THE OPERATIONS AND MAINTENANCE OF SMALL TOWNS' WATER SYSTEMS: A COMPARATIVE STUDY OF THE PUBLIC-PRIVATE PARTNERSHIP AND THE COMMUNITY-BASED MANAGEMENT MODELS AT PARAMBO-SAWABA AND KOKOFU

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ABENA KORANG ACHEAMPONG
BSc. Planning (Hons.)

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any degree of the University, except where due acknowledgement has been made in the text.

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ABENA KORANG ACHEAMPONG 23/04/09

9082106 Signature Date

Certified by: 23-04-09

PROF. SAM AFRANE Signature Date

Supervisor's Name

Certified by: 23-04-09

DR. YAW NSIAH-PEPRAH Signature Date

Head of Department

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ABSTRACT

Effective operation and maintenance of STWS is essential if sustainable water supply systems are to be achieved. The problem of unsustainable water supply systems however, exists because of lack of proper management practices. STWS are characterised by low technologies, low commitment of user communities, high water losses, low water production and consumption levels because of low demand, just to mention a few.

The study aimed at assessing the performance of the private sector and communities in the operations and maintenance of STWS, under the Community-Based Management (CBM) and the Public-Private Partnership (PPP) Models. This was to find out whether STWS are proving effective and sustainable under the two different management models. A comparative study approach of the PPP at Parambo-Sawaba and the CBM at Kokofu were chosen for the study. This approach was adopted because of the two different management models involved in the operation and maintenance procedures. Again, the choice of this approach was as a result of the multiplicity of data sources and the ongoing phenomenon under study.

Data were collected from both primary and secondary sources. The main research instruments used for data collection were document review and interviews with key informants in the small town water sector. These include DAs, DWST, WSDBs, and service operators. Focus group discussions were also used to conduct community perceptions survey from the different groupings in the communities including men, women, the youth and children. Data was collected with appropriate interview guides and by the use of digital recording.

The study revealed that three main factors contributed to the performance of small towns' water management models. The first issue which affected performance was the local and socio-economic conditions pertaining in the water supply area. The study revealed that factors such as geophysical characteristics, willingness and ability to pay for water services and the socio-cultural background of the local people influenced the performance of the water systems. These factors have led to the problem of low demands

of the pipe water systems. Water consumption levels were considerably low, 8 litres per capita per day and 12 litres per capita per day at Parambo-Sawaba and Kokofu respectively, which adversely affected production levels.

Another factor identified which influenced the performance of the water system was the water management models. The study revealed that the Community-Based Management Model performed better in community participation than the Public–Private Partnership. There was a greater sense of ownership and responsibility towards management by community members.

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The last factor which affected performance of both management models was low technology. The study revealed that high water losses averaging between 30-32 percent annually were encountered. The problem of high water losses has been attributable to technical deficiencies of the water systems.

In a nut shell, the study has identified three key issues which influenced performance of the two water systems. These are socio-economic conditions, water management model and the type of technology in place. The study however could not come out with which of the three factors has the largest influence on the performance of STWS. It is therefore proposed that user involvement must be carefully considered in any management model to be adopted. Community sensitisation and animation process must be carefully considered before any appropriate management model is chosen.

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List of Abbreviations

BOT	Build Operate Transfer
BOOT	Build Own Operate Transfer
CBM	Community-Based Management
COM	Community Ownership and Management
CWSA	Community Water and Sanitation Agency
DA	District Assembly
DACF	District Assembly Common Fund
DWST	District Water and Sanitation Team
EC	European Commission
ESA	External Support Agency
EU	European Union
GPRS	Growth and Poverty Reduction Strategy
GOG	Government of Ghana
GWCL	Ghana Water Company Limited
IWSC	International Water and Sanitation Centre
NGO	Non Governmental Organisation
O&M	Operation and Maintenance
PPOM	Public-Private Operation and Maintenance
PPP	Public-Private Partnership
PPIAF	Public-Private Infrastructure Advisory Facility
SIWI	Stockholm International Water Institute
STSP	Small Town Sector Policy
STWS	Small Towns' Water Systems
UFW	Unaccounted-For-Water
UNICEF	United Nations Children's Education Fund
VLOP	Village Level Operation and Maintenance
WATSAN	Water and Sanitation
WHO	World Health Organization
WSDBs	Water and Sanitation Development Boards

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CHAPTER ONE

GENERAL OVERVIEW OF STUDY

1.1 Background

Ghana and other sub-Saharan African countries face the challenge of achieving accessible and sustainable water service delivery. Sustainable access to safe water is essential for human health and survival, which in turn facilitate economic growth and sustained poverty reduction [Stockholm International Water Institute (SIWI, 2005)]. It is estimated that 35 percent of improved rural water supplies in sub-Saharan Africa are out of service at any given time (Harvey, 2005).

In Ghana, the situation is not different. About 36 percent of the population does not have access to safe water (WHO/UNICEF, 2004). The condition is even worse in rural and small towns where the majority of the population resides. The national coverage for potable water supply in both rural and small towns is currently 55 percent (Van Ess, 2008). This implies that nearly half of small towns and the rural populace do not have access to improved water supply. Nyarko (2007) put forward that one major challenge facing the small towns' water sector is that systems provided are not operated and maintained in a sustainable manner. In his study, it was revealed that four (4) out of the twelve (12) newly constructed small towns' water systems in the Western Region of Ghana were not functioning due to factors ranging from technical, institutional and financial mismanagement. It is no doubt that effective operation and maintenance of water systems is essential if small town water service delivery is to be sustained.

Before 1994, the government was solely responsible for adequately providing for the water needs for both rural and urban population of Ghana. Districts and communities were not involved in the planning and management of safe water facilities and the results were often unsustainable (CWSA, 2004). With increasing population and dwindling public resources, other alternative management options have emerged. The new approach revolves around the concept of decentralisation and emphasizes on empowerment of the

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communities and districts in the ownership and management of water supply systems. Again, private sector participation is also encouraged. These management options are supported by the Growth and Poverty Reduction Strategy II as well as the National Community Water and Sanitation Programme. The range of operational and management options in small towns are public community-based management to the local private sector participation (CWSA, 2004).

The central issue is that has the introduction of the community and the private sector increased efficiency in the management of Small Towns' Water Systems (STWS) over the past years? The research therefore focuses on the Public-Private Partnership and the Community-Based Management Models in the operations and maintenance of small towns' water systems. This is to find out whether financial, technical and institutional provisions for maintenance of the water systems are proving effective and sustainable under the different management models.

1.2 Problem Statement

Small towns and rural areas in Ghana are confronted with the problem of achieving sustainable water supply. The main cause of the problem is the lack of adequate operation and maintenance procedures for effective and efficient management of the existing water systems. The perceived poor maintenance is reflected in broken down pipes and irregular water supply. In the study communities, the problem of inadequate operation and maintenance is characterized by broken down water pumps, and hence the problem of water shortage. Consequently, community members resort to the use of unsafe water sources. This could subsequently pose a health menace to the people if unchecked.

Sarpong-Manu (2001) study revealed that most communities and district assemblies lack ownership sentiments and managerial skills. He further states that most district assemblies do not provide technical and advisory support because of lack of human and financial capacity. His study established that water quality monitoring is not regularly done and the quality of water in most cases is questionable.

Small Towns' Water Systems are also characterized by technical deficiencies because of low investment and hence, the problem of high water losses. Water losses were recorded as 30%-32% annually in the study communities. High water losses imply high non-revenue water and hence the problem of low revenues. In some cases, even the low revenues obtained are sometimes misappropriated for other purposes such as funerals and festivals and there is little or no money left for operation and maintenance purposes. In view of the above, the researcher wants to find out whether operation and maintenance are proving effective and sustainable under different management options. The questions to ask are:

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- What are the existing management models of STWS and how do they operate to influence water supply?
- What are the differences between the Community-Based Management and the Public-Private Partnership Models in terms of strengths and weaknesses?
- What are the causes of the problems facing Small Towns' Water Management Models?
- How can managements of STWS be improved to ensure sustainable water supply in small towns?

There is therefore the need to investigate and understand the performance of the management models in relation to effective, efficient and sustainable water supply systems. A comparative case study of the Community-Based Management and the Public-Private Partnership Models at Kokofu and Parambo-Sawaba respectively has been chosen for the comparison.

1.3 Study Objectives

The main objective of the study is to assess the performance of the Community-Based Management and the Public-Private Partnership Models in small towns' water service delivery; and to suggest measures to ensure sustainability through effective administrative, technical and financial management of the systems.

The specific objectives are:

- To examine the existing management models of STWS and how they influence accessibility to potable water supply.
- To assess the performance of the Community-Based Management and the Public-Private Partnership Models in small towns' water service delivery in terms of strengths and weaknesses.
- To identify the causes of the problems of the water management models in relation to sustainable water supply.
- To suggest measures that will addresses the challenges of the water management models; and to provide adequate information and basis to guide communities in the improvement of water management models for sustainable water delivery in small towns.

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1.4 Justification of Study

Water is a basic necessity in life and therefore an essential component to human health and survival. Smet and Van Wijk (2002) argue that safe water can greatly improve the health of the underprivileged population in rural and small communities and therefore serves as a source of, and condition for socio-economic development.

It must be emphasized that effective operation and maintenance is a key component to ensure sustainability of any infrastructure service such as water facility. In many countries worldwide including Ghana, the small town and rural populace often face with the challenge of achieving sustainable water supply systems. Lack of maintenance procedures of water systems often leads to unsafe water usage (Harvey, 2005). These conditions have important implications for the planning and management of existing and potential water management models.

It is expected that at the end of the study, the different water management models will be assessed to know how to maximize their benefits to ensure sustainable potable water supply in Ghana. In addition, the findings will serve as a basis to replicate appropriate

management options in different communities and districts as well as nation-wide. That is to say, it will provide a basis for the improvement of private sector involvement as well as community management or otherwise, to ensure the sustainability of water systems. Some accruing benefits will include increased access to safe water, a reduction in water-borne or related diseases, improved national coverage of (55 percent to the anticipated 85 percent), as well as meeting the millennium development goal target of halving the proportion of people without sustainable access to safe drinking water by 2015 (Van Ess, 2008).

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The research is also an attempt to provide a tool to guide communities, governments, non government organisations and multilateral agencies like the World Bank in their selection of appropriate management models for small towns. Ultimately, the outcome of the research will contribute to the body of knowledge available on rural and small towns' water management as well as generate further research studies.

1.5 Scope

Geographically, the study was carried out at Parambo-Sawaba and Kokofu in the Brong Ahafo and Ashanti Region of Ghana respectively. These two communities were purposively selected because they fit the focus or objectives of the research.

In terms of content, it focused on activities of small towns' water supply systems within communities where both private operators and the communities are involved in the operations and maintenance of water systems. Operations and maintenance procedures will consider administrative/institutional issues, technical and financial management. The extent of risks or challenges which were encountered by the Private Operator and the Community were identified. Measures to ensure sustainable and improved water supply systems to increased access to potable water supply are catered for by the study.

1.6 Research Methodology

1.6.1 Research Strategy/Approach

The study adopted the Comparative Study Approach to assess the performance of the Public-Private Partnership and Community-Based Management Models in the operations and maintenance of small towns' water systems. This approach was adopted because the social phenomenon under investigation is essentially a contemporary one that involves an empirical study within real life context, using multiple sources of evidence (Yin, 1984). That is, private sector participation and community management in small towns' water supply systems emerged over the past decade and has gained ascendance in recent years.

Again, the Comparative Study was employed because the approach lends itself for the researcher to explore issues both in the present and the past (Bell, 1999). Since trend analysis was a major tool used by the researcher to make concrete decisions about comparisons, the objective of the study fitted well into the Comparative Case Study Approach.

1.6.2 Data Sources and Collection Instruments

Both primary and secondary data were employed for the research study. The researcher reviewed relevant literature from secondary sources to support or refute arguments and conclusions about the subject matter. For instance, the use of journals, publications and internet was employed to understand the concepts, key components, principles and management models of small towns' water systems. Small towns' water management policies were also examined. A complementary source of data used was the primary data. The use of interviews, questionnaires as well as observations was the main instruments used to collect primary data. Before the onset of the detailed data collection, a reconnaissance survey was conducted by the researcher for familiarisation purposes. This was conducted to find out which topics are important, and when people directly concerned are encouraged to discuss. Thus, note taking was used to enable the researcher to extract points of interest and topics which was further included into the study.

Semi-structured or open ended techniques were adopted to collect data. The use of key informant techniques was adopted by which people with specialised knowledge about the issue in question were selected for the interview. Key informants included service operators, WSDBs, DWST and water vendors. Information from the above informants was both qualitative and quantitative on specific aspects like their roles, current staffs, water tariffs, revenue sufficiency, water quality monitoring, monitoring and supervisory functions and other operation and maintenance procedures. Focus group discussions were also held to know community perceptions about management of water facilities. Groupings focused on the different interest groups in the society.

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Since the research used a lot of qualitative approach, triangulation was adopted to cross check findings. Triangulation increases reliability and validity of data gathered (Patton, 1999). For instance, in an attempt to verify that weak institutional collaboration exist among key actors in the operation and maintenance of small town water systems, evidence were sought from community members, the Water and Sanitation Development Boards (WSDBs), the District Assemblies (DAs), the District Water and Sanitation Team (DWST) as well as service operators.

Apart from note taking of responses from interviews, the research devised some means of recording responses. The researcher used digital recording with respondent's permission. Digital recording was useful to check wording of any statement and was also used to verify any note taken by researcher from respondents.

1.6.3 Sampling Techniques

The use of purposive sampling was employed for the study. This is where sampling units were selected because they satisfy certain criteria of interest (Kumephor, 2002). Thus, key informants like the Private Operators, the Community Operators, the Water Boards and the DWST who have knowledge on STWS were the focus for the study. In addition, the researcher adopted the use of quota sampling for community perceptions survey. Here certain parameters were defined by the research to do groupings. Men groups were

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composed of opinion leaders, household heads opinion leaders, assembly men and unit committee members. Women groups were mostly water vendors, the youth were all men and children were composed of one pupil each from primary 5 to JHS 3 and the remaining 5 did not attend school

1.6.4 Selection of Survey Locations

Most small towns with pipe scheme system have been experiencing unsustainable water supply systems. Thus, the researcher wanted to find out whether financial, technical and administrative provisions for O&M are proving effective and sustainable under different management models at Kokofu and Parambo-Sawaba . For a successful comparison, the researcher considered population as a criterion. Thus, study settlements with population of 5000 to 15000 were considered. Again, Kokofu and Parambo-Sawaba were chosen because of proximity to the researcher.

1.6.5 Selection of Respondents

Data from respondents were collected from two levels, the district and community levels using mainly qualitative data (Interviews, discussions and field observations). Again, reports and records obtained from various offices in the study communities. The data collection levels and targets are summarized in the Tables 1.1 and 1.2 below.

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Table 1.1: Key Informants Interviewed

Key informants	Number Interviewed	Remarks
District Level • DWST	4	3 staff members, community development officer, the environmental health officer and the technician were interviewed whilst at Parambo-Sawaba; only the community development officer was interviewed.
Community Level • Service Operators	6	3 staff members each, the technical manger, revenue officer and finance and administrator were interviewed in the two settlements
• WSDBs	4	The chairman, vice chairman and the secretary were interviewed at Parambo-Sawaba, whilst the chairman only was interviewed at Kokofu
Total	16	

Source: Field Survey, 2008

Table 1.2: Selection of Informants for Focus Group Discussion- Community Level

Sub Group	Total No. of Members Interviewed	Remarks
Men	8	Men groups were composed opinion leaders, assembly men, unit committee members, household heads.
Women	8	Most women interviewed were water vendors
Youth	12	All youth interviewed were men.
Children	10	One pupil each from primary 5 to JHS 3 and the remaining 5 do not attend school.
Total	38	

Source: Field Study, 2008

The table above show the different sub groups interviewed in the communities, the number of people in each group and the categories of members in the groupings. There were four major sub-groups, men, women, youth and children in each of the two communities.

1.6.6 Data Processing, Presentation and Analysis

Data collected was processed by editing, coding and tabulation for analysis. Editing was carried out to detect and eliminate errors in the data. Interviews recorded were also transcribed.

The analysis of the data employed both qualitative and quantitative techniques. Quantitatively, statistical application techniques were used to analyse and compare data. This was complemented by qualitative techniques where descriptive analysis was adopted to analyse information derived and perceptions from the key informant interviews. Descriptive analysis was also employed to present observations made by the researcher.

The study summarized responses to relevant relationships between variables. Variables used for the analysis included water production and consumption levels, unaccounted for water, revenue/output from sales, incomes and expenditure, to mention a few. Whenever possible, interview transcripts and particularly statements have been used as direct quotes in the report in order to enrich the presentation of results, and to contextualise the discussions. Graphical presentations such as tables and charts have also been used to complement the discussion.

1.7 Limitations

The risks of bias creeping into interviews where large team of interviewers are employed were envisaged. To overcome this, the researcher solely conducted the set of interviews which reduced and ensured that biases were consistent. This made interview approach time consuming. The whole interviews were recorded for over 20 hours.

Another shortcoming of this approach was that the use of purposive sampling, where issues arising from changes that happened over the duration of the empirical work and where members of the sample were differently involved. For instance, it was difficult accessing 2005 records on water supply at Parambo-Sawaba because majority of the staff

members were employed in 2006. However, this was overcome by asking respondents their own view and about assumptions made in their discussions. Again, the use of quota sampling in selection of members for focus group discussion did not give each person in the population an equal chance of being selected.

