methods such as filtering through charcoal, exposing to sunlight, boiling and straining were used to treat water. The point must be made that filtration was discovered during the 1700 B.C. as an effective means of removing particles from water. Slow sand filtration also gained prominence in Europe during the 1800's. Turbidity (visible cloudiness) was the driving force behind the earliest water treatment (US – EPA, 2000). By 1500 B.C., it was reported that Egyptians used the chemical alum to cause suspended particles to settle out of water. By the mid 1800's, the sources and effects of drinking water contaminants were well understood by scientists and the attention was geared towards contaminants that were not possible to the eye. So, in 1855, cholera was proved to be a waterborne disease by Dr. John Snow; an epidemiologist. The 19th and 20th centuries saw scientists devoting much attention to understanding water contaminants such as pathogens and bacteria. This led to the emergence of the use of chlorine to treat water to reduce the number of waterborne diseases.

3.1 Evolution of Public Water Provision in Ghana

An interview conducted with the operational manager[1] of the Ghana Water Company Limited revealed that, the first public water supply in Ghana, then Gold Coast, began in the 1920's just before World War I and was established in Accra. He argued that, pumps, artificial reservoirs and piped water supply systems were constructed in the industrial enclaves, cities and settlements where the British administration resided. In addition, several water systems were built exclusively for other urban areas which include the Colonial capital: Cape Coast, Winneba and Kumasi. During this era, the water supply systems were managed by the Hydraulic Division of Public Works Department (PWD). The responsibilities of the PWD widened with time to include the planning and development of water supply systems in other parts of the country. A pilot pipe-borne system managed by the hydraulic branch of the Public Works Department (PWD) in Cape Coast. At the time, the PWD was responsible for both urban and rural water supplies

By 1948, the Department of Rural Water Development was established to engage in the development and management of rural water supply through the drilling of bore holes and construction of wells for rural communities.

It became evident that, after Ghana's independence, in 1957, a Water Supply Division with headquarters in Kumasi was set up under the Ministry of Works and Housing with responsibilities for both urban and rural water supplies. . In 1958, the Water Supplies Division of PWD became an autonomous entity directly responsible to the Ministry of Works and Housing (MWH). A severe water shortage hit the country in 1959. Consequently, this led to the signing of an agreement between the Government of Ghana and the World Health Organisation to conduct a study into the water sector development of the country. This study led to the preparation of a Master Plan for water supply and sewerage services in Accra-Tema covering a twenty year period 1960 to 1980. It also occasioned the birth of the Ghana Water and Sewerage Corporation (GWSC) in 1965 under an Act of Parliament (Act 310) as a legal public utility. The GWSC was to be responsible for the following; i). water supply and sanitation in rural as well as urban areas, ii). the conduct of research on water and sewerage as well as the making of engineering surveys and plans, iii). the construction and operation of water and sewerage works, iv). the setting of standards and prices and collection of revenues. However, GWSC's operations have not been self-sustaining and it has relied on parastatal to subsidies its operation and maintenance costs and to bear full responsibility for capital investments (Aryeetey & Ahene, 2007; Fuest & Haffner, 2007; MWRWH, 2007).

Subsequently, the operational efficiency of GWSC declined to very low levels the late 1970's and early 1980's and this was attributed to the deterioration of pipe connections and pumping systems and the inadequacy of

[1] Mr. Ahmed Tahiru – The Ghana Water Company Limited Operational manager – Wa.

funding. The latter was occasioned by the fact that the GWSC depended solely on government subvention to meet both operational and development costs and it was woefully inadequate and was released either late or not released at all before the end of the budgetary year. The latter constrain therefore resulted in the former.

Despite these challenges, the water sector saw some improvements. For instance, before 1957, there were 35 pipe-borne water supply systems in the country. By 1979, there were 194 pipe-borne and 2,500 hand pumped boreholes. In the same direction, an additional 3000 boreholes were drilled and fitted with hand pumps.

Again, by the late 1980's and early 1990's, about 33% of the water systems had either deteriorated greatly or completely broken due to inadequate funding to carry out maintenance and rehabilitation.

