

TECHNICAL AND COMMERCIAL ISSUES IN THE OPERATION OF PIPED WATER SYSTEMS IN NORTHERN GHANA

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INTRODUCTION

Northern Ghana is composed of Northern Region, Upper East Region, and Upper West Region, with a combined population of approximately 3 million broken down as follows; Northern Region 1.5 million; Upper East Region 0.9 million; and Upper West Region 0.6 million.

There are presently 32 piped water systems all operated by GWSC, and distributed as follows:

Northern Region 14;
Upper East Region 10; and
Upper West Region 8.

Upper East and Upper West Regions, with more favourable geological formations for the extraction of groundwater, have piped systems based on mechanised boreholes requiring very little treatment; the only exception being Bolgatanga water supply, which is a conventional treatment plant deriving its raw water source from an impoundment.

In the Northern Region, the story is however different. Prevailing hydrogeological conditions produce less groundwater than in the Upper Regions, and 12 of the piped systems are based on surface sources and only two have borehole sources. Four of the systems are conventional treatment plants whilst eight systems are packaged treatment plants. Four systems (Tamale, Yendi, Saboba and Salaga) derive their raw water sources from perennial rivers, while eight systems derive their raw water sources from impoundments created on streams, which dry out during the dry season (between November and May).

Before the arrival of Northern Electricity Department/Volta River Authority (NED/VRA) grid power in the Northern Ghana, all the systems used diesel engines or diesel generators to drive the pumps. Presently two systems in Upper East (Bolgatanga and Bawku), as well as two systems in the Northern Region (Tamale and Yendi) have been connected to VRA/NED grid power. Two boreholes in Bole in Northern Region are operated using solar power.

Prior to the incorporation of the Ghana Water and Sewerage Corporation (GWSC) in 1968, the commercial activities relating to these water systems were executed by the Municipal and District Council offices, while the water supply division of Public Works Department concentrated on the technical activities. After the incorporation, GWSC took over both the commercial and technical activities.

Earlier operations of Public Works Department water supply division was not commercially

oriented, with little emphasis on revenue collection. Most of the personnel in the revenue units of the Municipal and District Councils had inadequate academic qualifications and backgrounds. They were either labourers who were otherwise redundant in their former functions, dispirited clerks, or semi-literate watchmen from the Municipal and Local Councils. Some of them were transferred to form the nucleus of the GWSC commercial section.

The calibre of these GWSC commercial staff was rather low, and was a testimony of the marginality to which commercial duties were relegated. They were seen as an appendage to the corporation of no real consequence. Since government was then financing a large proportion of the operation and maintenance costs, internal generation of revenue was not seen as a priority. The commercial department's role was to receive monies from those who willingly came to pay the tariffs, which were so low as to be gratis in disguise.

In 1986 under the government's rationalisation scheme, GWSC was reorganised to be self sustaining. This meant that GWSC was to cover its operation and maintenance costs from its own resources; subsequently revenue generation needed attention. It therefore became necessary to reorganise and strengthen the commercial department. March 1986 marked the transition from non-commercialism to pseudo-commercialism. The post of commercial director was created, and commercial functions were divorced from the finance section. Qualified middle management staff for the commercial department were recruited. During this time, tariffs were increased by about 295%, to reflect commodity cost.

Technical and commercial problems in operation and maintenance from March 1986 to date will be discussed in this paper, and will be classified into those issues internal to GWSC, and those issues that are external to GWSC.

INTERNAL ISSUES

Internal issues such as adequacy of the plant, system maintenance, logistic and human support, unaccounted for water and debt management, are matters that are within the control of GWSC.

Adequacy of the Plant

In an attempt to increase the potable water supply coverage in the water budget year of 1968, small standardised packaged water treatment plants producing 2,000 gallon/hour were installed in Northern Ghana, some in very remote locations. All these systems are now inadequate to meet the communities' water demand. Their outputs can no longer sustain the communities. Because of the simplicity of some of the designs and because of rapid population growth, the distribution system does not serve the whole community. Although valves exist in the distribution network, designs are such that it is not always possible to allow water to be directed to different zones at different times for the day, or on different days. Consequently, water is very scarce when it is most needed and, in their desperate search for potable water, people often break the pipes to create collection points and sometimes empty the water into underground reservoirs for their use. Sometimes, valves, air valves and washouts are deliberately tampered with to create leakages to water livestock.

As a result of too little water being produced, service connections closest to the source

and/or the storage tank take all of the supply before it reaches further into the distribution system. In some instances, service connections have been made on the pumping mains, and consequently the water never reaches the overhead tanks, let alone the distribution systems. In such situations, those people receiving the water sell it to the less fortunate ones; they pay very little to GWSC, but make a good profit for themselves. This shows that there is a serious competition for potable water, emphasising the inadequacy of the systems as a result of increased water demand.

To prove the case of increased water demand, an experiment was conducted in Malshegu, a village near Tamale, to determine the actual per capita consumption. The net average result for the three month experiment showed that the per capita daily consumption was about 40 gallons, while what is being assumed for them is seven gallons/capita/day. This figure might include water used by cattle and other livestock. Allowing 20 gallons/capita/day for waste and livestock water use, the remaining 20 gallons/capita/day is quite alarming for a rural area. This increase in consumption at the village is not translated into revenue, and attempts to have the consumers metered have been met with violent resistance. This increased consumption constitutes a revenue loss to GWSC.

The reason for the increase in water use can be attributed to increasing population, improved hygiene and sanitation practices, and higher standards of living. This has both commercial and technical implications. Technically, extensions have to be made, plant and equipment have to be expanded and distribution system improvements made.