1.8 Organisation of Report

The report has been organised into five chapters. Chapter one looks at the general overview of the study, the problem statement, the study objectives, and the scope of the research as well as the research method adopted for the study. The chapter also considered the relevance of the study.

The second chapter focused on review of related literature on the operations and maintenance of small towns' water systems in relation to the management models and strategies that ensures sustainable water supply.

The third chapter presents the background and profile of the study areas as well as an overview of the water supply systems' and how they are managed in the two study areas. Alternatively, the fourth chapter presents an analysis and discussion of the survey conducted. This was done in relation to the study objectives. The last and final chapter looks at the major findings of the research, and suggest recommendations and general conclusion for the study and successive research to be done.

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CHAPTER TWO

SMALL TOWNS' WATER MANAGEMENT MODELS: CONCEPTUAL AND ANALYTICAL ISSUES

2.1 Introduction

Based on the definition of the research problem, the study objectives and other issues of the research, it is important to understand the elements and dynamics of small towns' water systems (STWS). This chapter therefore provides insights into the nature and characteristics of small towns' water supply systems and how management principles function for effective water supply. It will further explore the different water management models globally as well as at the national level. Lastly, the challenges confronting STWS and their planning implications will also be discussed.

2.2 Overview of the Small Town Water Sector

Researches carried out by water experts reveal that communities in developing countries that want to establish and run improved domestic water supply have similar characteristics. Smet and Wijk (2002) put forward that such communities are usually small in terms of population size, isolated and have scattered population. They further characterized small communities with attributes like limited demand for water, limited administrative skills but a strong leadership and social structure.

In planning for water service provision, the nature and characteristics of small communities vis a vis the management model to be adopted must be critically considered. Smet and Van Wijk (2002) assert that past projects and programmes with regards to water provision have often overlooked the different nature and history of small communities. They state that such projects have used the same technology, service level, management and financial systems as used in urban large communities and the results were unsustainable services.

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In response, water supplies in most parts of the world currently use the concept of demand responsive programmes. These programmes recognize that different types of communities want and can sustain different solutions, not only for technologies and service level, but also with regards to local maintenance, management and financial arrangements (Lockwood, 2004). This gives each community and the various groups in the community an informed choice of services and management systems. Impliedly, all locally relevant groups or stakeholders get information on all relevant aspects and implications of various water supplies management options.

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According to the European Commission (1998), the key principles articulated at the International Conference on Water and Environment Meeting held in Dublin in 1992, has some core principles expressed as the following:

- *"Water management and development must be based on a participatory approach involving users, planners and policymakers at all levels; and*
- *Women must play a central part in the provision, management and safe guarding of water."*

The centre piece of the above principles is a strategic approach for equitable, efficient and sustainable management of water supply systems. The next section will however discuss small towns' water management models which are commonly practiced.

2.3 Small Towns' Water Management Models

All over the world, local communities have developed their own creative water management solutions that focus on democratic participation, local accountability and community activism (Lockwood, 2004). Water management models in the past adopted full public ownership and management where provisions of water were based on supply driven approaches. Currently, management models range from community-based management, to a greater or lesser participation of the commercial private sector.

The European Commission (1998) states that three options are clear. These are described below.

- Option 1, is where local authorities or communities retain full responsibility for operations, maintenance, capital investment, financing as well as bearing all commercial risk. Harvey (2005) describes this option as the Community-based Management. Lockwood (2004) also terms it as Village Level Operation and Maintenance (VLOM).
- Option 2, is where responsibilities have been entrusted by local authorities/communities to autonomous commercialized utilities or companies. This option is termed the Private Ownership, Operation and Maintenance.
- Option 3, is where management of existing systems or construction of new installation has been organized through private operators under various contractual arrangements including leases, concessions and build - own - operate - transfer schemes. It is called the Public/Private Operation and Maintenance. (Harvey 2005). Bohman (2006) terms this model as the French Model. These available options have been discussed in details in the next section.

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2.3.1 The Concept of Community-Based Management Model

According to Lockwood (2004), Community Management has become the leading model for implementing water supply projects in rural areas in developing countries. He explains that the community management model allocates responsibility for ongoing management of a water supply to the community of users to ensure that the water service continues to operate on a sustainable basis. Harvey (2005) underscores this argument when he notes that the model can enable people to take control of the operations and administration of their own water system completely and indefinitely.

The basic principles behind this concept are that the community that benefits from an improved water supply should have a major role in its development, own the water system or facility, and have overall responsibility for its operation and maintenance (Lockwood, 2004). He further states that this is fulfilled through the formation of a

community water committee that is responsible for operating the system, setting and collecting water tariffs, and managing maintenance and repair activities. "Community members are normally expected to contribute to initial system installation costs and to meet all ongoing maintenance and repair costs through the regular payment of appropriate water tariffs", he added.

Despite the blanket application of community management of rural water supplies in sub-Saharan Africa, the sustainability of such interventions remains woefully inadequate. It is therefore important to understand why community management has been applied in so many cases and why it has had such limited success. A study conducted by Nyarko (2007) in Ghana, Kenya, Uganda, and Zambia, suggest reasons for the widespread faith placed in community management, and under what conditions it contributes to sustainable rural water services. Some fundamental reasons suggested are:

- The 'supply-driven' approach in rural water supply delivery led to management inefficiencies because of limited government capacity and commitment. Consequently, sustainability levels were low and the community management concept appealed to many governments, as it relinquished them of their responsibility for operation and maintenance.
- Community management has become a convenient concept for shifting responsibility for ongoing operation and maintenance from facility-provider to end-user. It is therefore most suitable to the 'project approaches' adopted by non-governmental organizations and bilateral organizations.

In view of the above reasons, community management has a wider application world wide and some countries of application are hereby described.

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a. South India Case Study: Success

In South India, an extensive breakdown of hand pumps in Visakhapatnam district in Andra Pradesh led to initiative of an NGO to transfer maintenance responsibilities from the district government to local communities. Water and sanitation committee were established to be responsible for establishing a water fund to pay for hand pump repairs. Village mechanics were also trained by government mechanics to carry out repairs and were paid a stipend in the interim period by the NGO. Village mechanics became self employed in no time and were remunerated by the water committees. Within 3 years, 400 water committees were formed and 50 had raised local funds. In 1997/1998, 2000 pumps were repaired. The community infrastructure for repairs is now in place and there is regular supply of water. (*Source: IRC, International Water and Sanitation Centre (2003)*

In the Yamphant community in Nepal, inadequate water supply in the early 1990s led to the refusal of people from paying water tariffs. The above problems led to an alternative search for sustainable water management system. Problem solving strategies were developed by a research team, which applied participatory research appraisal techniques. Local capacity building were developed which enhanced the capacity of the community in their water supply management. Administratively, a permanent and legally (13) member water user committee were formed, which constituted representatives' from women groups as well as other advisors. Thus, rules and regulations governed the management of water systems, and research volunteers including women were formed to work as a bridge between the community and the research team.

In terms of financial management, user cards together with ledger books were used to collect water tariffs. Each tap has a coordinator who is responsible for the collection of water tariffs. User cards are very useful to keep the records up to date and the financial system is more transparent. Households were now able to pay Rs 10 per month, twice as much after the restructuring system. A regulating valve is used to supply water which ensures that there is equal distribution of water to all taps. (*Source: International Water Sanitation Centre (IRC), 2003).*

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b. Cameroun Case Study: Failure

In Cameroun, the Community Management Model has had limited success. The major problems were limited capacity of field staff, use of inappropriate approaches and lack of skills and attitudes that promote this concept. Community members' argued that water committees have a life span and will eventually die. Again, there were a lot of questions raised by members on the outcome of the system in the event that trained community members leave the village as well as doubts about their ability to handle some major repairs.

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In addition, other people were of the view that the model seeks to relinquish responsibilities to communities because there are no funds for the state to handle the maintenance problems. For instance, handing over management of thousands of manual pumps to communities in the northern zone did not bring noticeable improvement in water supply. Cost recovery posed a threat and about 500 pumps are in the state of disrepair. (*Source: IRC, 2003)*.

2.3.2 Challenges of Community-Based Management Model

The fact that community water supply sustainability levels remain low throughout sub-Saharan Africa indicates that there are severe limitations to current approaches to community management. The reasons for the breakdown of management systems are numerous. A survey conducted by Nyarko (2007) in some communities in Ghana, Kenya, Uganda and Zambia reveals the following as some of the reasons.

- *Lack of Continuity*

Community management often relies on voluntary inputs from community members, which people may do for a while but are reluctant to do in the long term. There are often no long-term incentives for community members. In addition, key individuals on the water committee leave the community or die, and there is no mechanism to replace them

with trained individuals. The Cameroun case study as discussed above is classical example.

- *Mistrust*

The community organization charged with managing the water supply often looses the trust and respect of the general community. This may be related to a lack of transparency and accountability as a result of poor record keeping; and the lack of regulation by a supporting institution such as the local government.

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- *Lack of Institutional Support*

Another constraint of the community management model is the lack of institutional support. In Uganda water supply, studies conducted by Nyarko (2007) revealed that communities have no contact with local government (or the implementing agency) and feel that they have abrogated responsibility for service provision; they therefore feel abandoned and become de-motivated.

- *Low Income of Rural Economies*

Small communities are usually too poor to replace major capital items when they break down. In most cases, the amount and period of contribution depends on the fault. This implies maintenance or replacements funds are not catered for. Thus, conditions of system worsen which bears a higher cost and therefore becomes difficult to pay. In the case of Cameroun, the practice has been payment for operation and maintenance only and there are no provisions for replacement cost. Again, even though payments are to be made in cash, observations revealed that people are more likely to contribute if payments are by materials.

- *The Problem of 'Communal Ownership' of Water System*

Another key limitation to community management is the widespread perception that 'ownership' is a prerequisite for community management and is the key to sustainability. There is no definition of what constitutes the 'community' and thus community members

do not have clear or legal identity of the water system. Neidrum (1994) argues that community ownership does not necessarily translate into a sense of responsibility and management of the system, nor does it guarantee a willingness to manage or pay for its operation and maintenance (O&M). The reverse of this can also be said to be true, that is the fact that a community is willing to pay for O&M does not necessarily mean that they have a strong sense of ownership.

2.3.3 The Concept of Public-Private Operation and Maintenance Model

Private sector participation in water service delivery has been recognized as a means of making water supply services more efficient and cost effective as well as ensuring sustainability (EC, 1998). With regard to this model, a private sector is contracted by the community to undertake operation and maintenance requirements, and to ensure that water systems remain functional. The shift towards Public-Private Partnerships (PPP) in the water sector started in the 1990s and has now been popularized. According to Nyarko (2007), the number of PPP contracts in middle and low-income countries stood at 109 in 2000.

Nyarko (2007) put forward that, 34 out of 48 countries in Africa either have PPPs or have initiated actions towards PPPs. He stated that PPPs are increasing for a number of reasons. These include the desire for efficiency improvements by ensuring transparency and accountability to users, the need for private capital to reduce public sector borrowing, the injection of commercial principles into the water sector by the private sector and the aim of stimulating accountability and competition to improve utility performance.

According to EC, (1998), there are different ranges of contractual arrangements ranging from short term service contracts to full divestiture. These are discussed below.

Service Contracts

Service contracts refer to arrangements whereby the public authority retains responsibility for operation and maintenance of the system, but where specific activities

of the system are contracted-out to the private sector for a fee. Examples include periodic maintenance of electrical equipment, procurement of spare parts, billing and metering. Service contracts usually have duration of six months to two years.

Management Contracts

In management contracts, the private firm takes responsibility for operations and maintenance of the wider system or parts of the system for a fee. The public authority retains ownership of assets and investments in the system. It usually has duration of three -five years. Examples include the private operator having responsibility for all operations and maintenance in a town and /or metering, billing and collection of tariffs.

Lease/Affermage Approach

Under the lease (affermage) approach, the leaser (private operator) 'rents' the facility from the public authority and becomes responsible for operating, maintaining and managing the system. The public authority remains responsible for new investments into the system. The private operator pays a fee for the use of assets. The operator also bears the commercial risk. The duration of the contract is between 8-15 years.

The Build Operate Transfer

The Build Operate Transfer (BOT) or Build Own Operate Transfer (BOOT) contracts are generally used to construct new systems or parts of the system such as water treatment plants and wastewater treatment plants. The private operator builds the plant, and assumes responsibility for operation and maintenance in exchange for a fee, which is usually related to the volume of water supplied or treated. After a predetermined time, the facility is transferred back to the public authority.

Concession

In the concession arrangement, the concessionaire (private operator) has overall responsibility for services, including operation, maintenance, and management as well as capital investments during the concession period, carrying all commercial risks for

construction of fixed assets, operating and maintaining those assets in exchange for tariffs which the concessionaire is also responsible for collecting. Ownership of the fixed assets remains with the public authority. The duration is between 20-30 years to ensure a reasonable return to the concessionaire on the capital invested in new works.

Divestiture

Full divestiture, means a total sell out of the ownership of systems and services to the private sector. This was the case in the privatization of the British water utility in 1989 but has also taken place in Estonia and in Chile (Bohman, 2006).

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2.3.4 Case Studies: Success and Failures

The case studies present examples of Public-Private Partnership (PPP) in some countries of application. The introduction of PPP has brought benefits and presented challenges. Some of which are discussed below.

In Cote d'Ivoire, PPP arrangement is adopted in management of water systems. The system uses Water Development Fund to help achieve the social service goal of water provision and hence provide a good balance/leverage for the "socio-commercial" requirement of the service provision. In Gabon water supply, concession contracts introduced managerial innovations in the water industry. For instance, it resulted in limited government interference in tariffs especially future tariffs, placed utilities under corporate law and liberated them from undue public sector rules and regulations.

In Gambia for example, experience with the water supply lease contract concluded in 1993 was generally considered as a failure. While performance improved with respect to connection rate and un-accounted for water (UFW) levels but brought unhealthy relations between the public asset holding company and the private operator. This was partly attributed to a high degree of uncertainty regarding the precise scope of maintenance and investment responsibilities.

In Guinea and Senegal water supply, lease contract implemented in 1990s saw improvement but even then suffered from problems such as weak performance of public entities, poor coordination between operational and investment activities, dispute over exact scope of maintenance and investment responsibilities, and lack of accountability for overall performance. These problems were common when operations and maintenance are given to private operators and investment planning and financing to public entity.

2.3.5 Challenges of the Public-Private Partnership Models (PPP)

Private sector participation in public utilities in developing countries offers constraints from the point of view of both government and the private company related to political, economic and regulatory environment. Some of which are discussed below.

- *Political Risks*

There is the problem of unreliable payments by public institutions of its water bills and other subsidy payments. The untimely release of water tariffs amount in huge monies in arrears which in the long-run may crippled company and thus result in management inefficiencies.

- *Commercial Risks*

These stem from the challenge of meeting pro-poor needs, safeguarding public health, meeting quality standards whilst ensuring that profits maximization is achieved. The general perception (on the utility side) that people in low income settlements cannot afford to pay for services poses threat to the private sector and therefore profits are impossible to achieve.

- *Mistrust*

There is the perceive mistrust of private sector as seen as a profit maximizing firm who do not concern about the vulnerable in the society. Therefore, customer satisfaction is almost impossible to meet. In Porto Algre, Brazil, it is argued that water service delivery does not have to be private but rather a department or corporatised body where the key

ingredients transparency, accountability, defined managerial autonomy and commitment to public service can be presented.

- *Technical Risks*

The state of existing water system installations often results in high replacements costs, since huge sums of money are spent in rehabilitating infrastructure. These results in lack of funds for investments especially network improvements, to reduce high level of water losses.

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2.3.6 Best Practices

These refer to the best operation and maintenance procedures that ensure improved and sustainable water systems. These practices will focus on experiences and lessons on case studies discussed. The lessons reveal that effective management model should have the following requirements.

- Research programmes must be incorporated into water management models. There should be managerial innovations to constantly keep abreast with technology. This approach is demonstrated in the US water management model.
- Legalization of water user committees so that lay down rules and regulations can be duly enforced.
- Institutionalization of an independent regulatory body to regulate and monitor the activities of both the private and public sector.
- Participatory research appraisal techniques to build local capacities to ensure internal dependence.
- Equity considerations must be adhered to. Measures to protect vulnerable groups must clearly be set out in any contracts between government and the private operators. Tariff structures must which cover subsidies for low income areas from low value uses of water by 'well of groups' must be perceived.
- Management contract characterized by performance-based remuneration with penalties for non-performance must be adopted. There must be clear incentives systems incorporated to make the private operator deliver.

Nyarko (2007) is of the view that the water supply sector is said to be performing well if water services are delivered to all consumers in a sustainable, equitable, effective and efficient manner. These principles confirm the international principles with regards to water resource management already discussed in earlier sections of the chapter. He further stated that a good performing water supply sector should therefore satisfy the following conditions.

- Sustainability – financially, environmentally and technically sustainable
- Equity considerations – all users groups are treated equally and fairly
- Effectiveness –achievement of universal service
- Efficiency – efficient service delivery that will be assessed by indicators such as non-revenue water and bill collection efficiency ratio
- Good governance – accountability to users, transparency, customer involvement.

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2.4 The Practices of Small Towns' Water System in Ghana

In Ghana, water supply is classified based on the approach of service delivery. There are two distinctive classifications; Urban Water Supply and Community Water Supply (CWSA, 2004). The Community Water supplies constitute the rural and small towns' water systems. According to CWSA (2004), small towns are defined as communities of between 2,000 and 50,000 population who require improved water supply and related sanitation facilities.