To reverse the decline in water supply services, various sector reforms and improvement projects were taken in 1970, 1981 and 1988 by the World Bank, IDA, donor countries and other external support such as Austrian Government, Italian Government, Nordic Development Fund, the African Development Bank, CIDA, DFID, GTZ among others. Though there were some minimal gains, these general service delivery interventions however yielded rather disappointing gains. Due to the failure of these interventions, several efforts were made to improve efficiency within the water supply sector in Ghana. The Economic Recovery Programme (1983 – 1993) framework sought to remove government subsidies on prices of goods and services. These reforms were geared towards effecting the full and partial recovery of costs on social services, the promotion of market forces to determine the prices of goods and services, the divestiture of the state from the production and distribution of goods and services and generally to promote the private sector as the engine of growth of the economy (GoG & MWH, 1999).

This era saw, the country sought loans and grants from the World Bank and other donor countries and agencies for rehabilitation and expansion programmes, training of personnel and procurement of transport and maintenance equipment. However, in 1986, subvention for operations and maintenance was withdrawn although funding for development programmes continued.

As a way of enhancing the water supply, user fees were increased and subsidies on water tariffs were gradually removed from GWSC to achieve self-financing. As a measure, a formula for annual tariff adjustments to enable the Corporation generate sufficient funds to cover all annual recurrent costs as well as attain some capacity to undertake development projects was introduced by the government at the time. Unfortunately, this tariff formula could not be implemented due to political reasons. Instead, irregular tariff increases were always below cost recovery levels resulting in heavy corporate deficit financing and ineffective service delivery.

In order to curb the challenges that bedeviled the water sector, a "Five –Year Rehabilitation and Development Plan (1990 – 1995) was prepared in 1987 and the World Bank was directly involved. This resulted in the launching of Water Sector Restructuring Project (WSRP) between 1995 – 1997. The WSRP was aimed at reducing unaccounted for water, rationalization of workforce, hiring of professionals and training of staff. Equally important was also to ensure improved management and increased efficiency through organizational change of the water sector. A programme of rehabilitation and expansion for regional and district capital systems and improvement in commercial, financial personnel and project management was initiated.

In addition to the rehabilitation programme, the World Bank and the International Monetary Fund initiated other reforms which aimed at creating favourable conditions for increased private sector participation to improve efficiency in the development and management of the water supply facilities and thus attract more capital investment to the sector (World Bank, 1997).

The 1990's saw key reforms in the water sector of Ghana. As a first step, the responsibilities for sanitation and small town water supply which hitherto was being manned by GWSC were decentralized and moved to the District Assemblies in 1993. Again, the Environmental Protection Agency (EPA) was established in 1994 to ensure that water operations would not cause any harm to environment. In addition, the Water Resource Commission (WRC) was founded in 1996 to regulate and manage the overall water resource utilization. Furthermore, to ensure efficiency in the setting of tariffs and quality standards for the operation of public utilities, the Public Utilities Regulatory Commission (PURC) was established in 1997.

To ensure efficiency, corresponding reforms included the institutional separation of small urban and rural operations from urban operations which were to be privatized. The water supply systems of small towns (with less than 20,000 inhabitants) were to be transferred to community ownership. To this end, Community Water and Sanitation Division (CWSD) was set up within the GWSC in 1994. The CWSD was to implement the new policy in the framework of the National Community Water and Sanitation Programme which had been designed by the Government of Ghana with the World Bank and some NGO's assistance in 1993. By an Act of Parliament, the CWSD wa separated from the GWSC and turned into Community Water and Sanitation Agency (CWSA) in 1998. The Agency was charge to be responsible for the management of rural water supply systems, hygiene education and the provision of sanitary facilities. After the establishment of the CWSA, 120 water supply systems serving small towns and rural communities were transferred to the District Assemblies and Communities to be managed under the community-ownership and management scheme.