A study conducted by Sarpong-Manu (2001) reveals that Small Towns' Water Systems in Ghana generally fall into three groups. These are:

- Old community-managed systems, built through resources provided by Government of Ghana (GOG), External Support Agencies (ESA), and in some cases by charitable organisations;
- New systems facilitated by CWSA, built through resources from GOG, ESA, and contributions from the communities ranging from 5-10%;

- The Ghana Water Company Limited (GWCL) transferred systems (old and rehabilitated), previously owned by GWCL and transferred free of charge to District Assemblies for community management.

The total number of small towns' water systems under Community Management as at 2007 was about 300, which was adequately serving 1,087,635 people and contributed to 8% to the national coverage (Nyarko, 2007). A typical Small Town Water System can be described as the following: A source (usually a mechanised borehole), a pump house (a submersible pump powered by a three-phase voltage transformer), a source of power (AC power from the national grid, local diesel power generator), pipelines (transmission and distribution pipes made of unplasticised polyvinyl chloride and high-density polyethylene), an elevated reservoir, standpipes and appurtenances.

Small Towns' Water Supply Systems in Ghana are operated and maintained either directly by communities or contractual arrangement with private companies (CWSA, 2004). The next section discusses the practice of the community ownership and management model and the public-private partnership in small towns' water supply in Ghana.

2.4.1 The Community-Based Management and Public-Private Partnership Models

The Community-Based Management Model

The Community-Based Management Model is the most predominant model practiced in small town water service delivery. About 98% of rural and small towns' supplies in Ghana are managed by communities (CWSA, 2007). This is due to the fact that Ghana's decentralization policy provides the basis for participatory development. The policy strategy emphasizes demand responsive approach to access potable water facilities by communities. Communities decide if they want to participate and their preferred service level based on their willingness to fulfil their obligations, including payment of 5 % of the construction cost and also willingness to manage the system themselves(CWSA, 2004). Another reason is the 'project approach' adopted by External Support Agencies

who provide 85% to 90% of the funding, with users and the Ghana Government (through district assemblies) providing 5% to 15%. However, in all the cases, the responsibility for operations and maintenance rests with the user community (Sarpong-Manu, 2001).

The Public-Private Partnership Model

In 2003, community management with private sector expertise and resources was advocated as a viable alternative or option to improve sustainability of the small towns' water systems in Ghana (CWSA, 2003). A number of attempts were made to involve the local private sector in the management of small towns' water supply. This resulted in management contracts for the small towns' water supply systems in Bekwai, Atebubu, Enchi and Wassa Akropong. These project areas served as model contracts and guidelines for use in other rural and small towns.

At Bekwai, the private sector participation arrangement is a Management contract, where the private operator is responsible for operations and maintenance. The water system is designed for 500 house connections and about 40 standpipes which is considered relatively big within the small towns' water supply sector. Thus, the use of direct community management was considered inappropriate because of potential technical, managerial and institutional challenges associated with its size. The system is the oldest and highlights some positive aspects in terms of the performance improvement.

The management contract is characterized by performance-based remuneration with penalties for non-performance. There are clear incentives systems incorporated to make the private operator deliver. Because long interruptions go against the private operator, interruptions are minimal and occur for short durations. The model has also increased and improved accountability relationships between the WSDB and the private operator. It also provided technical expertise for efficient operations and introduced some level of immunity against local politics and political interference. However, a weakness in the Bekwai management contract is the fact that there is lack of clarity on the responsibilities for major maintenance. The issue is where to draw the line between maintenance and

rehabilitation to be able to know the responsibilities of the operator and the WSDB when it comes to some types of repair or maintenance.

2.5 Basics for Effective Operation and Maintenance of STWS

Sustainability of infrastructure equipment can only be achieved if the technical and financial requirements for operation and maintenance are met (EC, 1998). According to the CWSA (2004), operation and maintenance of small towns' water systems involve all management functions which include effective overall administrative, financial and technical procedures to ensure sustainable water supply systems.

Thus, in the context of this study, the concept of operation and maintenance include not only the technical tasks associated with maintaining a water supply system, but also the institutional and financial support necessary to support sustainable services within a community after the construction and commissioning of the system.

2.6 Institutional and Administrative Arrangement of STWS

The Community Water and Sanitation Agency (CWSA) is a government body with the responsibility of facilitating access to community water supply. Water supply to rural and small towns, which is decentralised under the local government structures, constitutes the Community Water Supply (CWSA, 2004).

The District Assemblies are the local government authorities with the responsibility of implementing water supply within their districts. The Local Government 1993, Act 462 gives the District Assemblies the power to delegate functions other than legislative. In accordance with this provision, the District Assembly has delegated the water supply management function to the Water and Sanitation Development Boards (WSDB). The WSDB, which is composed of elected community (small towns) members, is responsible for the management of the Small Towns' Water Supply Systems. Consequently, the WSDB is responsible for hiring or appointing operational staff,

promoting and disseminating information within the community, and ensuring that all community members participate in decision making. The WSDB also ensures proper financial management, hygiene education and sanitation promotion. Appendix 1 shows the institutional roles of the small towns' water actors.

2.7 Summary of Key Issues

The objective of this chapter has been to review relevant literature with regards to Small Towns' Water Management Models and other relevant concepts expected to aid in the development of an analytical framework for this study. The purpose of the review has been to identify good practices globally that could be adopted for small towns in Ghana. The summaries of emerging issues from the review are as follows.

- Most communities do not practice payment for replacement cost. It must be emphasised that as those communities grow and systems expanded, payment for management of water systems will be unavoidable, otherwise the problem of unsustainable systems.
- Local capacity building is a prerequisite for effective community management.
- Effective payment of water tariffs is dependent on the functionality and regularity of the water facility.
- Women's participation in water supply systems is crucial for effective decision making.
- Legalization of water committees enforces rules and regulations which ensures continuity of the water committees.
- Many of the reasons for low levels of sustainability are related to community issues such as limited demand, lack of affordability or acceptability among communities, perceived lack of ownership, limited community education and limited sustainability of community management structures.
- Improvements in efficiency result in cost savings that can generate investment funds for new infrastructure.

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- Success of PPP depends on at least the performance of a complementary public regulatory regime. Although regulation is usually seen as pre-condition to private sector involvement it has a role in the public sector too, where it enhances the accountability of the agency to the public.
- A criterion for effective regulation is the independence of the regulator, which should insulate it from political interference especially for PPPs.

It is evident to note that, with the current management models, access to improved water supply still lags behind the populations to be served in most small communities in the country. The resolution of this gap is to integrate participation by all stakeholders into water management models for successful water management and usage. Community participation must be seen as an integral component in the selection of any water management model.

From the forgone discussion, the premise that a good performing water supply sector should satisfy the issues raised with respect to the management of water supply systems will form the basis of analytical framework for the study.

Consequently, this study will be undertaken within an analytical framework as shown in Figure 2.1. It is suggested in the framework that, eventual local solution for an improved and sustainable water supply system is the product of a comprehensive planning and management, considering all community, technical, financial and institutional procedures.

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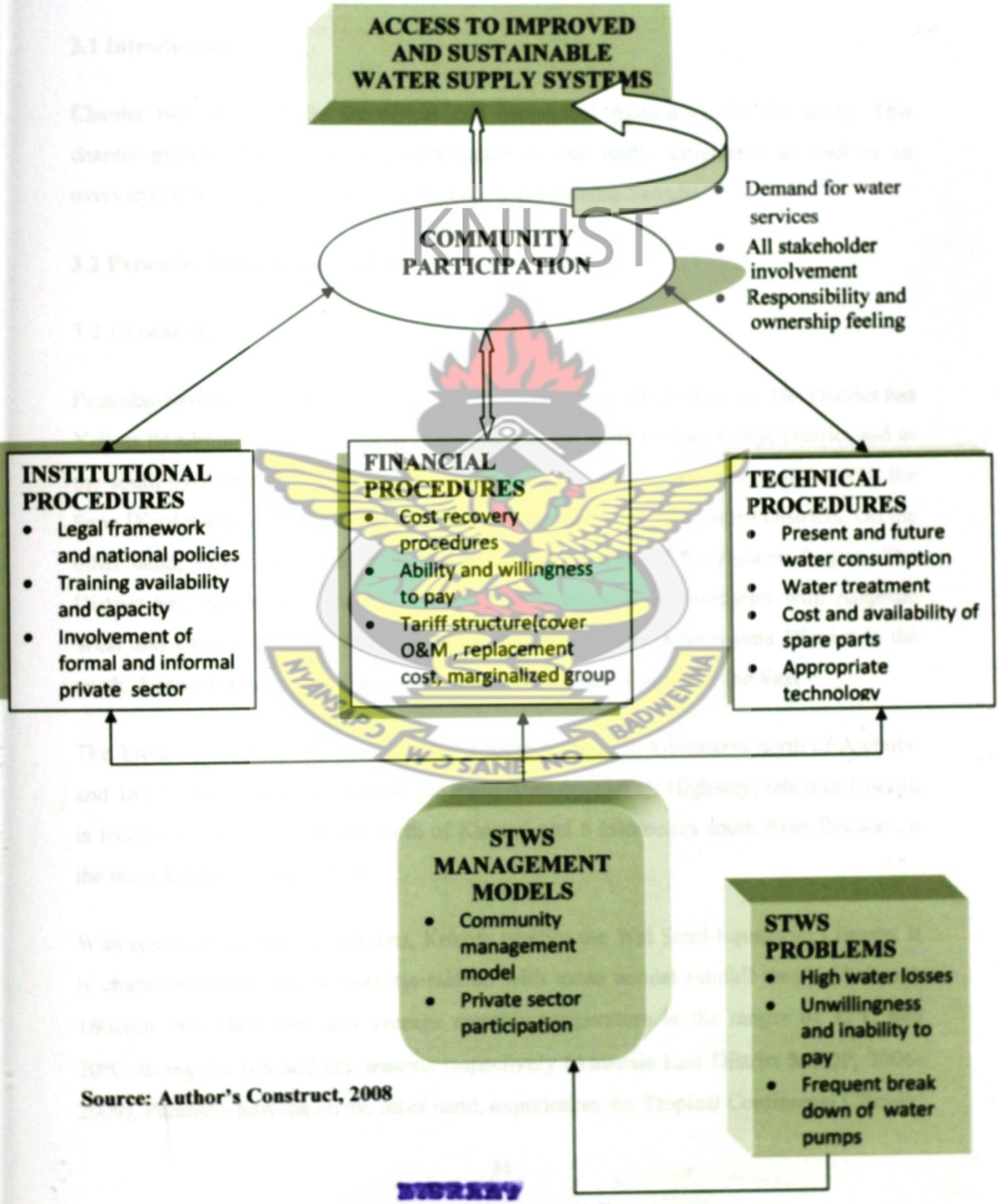
Figure 2.1: Integrated Approach for Effective Management of Small Towns' Water Systems



Source: Author's Construct, 2008

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CHAPTER THREE

PROFILE AND BACKGROUND OF STUDY SETTLEMENTS

3.1 Introduction

Chapter two provided the theoretical and conceptual framework for the study. This chapter presents the background information on the study settlements as well as an overview of water supply systems at Kokofu and Parambo-Sawaba.

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3.2 Parambo-Sawaba and Kokofu.

3.2.1 Location

Parambo-Sawaba is found in the Pru District of the Brong Ahafo Region. The District has Yeji as its administrative capital. It is bordered to the north by East Gonja District and to the south by Atebubu and Nkoranza Districts. To the east, it shares boundaries with the Sene District and to the west with Kintampo South and Kintampo North Districts. On the other hand, Kokofu is found in the Amansie East District of the Ashanti Region. The District has Bekwai as its administrative capital and shares boundaries with Amansie West and Central Districts to the West, Bosomtwe-Atwima-Kwanwoma District to the north, Adansi East, Adansi North and Asante Akim South District to the East. .

The Twin Town, Parambo and Sawaba, is located about 50 kilometres north of Atebubu and 18 kilometres south of Yeji on the main Atebubu to Yeji Highway; whereas Kokofu is located about 30 kilometres north of Kumasi and 5 kilometres south from Bekwai on the main Kumasi-Obuasi Road.

With respect to climatic conditions, Kokofu typifies the Wet Semi-Equatorial Climate. It is characterized by double maxima rainfall with mean annual rainfall ranging between 1600mm and 1800 mm; and average monthly temperature in the ranges of 32°C and 20°C during the wet and dry seasons respectively (Amansie East District MTDP, 2006-2009). Parambo-Sawaba on the other hand, experiences the Tropical Continental Climatic

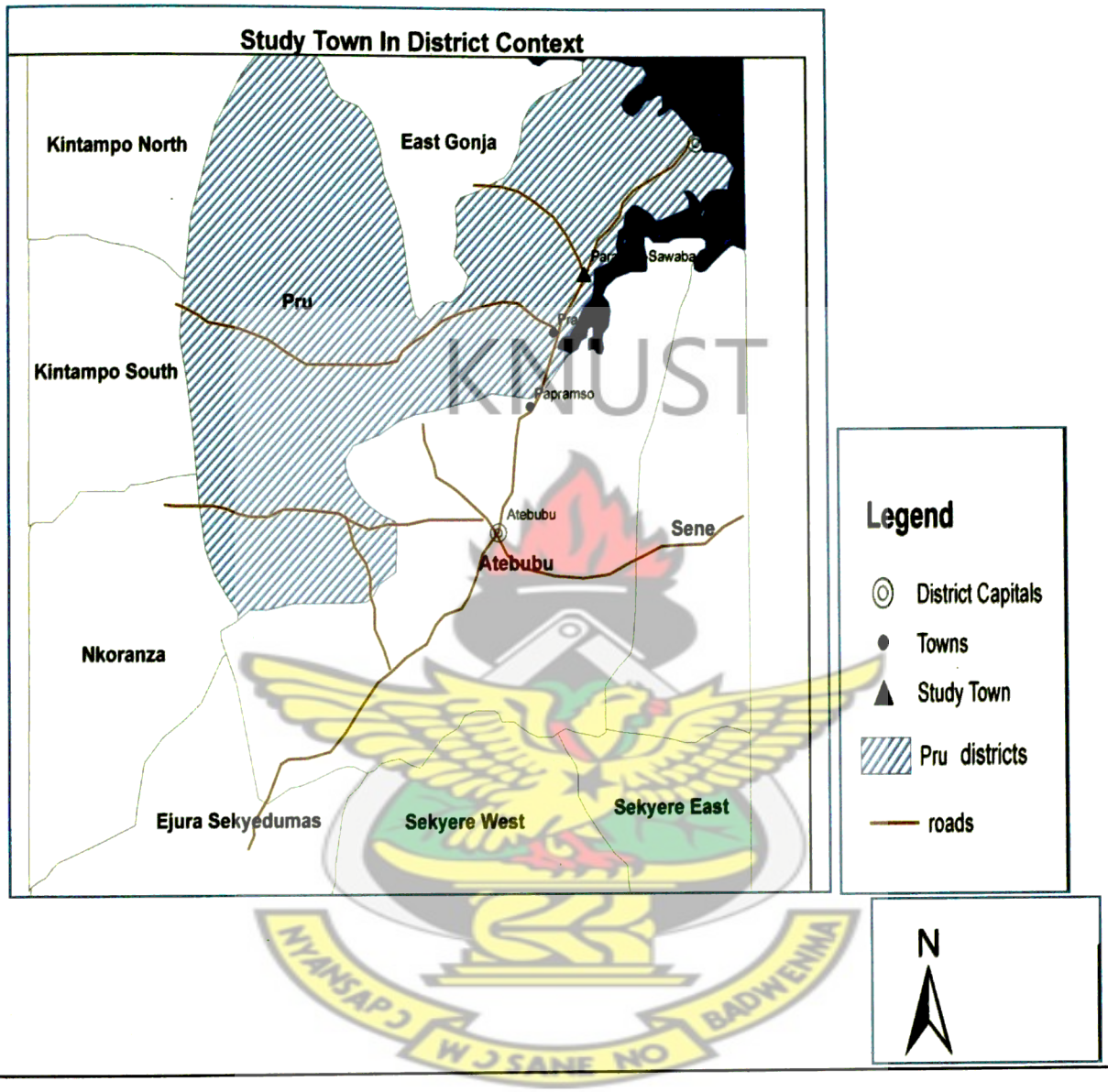
conditions, which is a modified form of the Wet-Semi Equatorial Type of Climate. The average annual rainfall is between 1,400 mm and 1,800 mm and occurs in two seasons – from May to June and from September to October. The mean monthly temperature ranges from 30°C in March to 24°C in August (Pru District MTDP, 2006-2009). The rainfall pattern enhances a potential source of ground water for the construction of boreholes.

Regarding geological features, Parambo-Sawaba is located in the Voltaian Basin where the geological formations do not yield groundwater in sufficient quantities. The water table in the District is however very low, resulting in the drying of water bodies including wells and boreholes especially during the dry season. Conversely, Kokofu is underlain, the Birimian, Tarkwain and Granitic rocks with a high water table. However, the Birimian and the Granitic Rocks have been identified to have great minerals potentials such as gold, iron and diamond which could affect underground water quality.

In terms of relief, the Pru District where (Parambo-Sawaba is located) has a rolling and undulating land surface with a general elevation of between 60-300 metres above sea level. The district is not associated with any significant highlands or hills. The area is mainly drained by the Pru River which is a tributary to the Volta Lake. It flows across the Northern part of the District. Water from the Volta Lake is currently being treated to supply the inhabitants of Yeji and Parambo-Sawaba under the Small Town Water and Supply Sanitation Project and a few surrounding communities. On the other hand, the Amansie East District's (where Kokofu is found) topography is relatively flat with very few undulating uplands ranging between 240 metres and 300 metres. The area is drained by the Oda, Dankran and Anum Rivers. Another important water body is the Lake Bosumtwe. The lake passes through the district and offers and offers a great potential for tourism development.

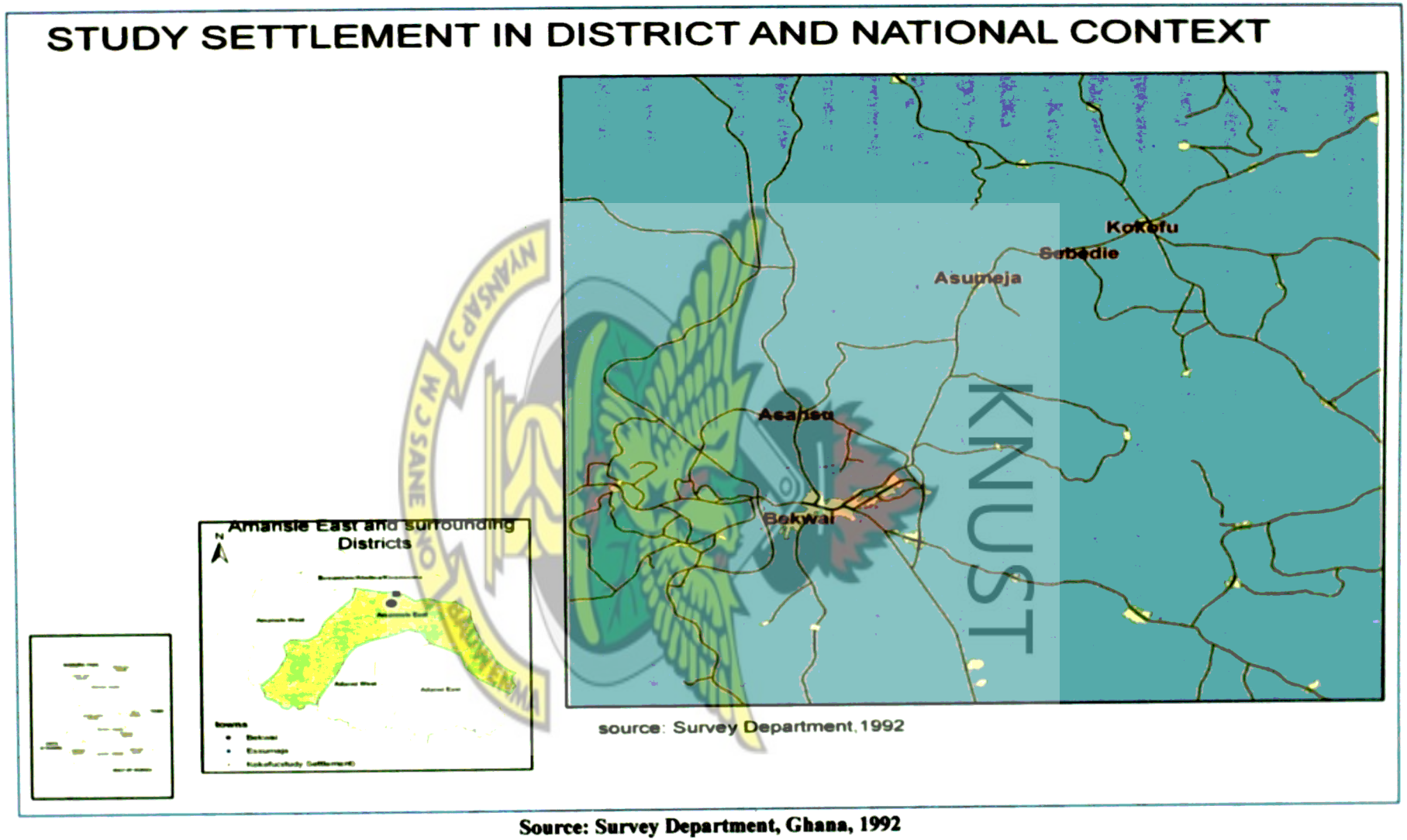
Figure 3.1 and 3.2 show the study towns in the districts and national context.

Figure 3.1: Parambo-Sawaba in District and National Context



Source: Survey Department, Ghana, 2005

Figure 3.2: Kokofu and Surrounding Settlements in District and National Context.



Source: Survey Department, Ghana, 1992

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3.2.2 Socio-Economic Characteristics

The population of the twin community is estimated to be about 12, 000 whilst Kokofu and its environs is approximately 7,000; with a population growth rates of 3% and 3.5% respectively (Pru and Amansie East Districts MTDP, 2006-2009). Parambo-Sawaba is a heterogeneous community with diverse ethnic and interest groups. The dominant tribes are Nchumburus, Ewes and Hausa. There are however other ethnic groups such as the Gonjas', Kotokolis, Kokombas, Dagombas from the Northern Regions, the Moshies from the Burkina Faso and the Kabres from Togo. Alternatively, Kokofu is dominated by the Akan (90.7%) ethnic group, which is also populated by the Asante (79.2%) sub-group. This largely homogenous nature of the population can easily be mobilized for developmental activities. In contrast, heterogeneous ethnic composition in the former could pose a major challenge to effective community mobilization for social and economic development. In such a situation, consensus building and negotiations should be adopted as management strategies to mobilize support for developmental activities.

Farming is the predominant economic activity at Parambo-Sawaba and about 90% of the total populations are farmers. The remaining 10% are mostly engaged in petty trading. The local people however, farm 10 to 15 miles outside the community. This is due to the fact that the soils do not have higher yielding potentials and therefore cannot support plant growth. Likewise, the major economic activity at Kokofu is farming, and the local people are engaged in palm oil extraction. Close to 65% of the populace are farmers.

According to the 2000 Population and Housing Census, the overall literacy rate in the Amansie East District was 55.6%. This translated into 69% for the population in urban areas and 53.5% for the population in rural areas. In the case of Pru District, 34% of the populations are literate (Pru MDTP, 2006-2009). The present literacy rate of the Pru district does not give a good picture of the districts educational status. The proportion of the illiterate population (66%) in the district is higher than the regional and the national averages of 48.5% and 42.1% respectively. The level of literacy has implication for the

inhabitants' to accepts and maintain any developmental project such as water infrastructure.

The availability of water and sanitation facilities contributes greatly to the health and well being of the people. District Water and Sanitation (DWST) field survey and needs assessment from the communities' show that effective water supply in the Amansie-East district is about 54% and sanitary facilities are about 39% (Amansie East District MTDP, 2006-2009). In an effort to improve upon people's access to potable water, the District Assemblies have collaborated with a number of development partners in the provision of potable water in the districts. Community Water and Sanitation Agency (CWSA) and the District Health Management Team have complemented these efforts by educating people to keep water sources clean and safe. They also assisted in detecting and treating water-borne diseases. The Community-Based Management Model has been promoted at Kokofu whereas Parambo-Sawaba combines the Public-Private Partnership to enhance the sustainability of existing water facilities.

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3.3 Water Supply at Parambo-Sawaba

Before 2004, the community suffered from a shortage of good drinking water especially during the dry seasons. The major cause of the problem is the fact that the area is in the Voltaian Basin where the geological formations do not yield ground water in sufficient quantities. Therefore, wells dry up in the dry seasons and attempts to obtain water from boreholes have failed. The area is mainly drained by the Pru River which is a tributary to the Volta Lake. The Pru River was the only reliable source of water for the community but very unsafe and polluted because of indiscriminate disposal of waste into the river.

The community solely depended on a borehole, and other unsafe sources such as hand dug wells and the Parambo Stream for their source of water. These sources were however polluted, unsafe and seasonal and hence resulted in the prevalence of the guinea worm disease. In 2004, the area was considered as guinea worm endemic zone and about 75 percent of the populace had guinea worm.

Plate 3.1: Parambo Stream

(Before 2004, the Parambo Stream was one the main source of water for the inhabitants of Parambo–Sawaba).

Source: Field Survey, 2008

Because of the situation hitherto described, the community was selected for the improvement of its water supply under the Village Infrastructure Project which accepted the Community Water and Sanitation Strategies. The community contributed 5 percent (12,500 Ghana Cedis) of the total cost of 250,000 Ghana Cedis as counterpart funding. The new water supply system as designed and constructed was considered to be too complex to be managed by the community, thus, a private operator with the requisite technical and managerial skills operated and managed the system. In February 2005, the Pru District Assembly signed a management contract of five years, with the Armco Company Limited in respect of the Parambo-Sawaba Water Supply System.

The main features of the Parambo-Sawaba Water Supply is a floating intake, a water treatment plant, a transmission main, a high level tank with a design capacity of 125m^3, distribution net work and public standpipes. There are a total of 21 stand pipes in the community. The process of water supply at Parambo-Sawaba could be described as follows. A submersible-pump, sited about half a kilometre from the Pru River pumps raw water (from the river) to the treatment plant. The water then passes through a

roughing filter where it is cleaned and then passes to a slow sand filter. Water in a slow sand filter is stored in a clear water well where it is disinfected with chemicals. From the clear water well, water is then pumped into the high level tank where it is distributed to consumers through public stand pipes and domestic private connections. Plate 3.2 illustrated shows the process of water supply at Parambo-Sawaba.

Plate 3.2: Process of Water Supply at Parambo-Sawaba

Source: Field Survey, 2008

3.4 Water Supply at Kokofu

Until 2001, Kokofu, including its neighbouring communities such as Sebedie and Essumaja suffered from insufficient water supply. The people of Kokofu and the surrounding towns depended on only two boreholes which were constructed by the Catholic Mission. Rivers and streams constituted the other sources of water for domestic utilisation for the people. A significant proportion of the households especially at Sebedie and Essumaja fetched water from rivers and streams due to inadequacy and unreliability of the available water facilities. Community members especially women and children travelled long distances in search for water.

Plate 3.3: Stream near Kokofu

(Some community members depended on this stream as a supplement source of water)

Source: Field Survey, 2008

In 2001, Kokofu Township including Sebedie and Essumaja benefited from a pipe water scheme. This was in support of the devastated and inadequate water facilities in most parts of the country. Funding was obtained by Government of Ghana from the European Union (EU) under its 7th European Development Fund (EDF) to support the construction and rehabilitation of 25 small towns' water supply projects of which Kokofu Small Towns' Water Systems was a part (World Bank, 2002). The current water system was constructed under CWSA strategies of providing water to small towns. The community contributed 5 percent of the total cost as counterpart funding.

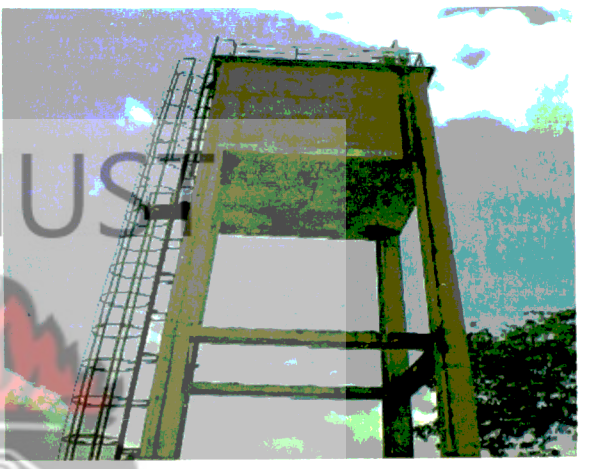
The Kokofu Water Supply System has been in operation since February, 2002. It serves Kokofu Township, and its environs, Sebedie and Essumaja with populations of about 7000 people. The system adopts the Community-Based Management Model. Here, community operating staffs employed by the Water and Sanitation Development Boards (WSDBs) entirely manages the system, with an oversight responsibility from the boards. This model was adopted because of the relatively small population size (less than 10,000) and the simplicity in operating the system. The source of water for the Kokofu water supply is a borehole. Water is pumped to the high level tank where it is treated with

chemicals and then pumped into the distribution lines. Treated water is supplied through public stand pipes or domestic private connections for consumption. There are a total of 13 stand pipes at Kokofu.

Plate 3.5: Water Pump Station

Source: Field Survey, 2008

Plate 3.6: High Level Tank at Kokofu in a Rusty Condition



Source: Field Survey, 2008

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3.5 Summary

In a nut shell, the two systems as described have different technical features. Kokofu Water Supply System relies on ground water source (bore hole) whereas Parambo-Sawaba Water Supply System obtains its potable water supply from surface water, the Pru River. Parambo-Sawaba adopts the Public-Private Partnership Arrangement of Management Contract. Financial arrangements are based on total outputs received and payments are made annually. The contract specifies that five percent of total outputs go to the district assembly, ten percent to the Water and Sanitation Development Boards and the remaining seventy five percent to the private company. Kokofu on the other hand adopts the Community-Based Management Model, and the WSDBs takes oversight responsibilities of the water facility. All monies accrued to the board. Both water systems are new systems facilitated by the CWSA, and built through resources from the Government of Ghana, External Support Agencies (ESA) and community contributions of counter part funding.

CHAPTER FOUR

PERFORMANCE ASSESSMENT OF THE COMMUNITY-BASED MANAGEMENT AND PUBLIC-PRIVATE PARTNERSHIP MODELS IN SMALL TOWNS' WATER SERVICE DELIVERY

4.1 Introduction

This Chapter presents an analysis on the performance of the Community-Based Management and the Public- Private Partnership Models in small towns' water service delivery at Kokofu and Parambo-Sawaba respectively. The analysis was based on indicators such as governance, community participation, economic performance, maintenance of water systems, water production and management as well as technical and operational performance, and how these indicators have been influenced by the two water management models.

4.2 Governance

In keeping with the literature, the study revealed that Kokofu and Parambo-Sawaba Water Supply Systems had established management structures both at the District and the Community (Town) Level to perform assigned functions on operation and maintenance (O&M) in small towns' water service delivery. The District Assemblies (DAs) are backed by the Local Government Act 462, 1993 while the community structures are supported by bye-laws prepared and approved by the District Assemblies.

The major actors in the Parambo-Sawaba Public-Private Partnership and Kokofu Community-Based Management in water supply systems have been discussed under two headings; district and community levels operation and maintenance (O&M).

I. District Level

At the district levels, the major actors in the O&M activities are the District Assemblies (DAs) and the District Water and Sanitation Teams (DWST). The DWSTs and the officers from the District Works Departments and the Internal Audit Unit of the DAs are the permanent officers of the District Assemblies (DAs), who execute the roles on behalf

of the DAs. There are other auxiliary staffs, the District Chief Executive (DCE) who is the chairman of the team and the Planning Officer who acts as the desk officer.

As indicated in Chapter two, the roles of the DAs in small towns' water management are monitoring and supervisory roles, approval of water tariffs, financial support for major breakdowns and replacement as well as technical and advisory support. However, the study revealed that these roles were virtually absent in both study areas with the exception of approval of water tariffs.

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An interview with the three field officers, the District Water and Sanitation Team (DWST) at Kokofu, indicated that their activities were hindered as result of inadequate logistics. Each district team in the study districts had one motor bicycle for field visits, which was not even in use because of lack of fuel and maintenance cost to run it. It was also observed in the field exercise that the team members were mostly found in the offices instead of being in the field. An interview with the team members revealed that the Assemblies did not have special funds or budget for monitoring of the water systems which greatly hindered their performance. They added that the District Assemblies Common Fund (DACF) allocation of five percent which is supposed to be given to the team for monitoring activities was not forth coming. There were no monitoring reports of their activities which indicated that monitoring was not done.

Again, the study revealed that there was poor information flow between the assembly as a body and the team. Information was channelled to the DCE and in both cases; the DWSTs were not aware whether quarterly or annual reports from the water boards have been received by the assembly. This implies that there was weak institutional collaboration among the stakeholders. The study also revealed that the DAs were not collaborating with the Water and Sanitation Development Boards (WSDBs) and vice versa. This was deduced from the fact the DWSTs who are the field officers were not aware of the problems raised by the WSDBs. In responding to the question, what is the visiting schedule and plan of activities by DWST in respect to small towns' water systems, the Community Development Officer of the DWST at Kokofu said,

"We only visit as to when they call on us".

This implies that the regular routine monitoring exercises by the DWSTs are not carried out.

All DWST members in both cases were men. This implies that a gender imbalance DWSTs exist and women's role in monitoring activities is being down played. An interview with the Service Operators at Kokofu and Parambo-Sawaba indicated that the District Assemblies had not been monitoring their activities and do not assist in major repairs and rehabilitation of the water systems.

The inability of the Assemblies to effectively monitor the finances and technical activities of the water supply systems do affect information and knowledge base for planning purposes and hence sustainability of the water systems could be compromised.

II. Community Level

The principle of control and management of the water systems in the two communities are hereby described. At the community levels, the major actors were the Water and Sanitation Development Boards (WSDBs), the Service Operators (Private Operator and Community Operating Staffs) and the User Communities. The WSDBs are elected members who represent the community in the operation and maintenance of water systems as indicated in the early chapters of the study. At Kokofu, a five member committee exists while Parambo-Sawaba had a nine member committee. In the two study communities, the percentages of men to women in the WSDBs were sixty percent and forty percent respectively in the case of Kokofu; and fifty-five percent and forty-five percent in the case of Parambo-Sawaba. The above proportions indicate that a gender balanced WSDBs exist, and therefore an active participation of women could help boost development in the small town water sector.

In reference to the literature, the WSDBs have oversight responsibilities of the water systems. However, the study revealed that these boards were not proactive and shirks

responsibilities to the Service Operators. It was observed that the WSDBs were hijacked by only few members who were mostly the chairmen.