Finally, pursuant to the Statutory Corporation Act 461 of 1993 as amended by LI 1648 on the 1st July 1999, the GWSC was converted into a 100% state owned limited liability company; Ghana Water Company Limited (GWCL) to focus on urban water supply only. In other words, the Ghana Water Company Limited is the main national utility in charge of supply of potable water to urban dwellers in Ghana. The regulation of tariffs for potable water and other services was shifted away from the government to the Public Utilities and Regulatory Commission (PURC) which was established in 1997 with the mandate to examine and approve water and electric rates, monitor the utilities and reinforce standards of performance. The PURC was charged with the setting of water quality standards according to the Ghana Standards Board to ensure the protection of consumer interest while maintaining the balance between tariff levels and investment, operation and maintenance costs of the utility services (GoG &MWH, 1999). Private sector participation in urban water delivery in Ghana featured prominently in the early 2000. For instance, a management contract was signed between GWCL and Vitens Rand Water Services BV of Netherlands, consortium of Vitens International BV of the Royal Netherlands and Rand Water Services Pty of South Africa on the 22nd November, 2005.

4.0 Ghana Water Policy

According to the account by the operations manager -GWCL, myriad of comprehensive reforms in the water sector in Ghana have been pursued since the mid 1990's. It is argued that these reforms were initiated by the Bretton Woods Institutions. At the time, the Government of Ghana was obliged to restructure the sector by establishing regulatory bodies, opening the sector to private sector participation and separating responsibilities of urban water supply from rural water supply (Petit, 2009). The reforms were aimed at enhancing the efficiency of the production and utilisation of water. The reforms had several setbacks which hindered the realization of the set objectives for these reforms.

Notwithstanding these efforts to improve the water sector, it was not until 2007 that a national water policy was launched. The National Water Policy of Ghana is intended to provide a framework for the sustainable development of Ghana's water resources. It is targeted at all water users, water managers and practitioners, investors, decision- makers and policy makers within the central and decentralised government structures, non-governmental organizations and international agencies. The policy also recognises the various cross-sectoral issues related to water-use and the links to other relevant sectoral policies such as those on sanitation, agriculture, transport, energy et cetera. The National Water Policy is underpinned by the principles stated in the Ghana Poverty reduction Strategy (GPRS) which states inter alia that "increasing access to potable water…is key to achieving health outcomes and sustained poverty reduction." The GPRS envisages improving provision of water to rural, peri-urban and unserved poor urban areas (Government of Ghana, 2000), the Millennium Development Goal 7c: reduce by half the proportion of people without sustainable access to safe drinking water; and the "Africa water Vision" of the New Partnership for Africa's Development (NEPAD, 2001).

5.0 Evolution of Potable Water Supply in Wa Municipality

It came to light during the key informant interviews that the provision of public potable water in the Wa municipality of the Upper West Region dates back to the colonial era, thus 1950's. The Upper West Region was carved out of the then Upper Region in 1983 with the view to accelerating development due to the deprivation in the area. The hydraulic unit of the Public Works Department (PWD) at the time was responsible for the treatment and pumping of water in the region. The primary focus of the department was geared towards ensuring that people within the catchment area have access to potable water for their myriad uses. Prior to the operation of the PWD, the people in the region for that matter, the municipality largely depended on hand dug wells and dams for their daily water needs. Due to the lack of adequate surface water in the catchment area, the department depended on underground water in the form of drilled boreholes. These boreholes were fixed with mechanized pumps that connected to the treatment tank. This was and remains the primary source of the potable water supply in the Municipality. It is so because the Region is not endowed much with adequate surface water sources hence the department resorting to the use of boreholes.

The PWD unit in charge of the water supply started operating with three (3) boreholes. These boreholes were mechanized to pump water to the sole water treatment tank which was situated at the centre of the city of Wa. With a storage capacity of 40,000 gallons[2], the treatment tank at the time was too small to meet the increasing water demand of the people. As the prevailing technology, six stand pipes were erected at the city center and connected to the treatment tank to supply water to the people. With a regional total population of 438,008 in 1984 (Statistical Service, 1987) the population growth was not corresponding with the available and operational infrastructure for the treatment and pumping of water. The situation therefore necessitated an infrastructural expansion to increase the production capacity of the PWD in order to meet the increased water demand of the

[2] 3.79 liters is equal to 1 gallon

people. To this end, in the 1980's, a concrete water treatment tank with a capacity of one thousand eight hundred meter cube (1800 m^3)[3] was constructed to ameliorate the situation. The tank had a daily production capacity of about one thousand, three hundred and twenty meter cube (1320 m^3). It became evident that the drilled and mechanized boreholes which supplied water to the treatment plant in the 1950's have increased from three (3) to sixteen (16). It is worth mentioning that, additional seventeen (17) boreholes have been drilled, but they are yet to be mechanized for it to start operating. The operational infrastructural expansion in terms of the number of boreholes has seen an increase of only 18% since the advent of potable water supply in the area. This situation can explain the overwhelming current pressure on the infrastructure and its attendant water shortages in the municipality. Typical of almost all cities in Africa, the ever increasing population rates (Songsore, 2003) is not developing with a commensurate expansion in the water infrastructure exerting undue pressure on the limited available facilities. The limited infrastructural development in the water sector in municipality in terms of the number of boreholes which is the major source of water and other relevant logistics depicts a general sluggish development pattern of northern Ghana in all aspects.

5.1 Challenges of Potable Water supply in Wa Municipal

An interaction with the operational manager of the GWCL revealed the following as the major challenges that militate against potable water supply in Wa municipal.

First, one major challenge that has bedeviled urban potable water supply over the years has been the inadequacy and inefficiency of operational infrastructure. Poor water distribution and inequalities in service provision between the rich and the poor is a manifestation of this challenge. There is widening gap between the required infrastructure that can enhance the optimal operations and the available infrastructure. In some instances, the available infrastructure is not equivalent to the ones that are operational due to malfunctioning and break-down. The rate of increase in consumers is not commensurate with the available infrastructure, hence there is constant pressure on these equipment resulting in the break-down and operating below capacity. The culminating effect is that, small portions of the population are able to have access to potable water. Currently, only 35% of the customers have access to potable. The irony however is that, water supply with regards to the 35% coverage is not continuous but intermittent. Customers experience water supply rationing of once in every four days (1/4) due to the scarcity of water and the limitation in terms of the capacity of the operational equipment. The intermittent water supply leads to many problems such as severe supply pressure losses and great inequities in the distribution of water. In support of this circumstance, Vairavamoorthy & Mansoor (2006) argues that the intermittent supply causes high levels of contamination which occurs in networks where there are prolonged periods of interruption of supply due to negligible or absence of pressure in the systems. Consequently, people resort to using any available water sources of which its quality cannot be assured. This practice also comes with its own health implications. In the same direction, under staffing is another operational challenge that the water supply company is contending with. It is required that, every pumping point is assigned to a supervisor to monitor the day-to-day operation. However, due to under staffing, one field officer is currently required to monitor more than two pumping points thereby affecting efficiency and productivity. The situation therefore requires coherent action to address the technical and operational issues identified (WHO, 2000).

Second, funding is considered as the most significant cause of world-wide deficiencies in water supply. In the case of Ghana and Wa in particular, funding is a critical challenge that confronts the water supply. Generally, emphasis is placed on the ability of the government and other stakeholders to fund the operations of the sector. However, an urban water scheme without adequate revenues even for effective operation and maintenance necessarily affect the financial resources for expansion and the physical condition of the existing system which inevitably deteriorate. This afore mentioned discussion mirrors the prevailing circumstance that the water supply company in the Wa municipality finds itself. An equally essential point is that, the inadequacy of funds has hindered the extent of maintenance and expansion of the needed infrastructure to increase the capacity of the water supply to have higher consumer coverage. Consequently, the state of the existing equipment and pipes are deteriorating hence affecting the production and efficiency of the company. The resultant deterioration has therefore affected the infrastructure for treating, storing and transporting water to the people in the municipality and this account for the relatively low service coverage of thirty-five percent (35%).