The study however revealed that the Community-Based Management model (CBM) at Kokofu had relatively stronger institutional collaboration between the WSDBs and the District Assembly. The District was part ownership of the system. Even though communication was one way, the WSDBs were never weary to confront the District Assembly in the case of any technical support. At Parambo-Sawaba on the other hand, there were political interferences from the District Chief Executive and the Traditional Authorities concerning WSDBs activities. The Chief had dissolved the board and did not recognize them because of their failure to release funds from the Water and Sanitation Coffers for extension of electricity to the Community Market. In an interview, One Board Member said, they have decided to resign from their work. This could pose a threat to the water system if conflict resolution strategies are not put in place.

The study also revealed that sitting allowances which are to be given to the boards have not been paid for over 2 years in Parambo-Sawaba and almost a year now at Kokofu because of low revenue from the water services. This confirms the low morale and poor performance of the WSDBs. The WSDBs were rated poor by community members and operating staffs alike. At Parambo-Sawaba, they were rated 20 percent and in Kokofu, they were rated 30 percent in their oversight responsibilities.

The operating staffs or service operators are the employees of the system. The private operating staffs at Parambo-Sawaba consisted of six member staffs who were all men. The situation at Kokofu was not any different. The operating staffs also consisted of four personnel who were all men. The study revealed that women's role were absent in service operation. However, the differences in the models were that there was weak administrative and managerial skill at Kokofu CBM which was largely due to unskilled personnel. The survey indicated that no provisions were made for ensuring user training activities. Thus, service operators had not received sufficient training in the operation and maintenance of the water systems. The absence of training programmes could result in lack of good management practices and hence unsustainable water supply systems.

Because Parambo-Sawaba PPP on the other hand, was a company on contract, this model tends to have more qualified and trained staff. The survey also revealed that 100 percent of the operating staffs at Kokofu were natives whereas at Parambo-Sawaba, 95 percent of them were natives. This implies that there is a potential for local capacity development and local knowledge base can be promoted in both areas.

Appendix 3 shows the composition of the operating staffs, the staff strengths, educational levels of staffs, number of on-job training and refresher training programmes organized in both study areas for the last year, 2007. The survey revealed that all staffs in both study areas had attained a minimum educational level of at least SSCE or MSLC which qualified them on the job. However, the selection criterion of WSDBs did not include qualifications or previous experience as a pre-requisite for selection. As such, some WSDB members are semi-literate, which could adversely affect the performance of the systems. With the exception of the Station Manager, the Pump Attendant, Treatment Attendant and the Revenue Officer at Parambo-Sawaba, other operating staffs have had no refresher training. There were no Public Relation officers in both study areas, and service operators had no assistance from the WSDBs for community mobilization. This situation made it difficult to mobilize the community for any support.

Selling water at the communal stand pipes was found to be women dominated activity. At Kokofu, all thirteen water sales attendants were women and similarly, at Parambo-Sawaba, out of the twenty-one sales attendants, 95 percent of them were women. In response to the question, why water vendoring are women dominated activity; the board chairman at Kokofu responded that the men mostly shy away from selling water. At Parambo-Sawaba, the response from the youth group (men) interviewed said,

> *"We are mostly busy at the farms and mostly return home late. The women are less busy and can be responsible for the taps. We propose that the elderly women are tasked to sell water at the communal stand pipes. They are more patient and can serve us better".*

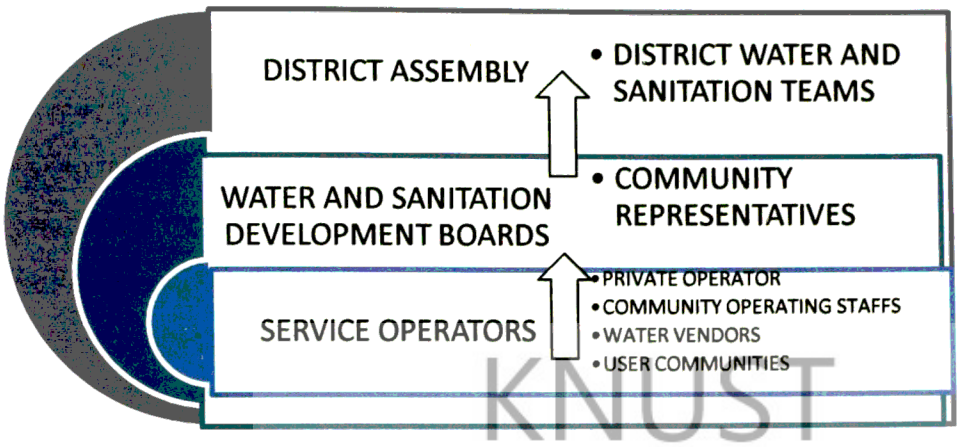
In an interview with a water vendor at Parambo-Sawaba, she remarked,

"Even though it is a volunteer work, we need some incentives to motivate us. Community members do not respect us at all. When we make a loss it is also deducted from our commission which does not motivate us to work".

In both cases, there was absence of community bye-laws to get community members committed to their roles and payment of water tariffs. It was observed in both communities that there were no rules and regulations guiding the time of opening the communal stand pipes. Vendors attended to stand pipes at any convenient time they wanted and as a result, some community members did not have access to water when they needed it. For this reason, some inhabitants are compelled to fetch water from the river side. At Parambo-Sawaba, prices also differed at different stand pipes and pricing depended on the vendors' criteria of measure of a bucket or pan which was very subjective. This raised a lot of concerns by the youth.

In an interview, the Technical Manger at Parambo-Sawaba lamented, it was difficult to get community members to be committed to sell water at the stand pipes. This has resulted in unqualified members to taking job, also at vendor's own risks. He added that six out of the twenty-one stand pipes (which constituted 30% of the total stand pipes) had been closed down because of lack of water vendors to man them. At Kokofu, the situation was different. Criteria for selection of water vendors were strictly according to ability to manage the system. Applications and interviews were conducted and qualified people were selected. Qualified people later went through series of training which equipped them in proper management practices of the water system. Almost all water vendors (about 95%) are literates. This implies that water vendors at Kokofu were more likely to keep proper records on sales than vendors at Parambo-Sawaba. Figure 4.1 illustrates the general management structure of small towns' water supply systems.

Figure 4.1: General Management Structure of Small Towns' Water Systems



Source: Author's Construct, 2008

In a nut shell, the study revealed that control and sense ownership of community members in managing water systems was stronger at Kokofu CBM than Parambo-Sawaba PPP. This was evident in the relatively stronger institutional collaboration between WSDBs and the District Assembly. At Kokofu, the District Assembly was part of the ownership structure. The board was properly constituted and they enjoyed the mandate of the people. Parambo-Sawaba PPP on the other hand had weak institutional collaboration between private operators and the District Assembly. Private interest does not naturally foster good community collaboration. Private operators and the water board face political interferences from the DCE and the traditional authorities.

4.3 Community Participation

Community involvement in the management of small towns' water systems in the two communities was considered as poor. Attendance to community meetings ranges between twenty and thirty people at Kokofu and Parambo-Sawaba respectively. The study revealed that even these categories of people were dominated by the service operators, WSDBs, unit committee members and some few opinion leaders.

At Kokofu CBM, the study revealed that meetings were quite regular and at least, had been held twice this year. Innovative means were used to capture relatively large number of people at meetings. For instance, meetings coincided with annual festive occasions. However, at Parambo-Sawaba PPP, this was virtually absent and attendance at meetings was appalling. Community meeting had not been held this year. During the previous year, community meetings were attended by only the WSDBs and the private operators. Various pockets of disunity among community leaders have impacted negatively on the small town water project. It has generated apathy and lack of collective commitment towards the management of the system. This explains why community participation is poor in the area.

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Responding to the question: What is the role of community members in water management? The Water Board Chairman at Parambo-Sawaba remarked:

> *"Community members only pay for water services and some do not pay at all. Attendance at meetings is poor and thus we have decided not to call for meetings again. Every tribe has a representative on the board but yet, people fail to attend meetings. Some complain the water tariffs are high and as such they prefer drinking from the river and other related sources".*

The homogeneous ethnic group of Kokofu which is largely dominated by the Akans was a major contributing factor for a relatively stronger social cohesion. However, at Parambo-Sawaba, there was weak social cohesion largely because of ethnic heterogeneity.

In both management models, community members were not involved in the setting of water tariffs. Community participation in decision making could be described as abysmal and participation was mostly in the form consultation. It can be established that due to lack of ownership and responsibility of community members at Parambo-Sawaba, community participation is deemed as very low. This was evident in the difficulty in getting sales attendants in managing communal stand pipes. Community participation is not directly influenced by the operational model per say, but by local socio economic and ethnic conditions.

4.4 Water Production and Management

A trend analysis of water production at Parambo–Sawaba indicated that the levels of production for the period 2006 to 2007 changed with the months of the year. In 2006, the company operated for only a maximum of six months, from November to April. There were no production between the months of May and October. This was due to the fact that production levels are related to the rainy seasons as such during those periods, community members do not patronise the pipe water system. The system is therefore closed down. The highest production level was recorded as 6615m³ volume of water which occurred in the month of January. Like wise, in 2007, the company operated for only 3 months, between the months of January and March.

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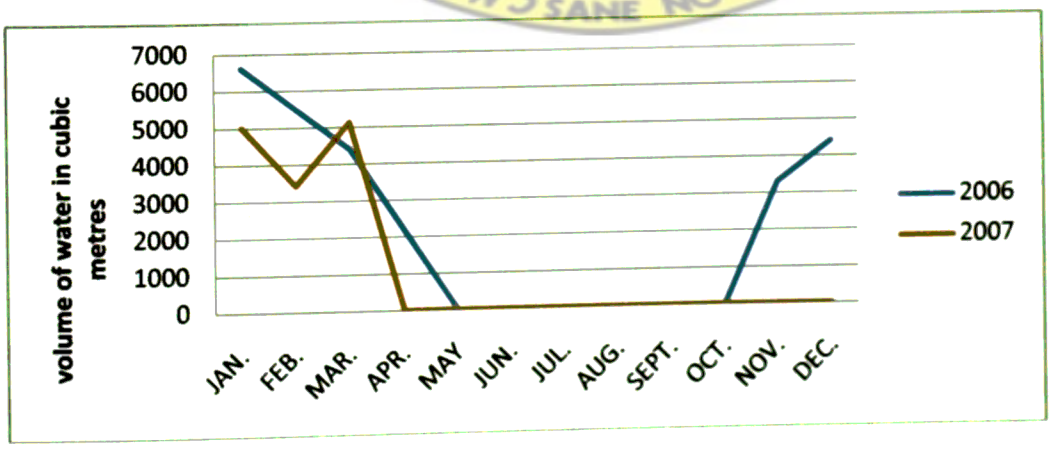
Figure 4.2 shows the water production trends from 2006-2007 at Parambo-Sawaba. From the figure, it can be observed that water production in 2006 fell from 6615m³ in the month of January to 2206m³ in the month of April. Between May and October, there was no production. Water production started again from November to December with considerably lower figures of 3304m³ and 4416m³ volume of water respectively. Alternatively, in 2007, water was produced for only three months with in the year. Production figures ranged between 5016m³ to 5131m³ for the months of January and March which represent only 4.5 percent of the total capacity of water treatment plant.

Figure 4.2: Water Production Trends at Parambo-Sawaba (2006/2007)



Source: Annual Reports, Armco Company limited, 2006-2007

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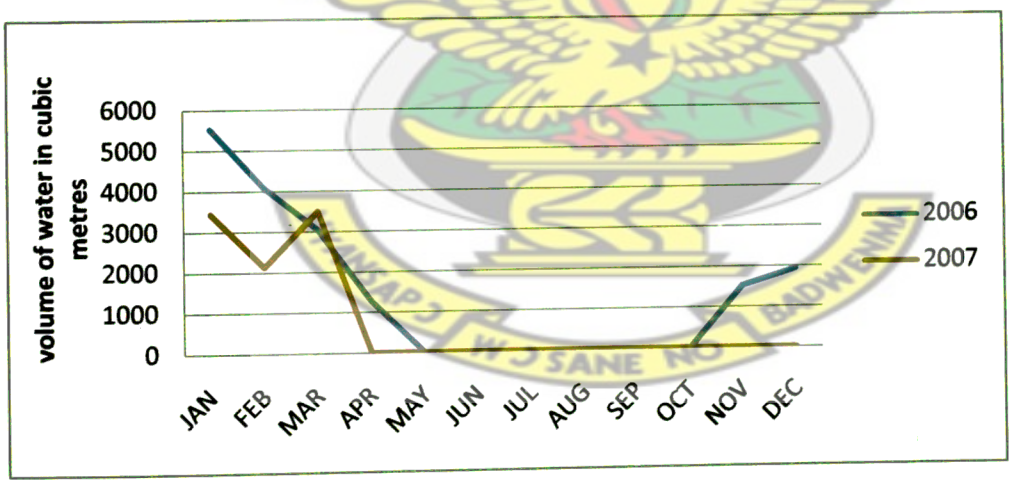
The consumption of water also trails along the lines of production at Parambo-Sawaba. Figure 4.3 shows the consumption trends from 2006-2007. In 2006, consumption levels decreased with increasing months from 5534m³ in January to 1256m³ in April, and then rose between 1537m³ in November to 1978m³ in December. Between the periods of May and October, no consumption figures were recorded because of the closure of the water system. In 2007, the consumption figures were recorded for only 3 months with the highest consumption level at 3501m³ in March.

The amount of water consumed by the community is often described in terms of how many litres one person uses in one day (litres per person per day). In the year 2006, water consumption was estimated as 8.06 litres per person per day whilst in 2007, the estimated value was 8.4 litres per person per day. These figures are far below the minimum requirement of 18 litres per person per day to stay a healthy life (CWSA, 2004).

Figure 4.3: Water Consumption Trends at Parambo-Sawaba (2006/2007)



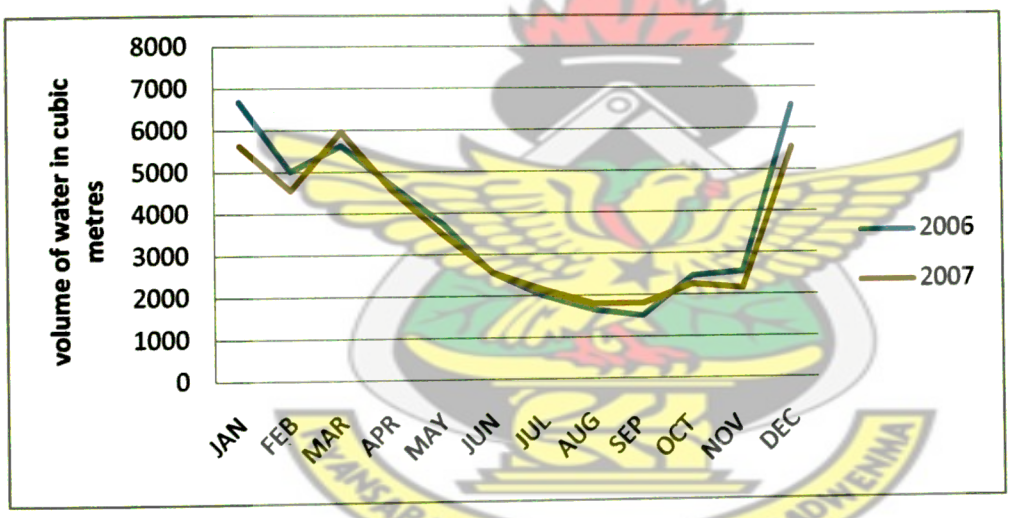
Source: Annual Reports, Armco Company limited, 2006-2007

At Kokofu, water production levels also changed with the months of the year. The peak periods of production were between December and March. The study revealed that production levels were also closely tied to the rainfall pattern. Therefore, there were lower productions during rainy seasons. Unlike Parambo-Sawaba, where there were

seasonal productions of water, Kokofu experienced a continuous production throughout the year; however, there were lower productions between the months of May and November because community members had water in their hand dug wells.

Figure 4.4 shows the water production trends at Kokofu from 2006-2007. In 2006, it can be seen that production levels fluctuated between 6675m³ to 5625m³ volumes of water from the months of January to March. Between April and November, production level fell with the lowest production of 1500m³ in the month of September. Production level increased again in December with a recorded production value of 6551m³ volume of water. The study revealed that production of water was however in response to demand.

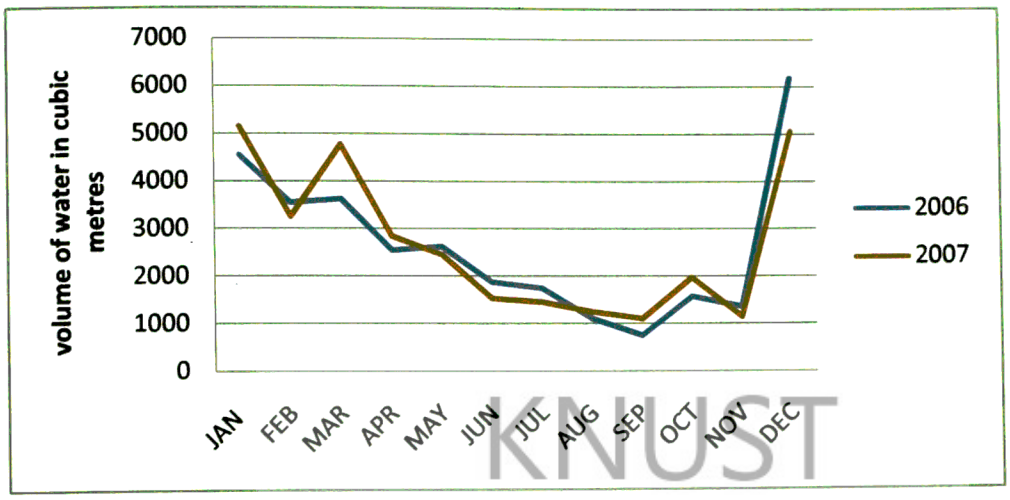
Figure 4.4: Water Production Trends at Kokofu (2006/2007)



Source: Annual Reports, Kokofu Water Supply 2006-2007

Consumption of water at Kokofu also followed the production pattern. Fig 4.5 demonstrates the consumption pattern from 2006-2007. In 2006, the highest consumption level was 6188m³ which occurred in the month of December and the lowest consumption of 955m³ occurring in the month of September. Similarly, in 2007, the highest consumption was 5150m³ with the lowest consumption of 1105m³ occurring in the months of January and September respectively.