Third, another challenge that came up strongly during this study was the fact that water demand is higher than the supply. This is attributed to the rapid urbanization with its associated population increases (Songsore, 2003) and the inadequate and inefficient treatment and storage capacity in the distribution system. As with many cities in African countries, Ghana is rapidly urbanizing. For instance, in 1950, 15.4 percent were urban dwellers but this figure has increase to 23.3 percent by 1960, 31.2 percent and 43.9 percent in 1980 and 2000 respectively (UNPD, 2003; GSS, 2000). Wa municipal with a population of more than 119,387 in 2006 (GSS, 2000) enforces dramatic increase in the demand for quality water consumption. This is having a detrimental effect on water

[3] 1 m^3 is equal to 1000 liters

supply system – both in terms of quality and quantity (Ministry of Urban Development, Government of India, 2012). This is forcing up to 70% of the urban poor to rely on costly options, including water vendors and small scale independent suppliers (African Water Facility, 2009). The consequential effect is that, the fact that demand is higher than supply, it has positioned the Ghana Water Company to resort to the rationing of the water supply (thus once in every four days). The quality of service delivery is therefore not satisfactory with no area within the municipality having access to a 24/7 water supply. The gap between the demand and supply owing to but not limited to the afore mentioned factors puts the water supply coverage in the Wa municipal at 35% which is not good enough in terms operational efficiency and sustainability. In addition to this, physical losses in the system which are caused by the bad state of the distribution infrastructures, which are also exacerbated by the limited leakage detection system. The bad state of the distribution infrastructure he reckoned can be attributed to lack of maintenance, replacement and rehabilitation. In effect, lack of funds is therefore blamed for the afore mentioned challenges (Adank, 2011).

Another important factor that militates against the treatment and supply of water is the Wa municipality is the prolonged power outages that has come to stay in the country over the past years. This is mainly caused by unreliable electricity supply. Reasons for the low supply are diverse. Due to the shortage in terms of the electricity production, the Electricity Company of Ghana is forced to ration power supply throughout the country. The seriousness of this challenge is that almost all the pumping points are mechanized and are powered by electricity. This therefore implies that anytime there is power outage, it holds back the pumping of the water to the treatment tank as well as the pumping of the treated water to supply customers and consumers. The prolong power outage in effect cutback the operation of the GWCL and also disrupts the rationing schedule of the company hence denying customers of prompt service delivery of the much needed supply of water.

In the same direction, one of the main challenges that hinders Ghana's potable water supply in urban areas is the inability of public sector to deliver, manage and maintain basic infrastructure services (Osumanu and Abdul-Rahim, 2008). Management and Maintenance are key component in ensuring optimal operation of systems. To this end, poor maintenance of pumping stations militates against the efficient operation of the water supply company and eventually affects service delivery. The poorly maintained infrastructural system is traced to insufficient financial resources and poor management. Consequently, the water infrastructure is deteriorating and this threatens the quality and reliability of water service delivery. The inept and inadequate operation and management and lack of effective administrative machinery of technical staff to promote new urban water supplies or to improve existing schemes are other factors that add to the challenges already discussed. Without independent and self-sufficient management and adequate financial resources, efficient water delivery cannot be achieved and the operation and maintenance of infrastructure cannot happen.

6.0 Conclusion and Recommendations

It is imperative to recognize the critical role that water play in human lives and how water treatment has evolved over the years. This to a large extent helps to shed light on the prevailing circumstance and the diverse efforts being made by major stakeholders in the water sector in Ghana with specific reference to Wa municipal. This can explain why governments and other private stakeholders across the globe are making efforts to make its provision and access sustainable to all. Indeed, the provision and access to potable water in urban areas has drawn tremendous efforts and attention as revealed in this paper and the challenges that confront its delivery is largely attributed to the lack of funds and rapid urbanization particularly in Africa in the 21st century. Notwithstanding the efforts made by successive governments in Ghana over the years, there seems to be numerous challenges that still confront the water sector with specific reference to Wa municipal. This study therefore put forth the following recommendations;

- The Ghana Water Company Limited – the mandated company responsible for the provision of water in urban areas, should be well resourced operationally in terms infrastructure and staffing to enhance efficiency and effectiveness in their operations.
- Adequate financial allocations should be given to the water company to enable the procuring of the needed equipment to increase the production capacity of the company to improve productivity and service delivery.
- Routine maintenance works should be encouraged to prevent abrupt break-down of equipment.
- Additionally, obsolete equipment and pipes should be replaced to remedy the incessant break-down of equipment.
- Alternative energy sources should be identified to power the pumping the mechanized boreholes as well as pump the treated water to consumers to ensure unreliable delivery services.