Figure 4.5: Water Consumption Trends at Kokofu (2006/2007)



Source: Annual Reports, Kokofu Water Supply, 2006-2007

With the above consumption figures, water consumption per capita was 12.5 litres per capita per day and 12.3 litres per capita per day in 2006 and 2007 respectively. These figures are also below the minimum requirement of 18 litres per person per day to lead a healthy life.

From the analysis, it can be concluded that there are low water consumption levels in the two study areas. The surveys conducted revealed several reasons for low consumption levels. One major reason which accounted for low consumption levels was as result of competing sources of water. In both study settlements, 50 percent of the community members interviewed said they relied on hand dug wells and rivers especially during the rainy seasons. Thus, the water production and consumption trends were related to the rainfall pattern of the district which is the double maxima type, occurs from May to June and September to October. Availability of alternative sources of water affected demand of the pipe water system.

Another reason for low consumption levels was related to water tariffs. Prices per bucket were comparatively higher in the two study areas as compared to other urban areas outside the study settlements (Price per bucket was 3 Ghana Pesewas per 18 litres bucket at Parambo-Sawaba and 2 Ghana Pesewas per bucket at Kokofu. The urban figures were 1 Ghana Pesewa per 18 litres (34 bucket) or 6 Ghana Pesewas per metre cube. It can be

concluded that low demand of water services was also influenced by higher prices of water.

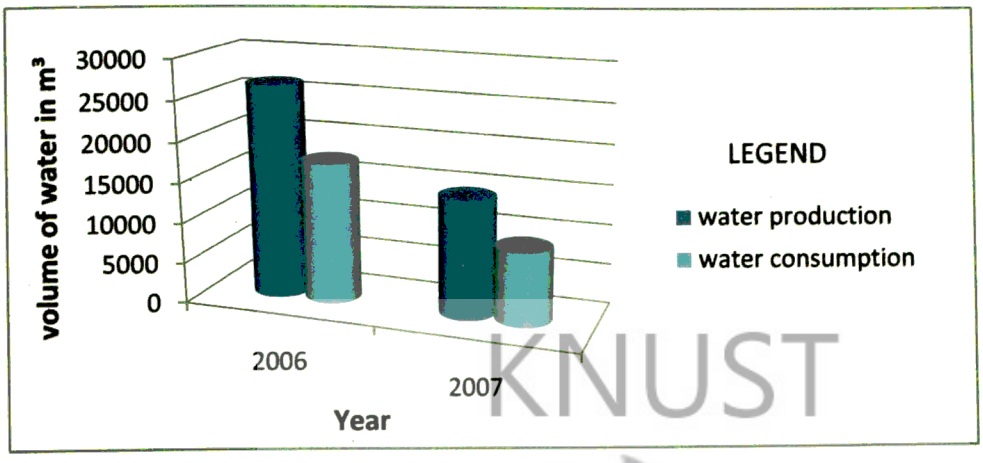
The lower production and lower consumption levels for water services in the study areas attest to Smet and Wikj (2002) argument (refer literature review) that small towns usually have limited demand for water services.

At Parambo-Sawaba, with a design water treatment plant capacity of 109,500m³ annually, a maximum annual production of 26,462m³ of water was produced. This represented only 24% of the total production of the plant. This implies that there is minimum utilization of the plant capacity. Kokofu on the other hand has a borehole yield of 50,000m³. The annual production capacity was recorded as 45,000m³ which represents 90% of the total production capacity of the bore hole. Impliedly, there is almost optimum utilization of the capacity of the bore hole.

- *Unaccounted-For-Water*

This refers to total annual water supplied less total water sold. Simply, it refers to water supplied that are not consumed by people. At Parambo-Sawaba, out of the total production of 26,462m³ in 2006, only 18,096m³ was consumed; whereas in 2007, out of total production of 17,420m³, 9,074m³ was consumed. This implies that a total of 8,366m³ and 8,346m³ volumes of water for 2006 and 2007 respectively were unaccounted for. These figures represent 34% and 38% respectively of water produced that was unaccounted for. These percentages are above the accepted limits of 10% for new systems as spelt out in the CWSA, tariff guidelines. The non-revenue water was calculated to be 6,000 Ghana Cedis and 10,125 Ghana Cedis for 2006 and 2007 respectively (using an average tariff of 1.1 Ghana Cedis per metre cube). Figure 4.6 shows the annual water production and consumption levels at Parambo-Sawaba from 2006-2007.

Figure 4.6: Water Production and Consumption Trends at Parambo-Sawaba (2006-2007)

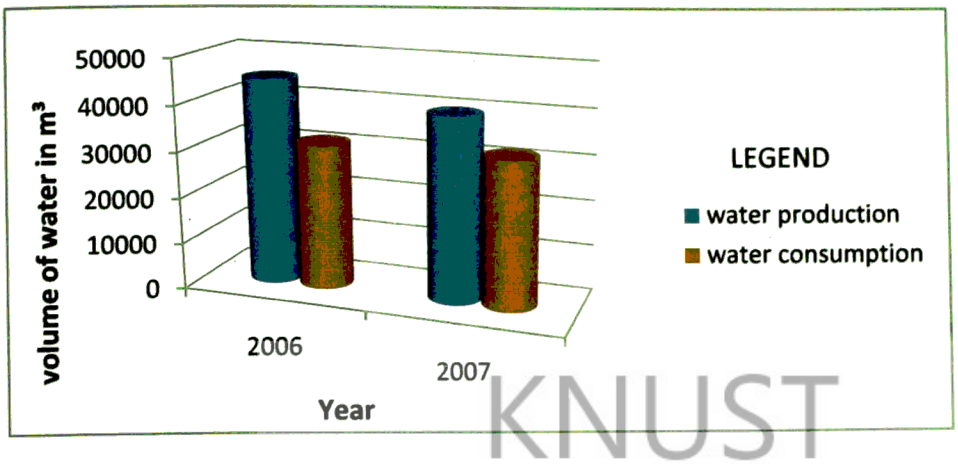


Source: Annual Reports, Armco Company Limited 2006-2007

Alternatively, Kokofu recorded comparatively lower rates of water losses. Out of the total water production of 45,000m³ volume of water, 31,500m³ was consumed. In 2007, out of the total production of 40,000m³ volume of water, 36,000m³ was consumed. Impliedly, 13,500m³ and 8,000m³ of water were unaccounted for 2006 and 2007 respectively. These figures represent 30% and 20% respectively for unaccounted-for-water in 2006 and 2007. These figures translated again into non-revenue water of 9945.1 Ghana Cedis and 6053.3 Ghana Cedis for 2006 and 2007 respectively (using 0.75 Ghana Cedis per cubic metre).

Figure 4.7 shows the annual water production and consumption levels at Kokofu from 2006-2007. There were higher water losses in both study communities, (which is above the accepted limits of 10% and 20% for new and old system respectively). The study revealed that high water losses in both study settlements were due to technical deficiencies in the system (absence of 'automatic cut out device' and iron content in ground water).

Figure 4.7: Water Production and Consumption Trends at Kokofu (2006/ 2007)



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Source: Annual Reports, Kokofu Water Supply 2006-2007

The survey conducted reveals several reasons for unaccounted-for-water. The reasons are as follows. An interview with the Technical Manger at Parambo-Sawaba remarked,

> *"There were several overflows of water at the high level tank over the years. This occurred because there is no device installed to automatically stop the pump when the tank is full, thereby resulting in high percentage value of waste".*

In an interview at Kokofu, the Technical Manager said, as a result of iron content in under ground water, a regular backwashing was carried out every quarterly. This resulted in quantities of water going waste during the clearing process. He further stated that water that runs into the distribution lines was washed away before it was made clear for consumption purposes. It was also observed that water losses were high because water vendors were not charging for every bucket of water, and also as result from spillage.

The study revealed that water production and management were independent on the water management models in place. Production levels were highly affected by local conditions such as demand, socio-physical conditions of the area, availability of traditional sources of water and the technical deficiencies of the water system.

4.5 Economic Performance

The economic performance considered factors such as profitability of water services, cost recovery on O&M, self financing ratio, non-revenue water and the bill collection efficiency of the two water systems.

- *Cost Recovery on Operation and Maintenance*

In both study settlements, systems in place for cost recovery on operations and maintenance were lacking. During the field survey, it was found out that the water pump at Parambo-Sawaba had been broken down for over three weeks. Due to lack of provision for replacement funds, monies were borrowed from the bank to fix the pump. The situation will soon become very critical, as the systems are getting old. Unfortunately, there are no mechanisms in place to address this issue. It must be emphasized systems in place will be unsustainable, if replacements costs are not catered for.

- *Willingness and Ability to Pay for Water Services*

Payment of water services followed the principle of 'pay as you fetch' at the stand pipes. The cost of producing one bucket of water depends on the total amount of water being produced by the water system (CWSA, 2004). If more water is produced in one year, then the cost of producing one bucket of water is reduced.

The survey revealed that the price per 18 litres (34) bucket at Kokofu was 2 Ghana Pesewas, which was equivalent to 1.1 Ghana Cedis per cubic metres. At Parambo-Sawaba, water tariff was 3 Ghana Pesewas per 18 litres (34) bucket which is equivalent to 1.6 Ghana Cedis per cubic metre. The price of water at Parambo-Sawaba was comparatively higher because of lower production levels and high operating costs. In both study areas, stand pipes billing recorded the highest consumption levels and therefore accrued the highest revenues. It was observed that most community members' preferred fetching only few buckets of water from stand pipes and supplement their water with other sources like hand dug wells. This accounts for the high consumption levels at the communal stand pipes than private domestic connections.

Plate 4.1: A water selling point at Parambo-Sawaba

Source: Field Survey, 2008

Plate 4.2: Community Members waiting to Fetch Water when there is an overflow

Source: Field Survey, 2008

The study revealed that there were only few domestic private connections to individual residences and government institutions. The study indicated that the number of private connections at Parambo-Sawaba was 12 while that of Kokofu was 70. In an interview, the station manager at Parambo-Sawaba remarked,

> *"Most community members feel reluctant to pay for water services. They prefer fetching the water free when there is an overflow".*

The few private domestic connections were attributed to the high connection and deposit fees charged. For example, Kokofu charged GH ¢150 as connection fee whilst Parambo-Sawaba took GH ¢55.

Responding to the question, why low patronages of the water facility, the Board Chairman at Parambo-Sawaba responded:

> *"It is not a problem of affordability, but community members prefer taking water without paying. The youth especially rebelled against an increment in prices of water and they are of the view that if water is even closed down, they will still get access to water from the river. In addition, community members feel they have already paid for water services through counterpart funding. Not withstanding, about 90% of community members pay for water services but some opinion leaders and government institutions still owe".*

- *Bill Collection Efficiency*

The collection efficiency refers to actual water that is paid for. At Parambo-Sawaba, out of the total billing of 19,568.5 Ghana Cedis in 2006, actual collection was, 14,487.1 Ghana Cedis, leaving a total arrears of 5,081.4 Ghana Cedis. On the other hand, the study revealed that about 3,000 Ghana Cedis were in debt at Kokofu. These figures represented 38% and 20% respectively of the average total billing on water used in both study areas. Thus, the bill collection efficiency ratios stood at 62% and 80% for Parambo-Sawaba and Kokofu respectively.

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It must be indicated that the problem of low revenue collection bills has implication for replacement and expansion of water facilities. This explains why there were no provisions for water infrastructure services to new areas in the two settlements.

- *Profitability of Water Services*

This is a measure of profit or loss of water services expressed as a percentage of total annual revenue. In 2006, the annual revenue expected at Kokofu was 15,000 Ghana Cedis. However, only 9,000 Ghana Cedis was received as result of water losses leaving an outstanding figure of 6,000 Ghana Cedis. However, the total annual expenditure was 4,137.1 Ghana Cedis. This implies that even with the non-revenue water there was a gain of 4,862.8 Ghana Cedis which represent a total profit of 54% on the annual revenues received. On the other hand, the average annual revenues expected at Parambo-Sawaba was 22,000 Ghana Cedis, and only 13,758 Ghana Cedis was received leaving a loss of about 8,242 Ghana Cedis. However, the total annual expenditure made was 14,453.3 Ghana Cedis. Thus, a loss of 6,211.3 Ghana Cedis was incurred on revenues received which leave a loss percentage of 5.5%.

The self financing ratio which is expressed as the percent of annual income on expenditure was estimated as 154 percent and 94.5 percent for Kokofu and Parambo-Sawaba respectively. It can be concluded that Kokofu water supply has a comparatively higher self financing ratio than Parambo-Sawaba water supply.

The study has revealed that the major contributing factor to economic performance was highly dependent on the local socio-economic conditions of the area of the water supply. It was revealed that water production levels were influenced by effective demand, willingness and ability to pay for water services which consequently affected revenue generation. Again, bill collection efficiency was influenced by the actors involved in the collection of bills and therefore the private operator faced difficulty in collecting bills for fear of being intimidated by traditional authorities and government officials. This explains why the bill collection efficiency was lower at Parambo-Sawaba than Kokofu. Thus, profitability is not influenced by the models but the level of water production.

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4.6 Maintenance of the Water Systems

The study revealed that regular routine maintenance of the two water systems were absent in the management models. This was evident in the frequent break downs of the water pumps. Break down of water pumps at Parambo-Sawaba had occurred three consecutive times this year, whereas Kokofu had experienced break down for once this year. Several reasons accounted for the break downs. These are discussed below.

At Kokofu, it was revealed that, the continuous accumulation of iron content in water causes pump to dysfunction. The Technical Manager recounted:

> *"In 2007, we experienced two pump breaks which cost several millions of Cedis. For about, 2 weeks we did not have water",*

In a response to the question, why pump frequently breaks down, the youth group at Parambo- Sawaba responded:

> *"We experience frequent break downs because since the operation of the water system in 2005, sacrifices made to pacify the gods of the River Pru have never been done. For this year, the pump has broken down for three consecutive times and for almost months we did have water. We believe that the gods are annoyed with us for drinking their water without performing the annual rituals to appease them".*

It must be emphasized that the above narration has serious implications for development. Impliedly, socio-cultural beliefs are being neglected and these have repercussion for any meaningful development. Again, the study revealed that replacement funds for maintenance of repairs and expansion was not catered for in the two management models. This explained the major reason why there were no new expansions of water services to new areas in both study settlements. Again, it can be concluded that maintenance culture was affected by socio-cultural factors and also as a result of unavailability of funds.

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4.7 Technical and Operational Performance

The technical and operational issues considered were water quality, reliability of water services, service coverage and customer satisfaction.

- *Water Quality*

The survey revealed that water quality tests were not carried out regularly in both study settlements. On few occasion, samples of water were sent to the Ghana Water Company Limited for testing. This implies that service operators were unmindful of the health implications of poor quality water. The survey also revealed that water quality monitoring was not done in both communities. The District Assemblies who are tasked with the responsibility of ensuring water quality monitoring do not carry out monitoring activities because they lack the capacity to undergo through the process.

In an interview with the District Water and Sanitation Teams at the two districts, it was revealed that water quality monitoring was often ignored because it requires a lot of efforts, both technical expertise and huge sums of money to carry out the test. The teams explained that it will be expensive to test all the parameters and specifications with respect to water quality as specified in the CWSA guidelines.

It was observed that the colour of water at Kokofu was observed as Yellowish-Brown because of iron content in ground water. The study revealed that the quality of water service provided to the Kokofu community had deteriorated within a few years of

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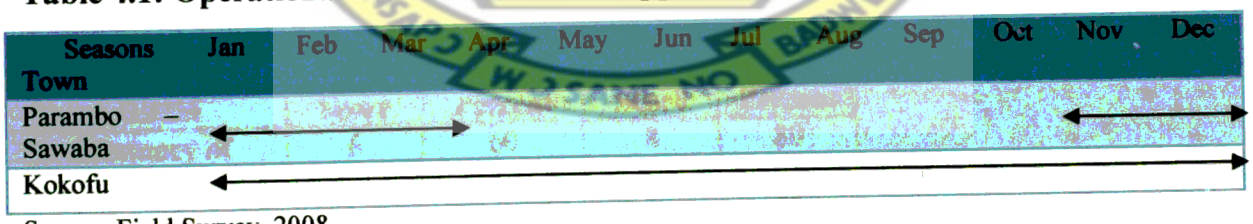
operation. Water quality was therefore affected by soil quality, financial and technical inabilities in the management system.

- *Service Reliability*

Even though the reliability of water service depends on the functionality of the facilities and the regularity of the flow of water, this was not in the case of the study areas. Interestingly, it was revealed that reliability of water in the study areas were influenced by demand. The study revealed that the operational periods of water services were between four to six months at Parambo-Sawaba, which were normally between November to March, because of low demand during the rainy periods. In the case of Kokofu, the operational days were all year round, but during certain times of the rainy periods, water sales attendants may decide to close down taps when there is no patronage.

Service reliability was estimated as 120: 365 days (which represent 33 percent of operational days annually) and 300:365 days (which represent 82 percent of operational days annually) for Parambo-Sawaba and Kokofu respectively. Thus, water supply at Kokofu can be said to be more reliable than that of Parambo-Sawaba. The chart below shows the operational periods of water supply in the study areas.

Table 4.1: Operational Months of Water Supply



Source: Field Survey, 2008

- *Water Coverage*

Water coverage refers to population with easy access to the pipe systems per total populations in the study areas. Access to potable water supply at Parambo-Sawaba was estimated as 52.5 percent of the total population. This implies that nearly half of the total

population relies on unsafe water sources. Alternatively, water coverage at Kokofu was 55.7 percent and impliedly 44.3 percent of the total population does not have access to potable water.

- *Customer Satisfaction*

Almost all key informants interviewed said they were satisfied with adequacy of water and the functionality of stand pipes in both settlements. In both study settlements, adequacy and functionality were rated as Good and Very Good respectively. However, most community members were not satisfied with the regularity of water and the down time of the water facility. In all cases, the reliability of water was rated as Good, whereas the down time of the facility were rated as Fair at Parambo-Sawaba and Good at Kokofu. With respect to the quality of water, informants said they were very satisfied with the water quality at Parambo–Sawaba, and was rated as Very Good. The quality of water at Kokofu was considered as Bad.

Table 4.2 indicates the summaries of community members' assessment on the water supplied. Assessment criteria used a scale of 10 or 100 percent. Scale used for assessment was as follows. 0-2 represents Bad, 3-5 represents Fair, 6-8 represents Good and represents 9-10 represents Very Good.

Table 4.2: Community Assessment of Water Supply System

Criteria	Parambo-Sawaba		Kokofu	
	Score	Percent	Score	Percent
Adequacy of Water	6	60	8	80
Reliability of Water	4	40	5	50
Functionality of Stand Pipes	9	90	9	90
Down Time Pump	5	50	6	60
Summary	6	60%	7	70%

Source: Field Survey, 2008

The study has revealed that operational performances were higher at Kokofu than Parambo-Sawaba. It can therefore be concluded that Kokofu Community-Based

Management Model performed better than the Parambo-Sawaba Public-Private Partnership Model.

4.8 Summary of Key Issues

The analysis has revealed the differences between the Community-Based Management and the Public-Private Partnership Models in small town water service delivery in terms of strengths and weaknesses. Appendix 4 shows the summary. Indicators used in the analysis included governance, community participation, economic performance, water production and management, technical and operational performance as well as maintenance procedures of the water systems.

The study revealed that the performances of water systems were highly dependent on the local socio-economic conditions, technical deficiencies and to some limited extent, the management model in place. For instance, low demand of water services affected economic performance of the water systems. Again, as result of technical deficiencies, high water losses were incurred.

In addition, the study revealed that water management model in place has an influence on the level of community participation and commitment. The Community-Based Management Model favoured community ownership and higher commitment to payment of bills, which was deficient in the Public-Private Management Model. The outcome of the discussions in this chapter guides the findings and proposals made in the next chapter.

CHAPTER FIVE

MAJOR FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

The Last Chapter reviews the summary of major findings of the study and proposes recommendations that will enhance sustainable water supply systems in small towns in Ghana. Lessons learnt from study have been fed into the recommendatory section for subsequent studies.

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5.2 Major Findings

The summary of the research findings are tailored along the objectives of the study. These are discussed below.

5.2.1 Existing Management Models and their Influence onWater Supply Systems

Even though Kokofu Water Supply is operated and managed under the Community-Based Management Model, the study revealed that this model was however not conclusive in terms of the underlying principles as informed by the literature. The study established that community members did not have a major role in the development of the system and were supported by the district assembly in payment for counterpart funding. This situation resulted in the lack of ownership sentiments and sense of responsibility by community members towards the water system.

Similarly, although Parambo-Sawaba Water Supply is operated under the Public- Private Partnership, they study found that partnership arrangement had not proved successful. For instance, it was revealed that the PPP faced political interference from traditional authorities and government institutions. Again, the WSDB did not have the mandate of the people and was at the verge of collapse. In addition, the DA's role in renewal and expansion of the water system were absent. This condition increased the down time of water pump and hence the problem of water shortage.

5.2.2 Strengths and Weaknesses of the Existing Water Management Models

Kokoku CBM had a stronger leadership and social structure. Community operating staffs were very proactive and never weary to confront government officials for monies in debt. This reflected in high bill collection efficiency of 80%. Again, community meetings were more organized and meetings coincided with festive occasions. However, weak administrative skills were identified as a major weakness with this model. This was reflected in improper records keeping due to inadequate and unqualified personnel.

On the other hand, Parambo-Sawaba PPP had stronger administrative skills. This model was on contract and therefore private operator employed more qualified and trained staffs. In terms of weakness, the PPP suffered political interferences from government institutions and traditional authorities. These groups were the highest debtors and this reflected in a low bill collection efficiency of 62%. In addition, there was low community commitment with regards the PPP. This was manifested in the difficulty encountered by the private operator to get community members to operate and sell water at the communal stand pipes. The bi-annual community meetings were absent and community participation was only in the form of consultation

5.2.3 Causes of the Problems Facing the Water Systems

The study has identified some challenges confronting the two management models. These ranges from institutional/administrative, technical and financial mismanagement are discussed below.

a. Institutional Problems

- *Inadequate knowledge base of beneficiary communities*

The study identified that the two communities lack the knowledge base with regards to the water supply systems. The problem is attributable to poor animation process since most community members feel their contribution with regards to counter part funding should cater for cost of water fetched. This was due to the fact that community members were assisted through various means such as HIPC funds in the case of Parambo-Sawaba

and the DA support in the case of Kokofu, in their payments of counter part funding. This makes community members lack ownership and responsibility towards maintenance of the water facilities.

- *Weak Institutional Collaboration*

The study identified that there was poor institutional collaboration among the various stakeholders. The DAs did not collaborate with WSDBs and they only did so when they were called by the WSDBs. Communication could be described as one way. The study established that the regular routine maintenance by DWSTs was not carried out.

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b. Technical Problems

- *Infrastructure Inadequacy*

The study revealed that in both settlements, water systems lacked 'automatic cut-out device' to control the water pumps when the high level tank was full. Technical operators therefore handled this process manually at every pump hour and power interruptions. Due to technical deficiencies, operating the system was very tedious and energy sapping. This situation contributed to the high water losses at the high level tanks. Parambo-Sawaba recorded water losses of 34 percent and 38 percent in 2006 and 2007 respectively. Alternatively, Kokofu recorded comparatively lower rates of water losses. These were recorded as 20 percent and 30 percent for 2006 and 2007 respectively.

- *Inadequate Staffing and Logistics*

The study established that the technical expertise (human resources) and spare parts to carry out maintenance of the water systems were lacking. The lack of needed resources increased the down time of pumps and huge losses were incurred.

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c. Financial Problems

- *Low Demand*

The study revealed local conditions such as the rainfall pattern and the availability of traditional water sources influenced the performance of the water systems. These factors led to the problem of low demands of the pipe water systems. Water consumption levels were considerably low in the two study areas which adversely affected production levels. Daily consumptions of water were recorded as 8 litres per capita per day and 12 litres per capita per day at Parambo-Sawaba and Kokofu respectively. These consumption figures were woefully inadequate (below CWSA minimum requirement of 18 litres per capita per day) to lead a healthy life.

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The problem of low demand led to low revenue and hence the lack of replacement cost. The study revealed that "replacement fund" to pay for replacement of major system components was not provided in the preparation of budgets in both study areas. This inadequacy increased the down time of the facility when it broke down.

- *Commercial Risks*

Service operators at both Parambo-Sawaba and Kokofu face high operating cost because of low demand of water services. The cost of producing one cubic metre of water was GH¢1.6 and GH¢1.1 at Parambo-Sawaba and Kokofu respectively as compared to the urban figures of GHp 6. Operators were not able to pay for services at all times. In both cases, the payments of WSDBs sitting allowance were long overdue. At Parambo-Sawaba, payment of salaries of workers had been in arrears for over 9 months. The Lack of incentives and unpaid salaries for services rendered has crippled the motivation to work efficiently and in the long run, the collapse of the system.

5.3 Recommendations

This section proposes some interventions important to address the challenges confronting small towns' water systems. The study has suggested three main interventions, institutional capacity building, improved technology and financial management to ensure sustainable water delivery in small towns. Responsible key actors and their respective roles have also been specified to improve institutional, technical and financial mismanagement in the water systems.

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A. Institutional Capacity Building

Sensitization Programmes

The viability and profitability of water systems largely depends on effective demand. Thus, to increase water demand by encouraging the whole community to use safe water provided by the piped water system, it is proposed that series of educational campaigns organised to sensitize beneficiary communities on the importance of drinking good quality water. This can be done by the District Assemblies by instituting annual 'drinking water day' at the community and the district levels. In addition, the inactive WATSAN committees must be strengthened in small towns to help in community mobilization and hygiene education programmes. The district assemblies must organise in-service training and refresher courses for beneficiaries' communities and service operators at least once every year.

Redefinition of Institutional Roles

To improve the performance of stakeholders at Parambo-Sawaba and Kokofu water supply, institutional collaboration should be strengthened by the District Assemblies by redefining the roles of stakeholders, DWSTs, WSDBs, and the WATSAN committees in the management of STWS. This will help curb the issue of conflicting roles and revive dormant stakeholders. In addition, a technical support team should be established under the arrangement of the DA. The DWST must work with the water boards as an advisory unit.

Community Participation

To boost community commitment in the management of water systems, the WSDBs must develop innovative means such as organizing meetings on festive occasions, and also at smaller group levels. The community/town must be sub-divided into various sectors or zones and each zone targeted at a specified agreed time. Space and time needs for meetings must be carefully considered. The board must conduct frequent debriefing meetings at the community level to ensure accountability and transparency in their activities to incur the satisfaction of community members. In addition, the WSDBs must involve community members in the fixing of water tariffs to incur their satisfaction in the payment of fees. Community meetings must be used to agree on the price of water in the settlement.

Encourage Private Sector Participation in STWS

District assemblies should coordinate with the private operators to effectively plan and oversee infrastructure development including rehabilitation, renewal, improvement and extensions of water supply systems. Furthermore, a suitable relationship between the public and private sectors needs to be established to promote efficient operation of the water facilities.

B. Improved Technology

Upgrading of existing technology is a key to achieve sustainable water supply systems. The District Assemblies must make adequate investments at Kokofu and Parambo-Sawaba small towns' water systems to make water cleaner and easier to transport to consumers. For instance, the acquisition of automatic cut out device will help decrease non-revenue water by reducing water losses in the production and distribution systems.

C. Financial Management

To ensure regular maintenance and to reduce down time of pumps at Parambo-Sawaba and Kokofu Water Supply Systems, the WSDBs at the community levels must set up maintenance budget for replacement purposes. That is to say, some monies need to be set aside by the WSDB as savings in a "capital fund" which could be used to pay for new items required for expansion of the water systems. The District Assemblies must enforce that service operators undergo financial management training to ensure that proper records are kept. Service operators must organised frequent debriefing to ensure accountability and transparency to relevant stakeholders to avoid misappropriation of funds.

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5.4 Conclusion

The study has compared O &M of STWS under different management options in the light of factors such as community participation, governance, economic performance, water production and management, technical and operational performance and lastly maintenance of the systems. A comparative case study approach was adopted to examine the Community Ownership &Management and Public-Private Partnership at Kokofu and Parambo-Sawaba respectively.

The study revealed that three main factors contributed to the performance of the water management models. The first issue which affected performance was the local and socio-economic conditions pertaining in the water supply area. The study revealed that local factors such as geophysical characteristics (rainfall pattern, ground water quality), the willingness and ability to pay for water services and the socio-cultural background of the local people influenced the performance of the water systems. These factors led to the problem of low demands of the pipe water systems. Water consumption levels were considerably low in the two study areas which adversely affected production levels. Daily consumptions of water were recorded as 8 litres per capita per day and 12 litres per capita per day at Parambo-Sawaba and Kokofu respectively. These consumption figures were

woefully inadequate (below CWSA average standard of 18 litres per capita per day) to lead a healthy life.

Another factor identified which influenced the performance of the water system was the management models. For instance, the study revealed that the Community-Based Management Model performed better in community participation than the Public–Private Partnership. There was greater sense of ownership and responsibility towards management by community members. Low participation and commitment of beneficiary communities was identified as one major challenge facing the private sector. Again, political interferences from traditional authorities and government institutions also posed a threat to the performance of the Public-Private Partnership in small towns' water delivery. The study revealed that bill collection efficiency was relatively low, 62 percent as against 80 percent at Community-Based Management Model, and traditional authorities and government institutions were the highest debtors.

The last factor which affected performance of both management models was low technology. The study revealed that high water losses averaging between 30-32 percent annually were encountered. The problem of high water losses was attributable to technical deficiencies of the water systems.

In a nut shell, the study has revealed that water management models alone do not influence performance of water systems, but inherent local socio-economic conditions and the type of technology in place. The study has suggested recommendations which will eventually lead to sustainable and improved water supply systems. Participatory approach has been suggested as an ultimate solution to ensure sustainable water supply systems. Community participation must be seen as an integral component in any management option for a successful intervention in small towns' water delivery. The study proposed that user or beneficiary communities must be involved at all stages in the planning and management process. The implementation of these proposals will lead to high water consumption, increased revenues, high investments and thus sustainable and improved water supply systems.

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Appendix 1

STWS Sector Related Institutions in Ghana: Roles and Responsibilities

Roles/ Responsibilities	Institution/Actor
Policy Objectives • Formulation • Implementation	CWSA/District Assemblies(DAs)
Ownership of Water Facilities	DAs, Communities
Facilitation – capacity building, technical assistance	Partner Organizations
Management of Water Facilities • Operations and maintenance • Repair (regular) • Repair (major rehabilitation/replacement) • Revenue collection • Auditing of accounts	WSDB Private sector Private sector WSDB/Vendors Das
Regulations and monitoring of operations	Das
Tariff Structure • Guidelines • Approvals	CWSA DA
Water Quality • Definition of standards • Monitoring • Enforcement	District Water and Sanitation Team(DWST), CWSA
Consumer Protection	DAs

Source: Community Water and Sanitation Agency, (2004) Small Town Sector Policy,

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Appendix 2: Operation and Maintenance Functions

Financial Management	**Responsible Unit**	**Number of times done in (2007)**		**Remarks**
Activity		**Kokofu**	**Parambo-Sawaba**	
Record keeping	Operators	12/12	3/12	Records are kept on monthly basis
Quarterly auditing	WSDBs, DA	¼	¼	Quarterly reports sent to Das
Internal auditing	WSDBs	0	0	Monthly Internal auditing are not done
Financial reporting to community members	WSDBs	0	0	Never been done
Banking	Operators	12/12	3/12	Monies are banked every 3 days after collection from vendors.
Meter reading/billing	Operators	Every 3 days	Every 3 days	Done, lack of prompt payment of bills
Technical Functions				
Activity				
Water quality monitoring	WSDBs, DA	0	0	Lack capacity to do water quality monitoring
Replacement/extension	DA	0	0	No expansion works has been carried out since construction
Periodic/routine maintenance	Operating staff	¼	1/12	Done quarterly
Major repairs	WSDBs	Once	3 times	Private operator bore the cost at parambo-sawaba
Administrative and Management Functions				
Activities				
Community mobilization	WATSAN	0	0	WATSAN is not functional
Hygiene education	WATSAN	0	0	WATSAN is not functional
Community meetings	WSDBs	Once	Never	Poor Attendance
Supervision of employees	WDSBs	0	0	Never
Performance monitoring	DA	0	0	Not done
Stock taking	WSDBs	0	0	Not done
Budget preparation	Operators	Once	Once	Annually
election of new committees/board	WSDBs	Never	Never	No new elections since inception

Source: Field Survey, 2008

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Appendix 3: Staffing and Organization

Staff	Kokofu Water Supply				
Position	**Existing**	**Educational level**	**Length of experience**	**Job training**	**Refresher training**
Technical manager	✓ (2)	SSCE	1 year	✓	-
Operative/care taker	✓ (1)	SSCE	2 years	✓	-
Administrative/financial clerk	✓ (1)	ACCA Part 1	6 years	✓	-
Public relation officer	0	-			-
Cashier/revenue officer	✓	SSCE	2 Years	✓	-
Water vendors	✓ (13)	MSLC	Minimum 1year	-	-

Staff	Parambo-Sawaba Water Supply				
Position	**Existing**	**Educational level**	**Length of experience**	**Job training**	**Refresher training**
Station Manager	✓ (1)	Tertiary	3 year	✓	✓
Pump Attendant	✓ (2)	SSCE	2 years	✓	✓
Treatment Attendant	✓ (1)	GCE/O Level	3 years	✓	✓
Accountant	(1)	GCE/O Level	3 years	✓	-
Cashier/revenue officer	✓ (1)	GCE /O Level	3 years	✓	✓
Plumber/meter reader	✓	SSCE	3 years	✓	-
Security	✓	SSCE	3 years	-	-
Public relation officer	None	-	-	-	-
Water vendors	✓ (21)	None	Min. 1 yr.	-	-

Source: Field Survey, 2008

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Appendix 4: The Strengths and Weaknesses of the Community-Based Management and the Public-Private Partnership Models