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Figure 1 MAP OF GHANA INDICATING WA MUNICIPAL

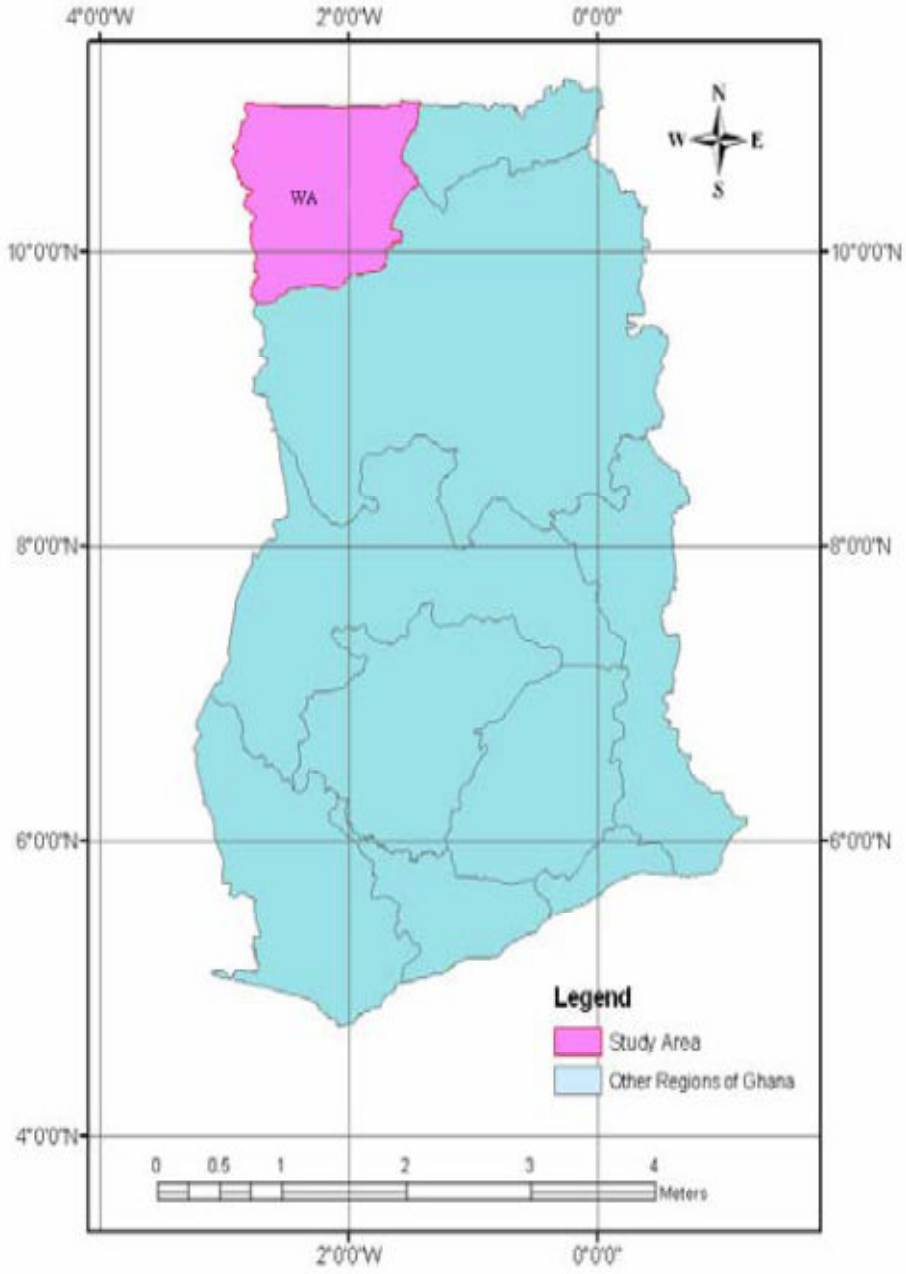


FIGURE 2: MAP OF UPPER WEST REGION INDICATING WA MUNICIPAL

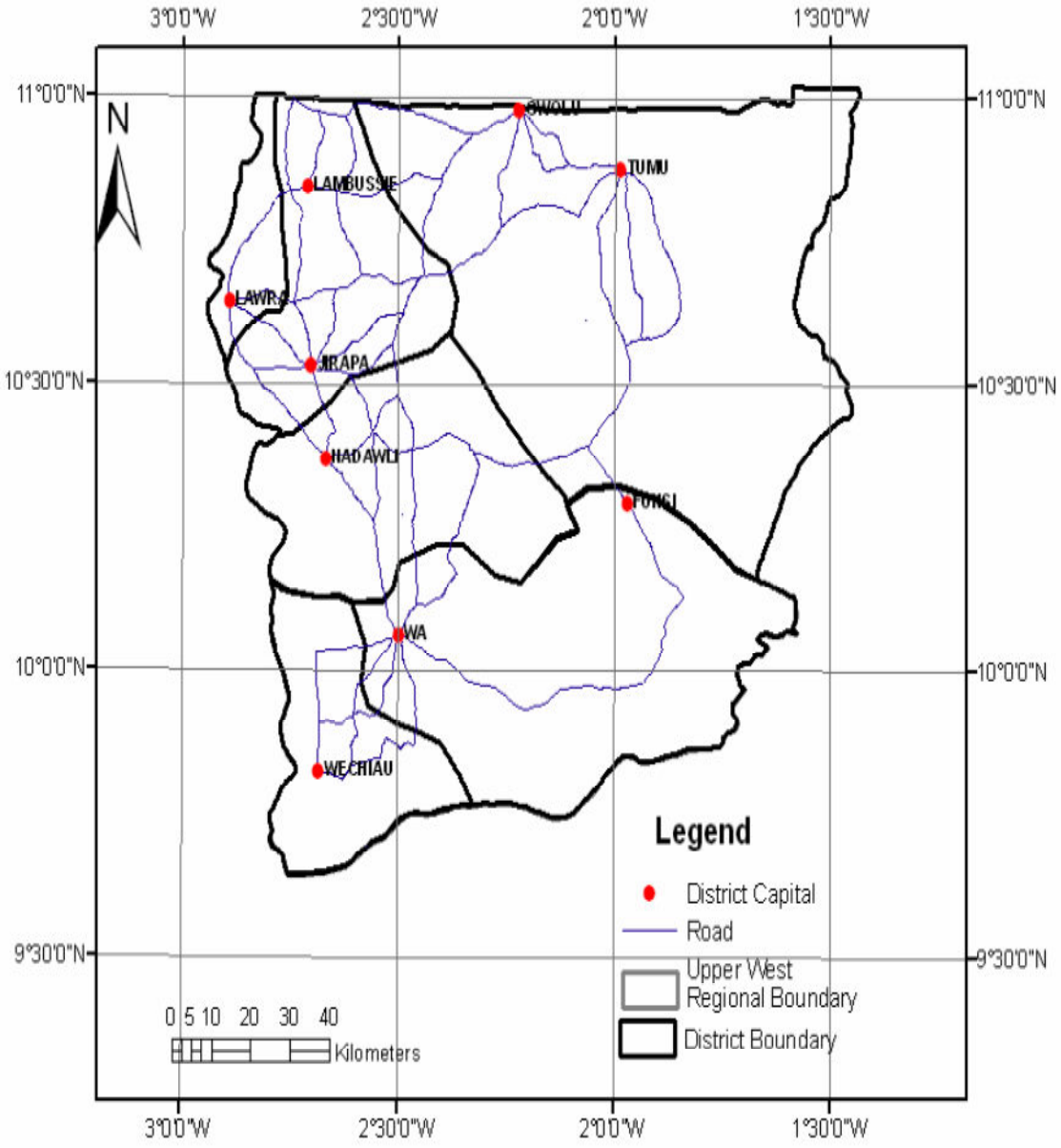
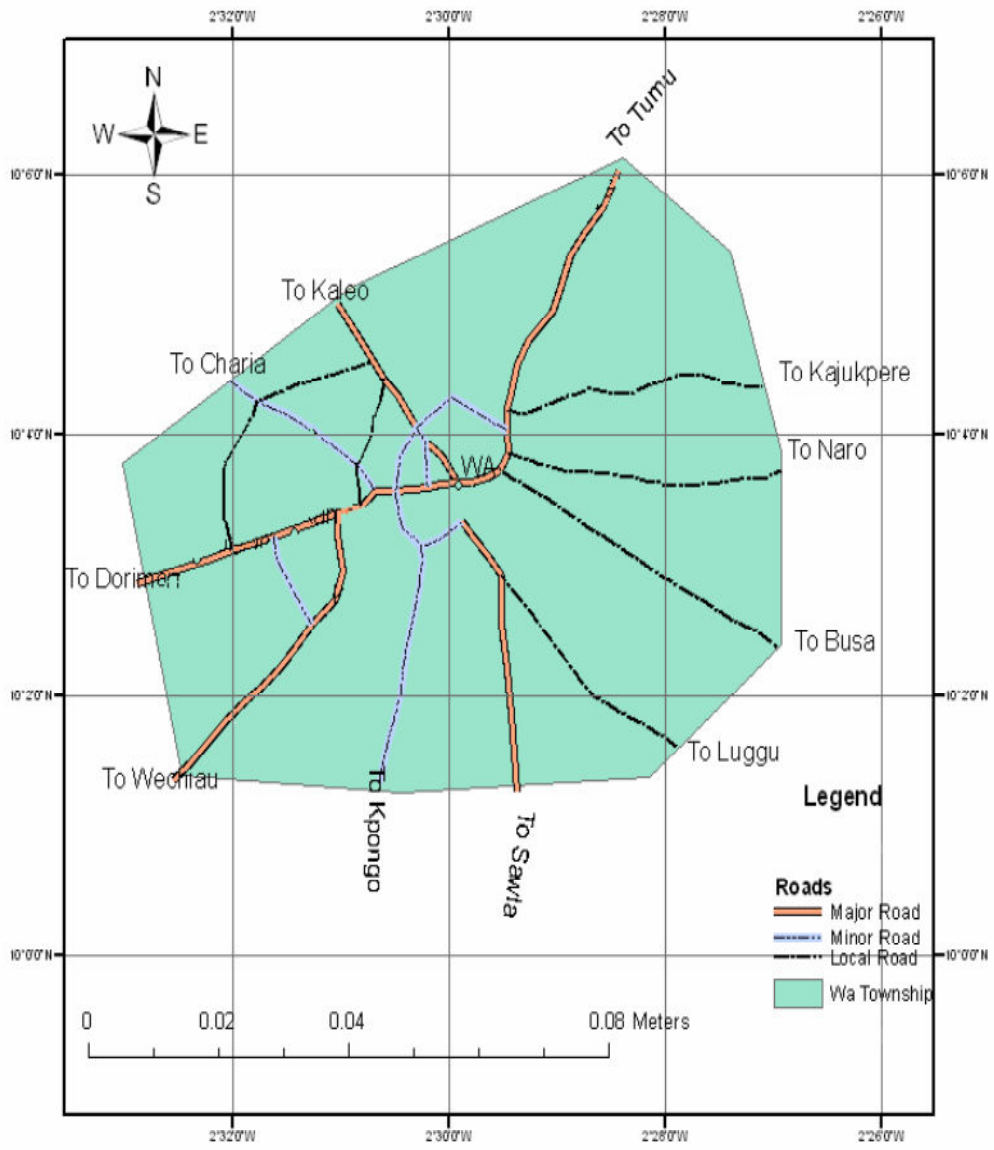


FIGURE 3: MAP OFWA TOWNSHIP INDICATING THE PHYSICAL LAYOUT OF THE TOWNSHIP



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