Indicator	Community-Based Management Model		Public-Private Partnership	
	Strengths	Weakness	Strengths	Weakness
Governance • Control and sense of ownership	• Greater control and sense of community ownership • The board was properly constituted and they enjoy the mandate of the people.	• Weak administrative and managerial skills (Largely unskilled personnel) • Lack of community bye-laws	• Relatively Strong administrative and managerial skills(semi skilled and skilled personnel)	• Weak institutional collaboration between service operators and the district assembly. Partnership had been lumped under one heading "privatization" • Political interferences from the DCE and the traditional authorities • Board was at the verge of collapse
Community Participation	• A relatively stronger social cohesion • Regularly meetings held , met twice this year	• Non involvement of community members in the setting of tariffs	-	• Weak social cohesion • Non involvement in the setting of tariffs • Hardly organized meeting. Never met this year. • Chieftaincy disputes hamper community participation.
Economic Performance • Profitability of water services • Cost recovery on O&M • Self financing ratio • Non-revenue water • Bill collection efficiency	• A profit percentage of 54% were made on revenue annually • Self financing ratio of 154% • High recovery rate (Bill collection efficiency was 80%) • Willing and able to pay economic rates	• Non- revenue water was high • Lack of replacement cost	• Support from relevant financial institutions because of collateral security	• A loss percentage of 5.5% • Unable to make reasonable profit. Self financing ratio of 94.5%. • Bill collection efficiency stood at 62% • Cost recovery on O&M was not attained(lack of replacement cost)

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				• Non revenue water was high • Relatively low recovery rate
Water Production and Management • Water production levels • Water losses(unaccounted for water	• 40,000m³ and 45000m³ in 2006 and 2007 which represent 80% and 90% of the total design capacity of borehole. Relatively optimum utilization of capacity.	• High water losses (30% and 20% of water losses in 2006 and 2007 respectively		• 26462m³ which represent 24% of the total production capacity of the plant. There is under utilization of the plants' capacity. • High water losses (34% and 38% of water losses in 2006 and 2007 respectively.
Maintenance of the System	• Minimal maintenance of water system (regular backwashing	• Break down of water pumps. • Routine maintenance was absent • Lack of replacement cost		• Poor maintenance culture. Only under take repairs. • Frequent break down of pumps • Lack of replacement cost
Technical and Operational Performance • Water quality • water coverage • Reliability of water supply	• Changes in water quality. Quality of water was poor • Low water coverage 55.7% • Reliable water services (82% of total operational days)	• Low investment in water quality test. • No new service points due to lack of replacement funds	• Good water quality. • Huge investment in maintaining water quality.	• Low Water coverage was 52.5% • Unreliable water services (33% of operational days)

Source: Field Survey, 2008

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Appendix 5: Water Production and Consumption Levels For Kokofu and Parambo- Sawaba water supply for the period 2006-2007

System	Year	Production in cubic metre (m^3)	Consumption (m^3)	Water stored	Volume of un-accounted for water(m^3)	Unaccounted for water %	Efficiency (%)
Parambo – Sawaba	2006	26462	17420	675	8366	34	66
	2007	14577	9074	-	4503	38	62
Kokofu	2006	45,000	31500	-	13500	30	70
	2007	40000	32000	-	8000	20	80

Source: Armco Company Limited and Kokofu Water Supply Annual Reports, 2006-2007

Water Production and Consumption Levels at Parambo-Sawaba (in cubic metres) from 2006 and 2007

Year	MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
2006	Production in cubic metres	6615	5512	4410	2205	-	-	-	-	-	-	3304	4416	26462
2007		5016	3430	5131	-	-	-	-	-	-	-	-		14577
2006	Consumption (cubic metre)	5534	4087	3043	1276	-	-	-	-	-	-	1537	1938	17420
2007		3445	2128	3501	-	-	-	-						9074

Annual Reports Armco Company Limited (2006-2007)

Water Production and Consumption Levels at Kokofu (in cubic metres) from 2006 and 2007

Year	MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
2006	Production in cubic metres	6675	5012	5625	4675	3750	2550	2005	1650	1500	2455	2552	6551	45,000
2007		5625	4550	5955	4550	3500	2565	2155	1810	1800	2255	2155	5535	40,000
2006	Consumption in cubic metres	4552	3550	3625	2545	2625	1875	1750	1105	755	1575	1355	6188	31,500
2007		5150	3255	4775	2850	2455	1533	1452	1250	1105	1975	1150	5050	32,000

Annual Reports, Kokofu Water Supply, 2006 and 2007

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Appendix 6

Income and Expenditure Statement of operation and maintenance of STWS at Parambo-Sawaba from 2006-2007

	2006	%	2007	%
Income	(GH¢)		(GH¢)	
Income from stand pipe sales	17,574.7	89.8	7720.3	98.7
income from private customers	1772.3	9.1	101.9	1.3
Income from new user connections	165	0.8	-	
Meter maintenance fees	56.5	0.3	-	
Total income	195,685	100	78,225	100
Operating expenditure				
Energy	3,654.32	16.3	1691.8	25.6
Small maintenance	2,627.6	11.7	1039	15.7
Personnel	3,976.9	17.8	280.5	4.3
Vendors' commission	2,987.6	13.4	142.7	2.2
Transport cost	344	1.5	85	1.3
Water treatment cost	1,020	4.6	162.7	2.5
Water quality analysis	1,100	4.9	-	-
Administrative cost	806.4	3.6	147	2.2
Administrative overheads	5,800	26	-	
Total operating expenditure	22,316.9	100	6589.7	100
Operating surplus/deficit	Deficit =2,748		Surplus =1232.4	

Source: Armco Company Limited, Annual Reports 2006, 2007.

Income and Expenditure Statement of Operation and Maintenance of STWS at Kokofu from 2006 - 2008

	2006	2007
Income		
Income from stand pipe sales	6200	7500
income from private customers	2400	1500
Income from new user connections	250	-
Meter maintenance fees	150	500
Total income	9,000	9500
Operating expenditure		
Total operating expenditure	4511.5	7900
Operating Surplus/ deficit	Surplus= 4488.5	Surplus= 1600

Source: Annual Reports, Kokofu Water Supply, 2006- 2007

Appendix7: Water Coverage Levels at Kokofu and Parambo-Sawaba

Community	Year	Total population	Number of Stand pipes	Threshold population	Coverage levels(%
Prambo-Sawaba	2008	12000	21	6300	52.5
Kokofu	2008	7000	13	3900	55.7

Source: Kokofu and Parambo-Sawaba Water Supply, 2008

Daily Water Consumption at Kokofu in 2006 and 2007

Total Consumption in 2006 = 32,000m³

But 1m³ = 1000litres

1 year (365 days)

32,000* 1000 = 32,000,000 / 365

= 87,671.23 litres

87,671.23 litres / 7000

= 12.5 litres per person per day.

Total Consumption in 2007= 31,500m³

1m³ =1000litres

1 year (365 days)

31500*1000 = 31500,000 / 365

= 86,301.36 litres

86301.36 / 7000

=12.3 litres per person per day

Daily Water Consumption at Parambo-Sawaba in 2006 and 2007

Total Water Consumption in 2006 = 17420m

Operational Periods = 180 days

17420*1000 litres= 17,420,000 litres

17420,000 / 180
= 96777.7

96777.7 / 12,000

= 8.06 litres per person per day

Total Consumption in 2007 = 9074m

Operational Periods = 90 days

9074* 1000 litres = 9074,000 litres

9074,000 / 90
= 100,822.22 litres

100,822.22 / 12,000

= 8.4 litres per person per day

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Appendix 8

COLLEGE OF ARCHITECTURE AND PLANNING
FACULTY OF PLANNING AND LAND ECONOMY
DEPARTMENT OF PLANNING

MSc. DEVELOPMMENT PLANNING AND MANAGEMENT

TOPIC: THE OPERATIONS AND MAINTENANCE OF SMALL TOWNS' WATER SYSTEMS: A COMPARATIVE STUDY OF THE PUBLIC-PRIVATE PARTNERSHIP AND THE COMMUNITY OWNERSHIP &MANAGEMENT MODELS AT PARAMBO-SAWABA AND KOKOFU RESP.

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INTERVIEW GUIDE FOR COMMUNITY WATER AND SANITATION AGENCY (CWSA)

1. Name and title of job of interviewee .....
2. Name of institution and the region.....
3. Date of interview .....
4. What is the current composition of the RWST?
5. What are the specific roles of each member in terms of water supply systems?
6. Have you given any support to small towns for the past two years?
7. What kind of support?
8. Institutional collaboration between CWSA and the District assembly.
9. Assessment of or level of effectiveness of the district water and sanitation team.
10. The composition and level of effectiveness of the water and sanitation development boards of the study area.
11. The composition and level of effectiveness of the water and sanitation committee of the study area.
12. Community participation in the management of STWS.
13. Payments of water supply by user communities and government institutions.
14. Water supply, coverage and water quality monitoring
15. Role of women in STWS
16. Key challenges of STWS.
17. Measures in place to improve challenges.
18. Changes required in ensuring sustainable water system

Appendix 9

COLLEGE OF ARCHITECTURE AND PLANNING

FACULTY OF PLANNING AND LAND ECONOMY
DEPARTMENT OF PLANNING

MSc. DEVELOPMMENT PLANNING AND MANAGEMENT

TOPIC: THE OPERATIONS AND MAINTENANCE OF SMALL TOWNS' WATER SYSTEMS: A COMPARATIVE STUDY OF THE PUBLIC-PRIVATE PARTNERSHIP AND THE COMMUNITY OWNERSHIP &MANAGEMENT MODELS AT PARAMBO-SAWABA AND KOKOFU RESP.

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INTERVIEW GUIDE FOR THE DISTRICT WATER AND SANITATION TEAM (DWST)

1. Name and Position of Interviewee .....
2. Name of Institution and the District.....
3. Date of interview.....
4. What is the current composition of DWST?

   .....
   .....
   .....

5. Are all members of this team currently at post?

   .....
   .....

6. What is the specific role of each member?

Members Name	Position	Specific Role(s)

7. Could you kindly comment on the current performance of the WSDBs in your district?

   .....
   .....

8. Has the district given any specific support to Kokofu Township in terms of small towns' water supply in the last two years? If any, what were they?

   .....
   .....

.....

.....

9. How is water quality monitoring done?

.....

.....

10. How often is water quality monitoring done in a year?

.....

11. In your opinion, how would you rate the performance of the WSDBs and operating staffs at Kokofu Township?

Comments.....

.....

.....

.....

12. Do you know of any specific problems or challenges confronting Kokofu Water Supply System?

Comments.....

.....

.....

.....

.....

13. What specific recommendations can be suggested to improve the Kokofu Water Supply System?

.....

.....

.....

.....

14. What are constraints/ problems facing DWST for executing their functions effectively?

.....

.....

.....

.....

.....

15. What solutions do you suggest to enhance DWST functions?

.....

.....

.....

.....

.....

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Appendix 10

COLLEGE OF ARCHITECTURE AND PLANNING
FACULTY OF PLANNING AND LAND ECONOMY
DEPARTMENT OF PLANNING

MSc. DEVELOPMMENT PLANNING AND MANAGEMENT

TOPIC: THE OPERATIONS AND MAINTENANCE OF SMALL TOWNS' WATER SYSTEMS: A COMPARATIVE STUDY OF THE PUBLIC-PRIVATE PARTNERSHIP AND THE COMMUNITY OWNERSHIP &MANAGEMENT MODELS AT PARAMBO-SAWABA AND KOKOFU RESP.

KNUST

QUESTIONNAIRE GUIDE BENEFICIARY COMMUNITY: COMMUNITY PERCEPTIONS

1. What specific roles do community members perform in the management of Kokofu STWS?
   .....
   .....
   .....

2. How often do community members meet with the WSDBs in a year concerning the water supply system in the community?
   .....
   .....
   .....

3. Are all community members involved in meetings?
   Comment.....
   .....

b. Which category of people is mostly at meetings?
.....
.....

4. Do you use any other source of water apart from this pipe system? a. Yes [ ] b. No [ ]

Tick source appropriately and give reasons for your preferred choice

Distance	Affordability	reliability	Taste of water	Colour of water
Pipe borne water				
Well				
Bore hole				
Stream				

5. How regular is the pipe system?
a. All year round [ ] b. once in a week [ ] c. once in a month [ ] d. once in two months[ ]
e. other specify……..

6. If management option is private sector approach,
b. In your view, do you think private operators are managing water effectively?
a. Yes [ ] b. No [ ] Give reasons for your answer
……

7. If management option is community management approach,
b. In your view, do you think water boards are managing water effectively?
a. Yes [ ] b. No [ ] Give reasons for your answer
……

8. Are you (the community members) involved in fee fixing?
Comments……
……

9. Are women involved in the management of the water system?
Comments …(how many and the roles they play)
……
……

10. What is the Relationship between the Community, WSDBs and the community's operating staffs
……
……
……

11. What are the problems with the existing pipe system in the community?
……
……
……

12. What can be done to improve the problems of water supply in the community?
……
……

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Appendix 11

COLLEGE OF ARCHITECTURE AND PLANNING

FACULTY OF PLANNING AND LAND ECONOMY
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MSc. DEVELOPMMENT PLANNING AND MANAGEMENT

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KNUST

INTERVIEW GUIDE FOR WATER AND SANITATION DEVELOPMENT BOARDS (WSDBs)

1. What is the current composition of the WSDBs?

.....

.....

2. What are their specific roles?

Name of Member	Position of Member	Skill	Specific Roles

3. Who are the other stakeholders in the management of the system?

.....

.....

4. Do all community members pay for water services? a. Yes [ ] b. No [ ]

Comments

.....

.....

5. What is the payment rate or level?

.....

6. Do all government institutions pay for water services?

Comments

.....

.....

b. What is the payment rate or level?

.....

.....

7. Which method is used to collect money for water services provided?
a. Per households [ ] b. Adults [ ] c. Pay as you fetch [ ] d. other specify.....

8. Do people rely on other sources for water apart from this system?
a. Yes [ ] b. No [ ]
b. If yes, what are the other sources?
.....
.....

9. Are they any exemptions in the payment of water services? a. Yes [ ] b. No [ ]
b. Which categories of people are exempted?
Comments
.....

10. How many water points do you have in the community? .....
Comments (Are they all functioning? How many are not)
.....
.....

11. How do you fix water tariffs?
Comments (components)
.....
.....

12. What is the Average tariff in Cedis per m3?
.....

13. Are they any arrears in the payment of tariffs?
Comments (total monies in debts)
.....
.....

14. What are the causes of poor tariffs payments?
.....
.....

15. What benefits has the water system brought to the community?
.....
.....

17. What are the challenges faced in the management of the system?
.....
.....

18. What are the lessons learnt from the management this system?
.....

19. How can the water system be improved?
.....
.....

Appendix 12

COLLEGE OF ARCHITECTURE AND PLANNING
FACULTY OF PLANNING AND LAND ECONOMY
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MSc. DEVELOPMMENT PLANNING AND MANAGEMENT

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INTERVIEW GUIDE FOR PRIVATE OPERATORS AND/ OR COMMUNITY OPERATING STAFFS IN THE OPERATION AND MAINTENANCE OF STWS

1. What is the current composition of the operating staff?

.....

.....

2. What are the specific roles of each member?

Name of Member	Position of Member	Skill	Specific Roles

3. How long has this system been operating?

.....

Technical issues

4. What is the total quantity of water produced per day/ per month/ annually?

.....

5. What is the design capacity of the water tank?.....

6. What account for the difference in actual water produced and the design water production capacity? Give reasons

.....

.....

.....

7. What quantity of water supplied is unaccounted for per monthly?

.....

b. Why does this quantity go waste? Give reasons

.....

.....

8. Have you encountered any breaks since the last previous year?

Comments

.....

.....

.

9. Which method is used to collect money for water services provided?

No. of households [ ] b. Adults [ ] c. Pay as you fetch [ ] d. other specify.....

b. What is the price per bucket of water?.....

10. Are they any exemptions in the payment of water services?

Comments (category of people exempted)

.....

11. What are total annual revenues received / annual amount of water sold?

.....

12. Do you incur Profit or loss? a. Yes [ ] b. No [ ] c. break even [ ]

13. What is the profitability of water service?

.....

14. Do all community members pay for water services?

Comments (payment rates)

.....

.....

15. Do all government institutions pay for water services?

Comments (payment rates)

.....

.....

16. What are the total annual revenues in debt?

.....

17. What measures have you put in place to ensure people pay for water services provided?

.....

.....

18. What are the total costs incurred in providing for water services per year?

.....

.....

.....

19. Are you able to recover cost on operation and maintenance?

a. Yes [ ] b. No [ ]

What is the gap?

.....

Comments .....

20. Do you make provision for maintenance budget?

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a. Yes [ ] b. No [ ]

b. If Yes, how much money is set aside for maintenance of the system annually?.....

21. Do people rely on other sources for water apart from this system?

a. Yes [ ] b. No [ ]

b. If yes, what are the other sources?.....

.....

22. Water production and sales chart from 2005 – 2008

Year	Quantity of Water Produced(m3)	Quantity of Water Sold/consumed(m3)	Unaccounted for water(m3)
2005			
2006			
2007			
2008			

23. What is the revenue and expenditure pattern per year?

Year	Total revenues (quantity of water sold)	Expenditures
2005		
2006		
2007		
2008		

24. Do you sometimes receive complaints about water services provided?

Comments (complaints per year)

.....

.....

25. What is the total Cost of staff per year?

.....

.....

26. What are the total customers (population) who use this water system (both stand pipes and private connections).

Comments .....

27. Do you contract out service to private persons in the case of major repairs?

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Comments (charges in a year)

.....
.....

28. What benefits has this system brought to the community?
Comments
.....
.....

29. What problems do you face in the operation and maintenance of the system?
.....
.....
.....

30. In your opinion, how can these problems be addressed?
.....
.....
.....

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