System Maintenance

An important issue related to the operation of the piped systems is the question of system maintenance. The operators who operate the system in the remote areas are often not skilled enough to carry out certain types of maintenance and repair works on the equipment. All major repairs and maintenance works at the stations are therefore referred to the GWSC centralised maintenance team. Repairs of breakdowns and maintenance of the system can therefore be delayed if this team is not readily available.

With very little revenue being derived from these systems, GWSC has very limited funds for stocking spare parts and lubricants for maintenance. It is therefore difficult to keep to a planned maintenance schedule. Consequently, there are often long delays in attending to breakdowns. With repair and maintenance costs alone being 23% of the operating cost, there is no way the systems can be maintained regularly if the communities neglect to promptly pay their bills.

Logistic And Human Support

Other important issues worth considering as far as operation and maintenance of piped water systems in Northern Ghana are concerned are logistic and human support. Most of the water supply systems are located in remote parts of the regions with a very poor road network. The operators often have no means of transport or reliable means of communication which can assist them to report a breakdown. They normally depend on local transport, which is often not regular. A breakdown can take several days, even weeks to be reported. In situations there is a long break in the operation of the system, the consumers lose confidence in the system and in GWSC, and payment of water bills becomes more of a problem.

Some of the station managers are from other parts of the country and are unhappy and disillusioned at being posted in these small remote centres. This is worsened by the low levels of remuneration existing in GWSC. This affects morale and job performance and results in poor plant operation, more down time and lower rates of tariff collection.

The commercial department is not sufficiently equipped to deal with marketing issues, public education, customer relations, consumer surveys, etc. This has created suspicion, antagonism and a communication gap between GWSC and customers in Northern Ghana.

Unaccounted for Water

Leakages are a universal problem in the water industry worldwide, and this paper will concentrate on factors creating high levels of unaccounted for water which are specific to GWSC in Northern Ghana. The paper will look at the issue of standpipes, and unmetered connections and vandalism.

Standpipes

Consumption through public standpipes is a major source of unaccounted for water in the Northern Region. For example, using a minimum per capita consumption of seven gallons for this category (which is the approved GWSC minimum consumption per person), and a surveyed average population per household or compound of 15, the consumption per household is about 3,000 gallons per month. By GWSC regulation, 2,000 gal per month consumption is assumed and charged for (until 1992, 1,000 gals was assumed) thus creating 1000 gal per compound of unaccounted for water every month. This constitutes a perpetual loss of revenue for the corporation. If GWSC is to be fully commercialised, then a much more better way has to be found to reduce this revenue loss.

Unmetered Connections

Most private connections are unmetered, and relatives come to such unmetered places to draw water. In effect, one service connection may serve about six or more compounds, but only a flat rate of 3000 gal a month is charged. In cases where an assessment is made, it is made with reference to the inhabitants of the compound and not the outsiders who flock there. For example, in a survey in Zabzugu in the Northern Region, it was revealed that from October 1990 to March 1991, the monthly average metered water consumption was 534,000 gallons with 49 private connections; an average of 363 gals per day per household. Assuming seven gallons per capita per day, it shows that 52 people were drawing water from each connection on the average. This is what a metering experiment revealed. If there had been no meters, assessment would have been based on only 15 people fetching from each connection whereas in actual fact about 52 were using that facility. The water drawn by the extra 37 people constitutes a revenue loss to the corporation.

It could also be that, in actual fact, the per capita consumption of seven gallons being assumed by GWSC is rather low. The irony is that metering may be the solution, but the lack of money to purchase meters and the fact that they generate their own operation and maintenance cost which increases the already high collection cost, keeps the vicious cycle going.

Vandalism

In Northern Ghana a greater proportion of leakages are the result of vandalism. Members

of the communities see such leakages, but allow them to go unreported, because they provides a source of drinking water for their livestock.

Debt Management

Dealing with recalcitrant debtors requires adequate customer information, legal resources and staff solely dedicated to the process of debt recovery. This means that a department should be set up to deal with the issue of debt recovery. However, comparing costs against benefits may produce unacceptable results. For example, the cost of collection in Zabzugu in 1991 was 442,800 Cedis while revenue collection for the year stood at 1,116,616 Cedis. Almost 50% of revenue collected went to pay for the cost of collection. It must be pointed out that this is cost incurred in collecting tariffs from those willing to pay. One can imagine if recalcitrant customers were the target. Again, if cost of collection is held constant, it becomes very expensive to deal with small customers whose debts are small and many. Unfortunately, this is the situation in Northern Ghana as opposed to Accra, Takoradi and Kumasi. The corporation is in a dilemma as to whether to let debt pile up or institutionalise an expensive debt recovery programme

EXTERNAL ISSUES

Issues that are external to and beyond the control of GWSC are examined under the following subheadings; raw water sources, power sources, spare parts acquisition, free water notion, government control, cultural practices and factionalism.

Raw Water Sources

Apart from the White Volta and River Oti which are perennial, all the other water sources have no inflow between December and May. The systems therefore rely on the water that can be stored during the past rainy season. However, the storage areas are shallow and large due to the flat nature of the landscape, and therefore, considerable amount of water is lost through evaporation.

There are also very intensive farming activities in the watersheds, despite concerns expressed by GWSC to the District Assemblies. Consequently, tremendous amounts of sediment are carried over from these farmlands into the impoundments, causing serious siltation problems and reducing the volume of the raw water stored. These impoundments should be dredged frequently to restore their capacities.

The unpreventable seasonal bush fires and deliberate farmland burning destroys the vegetation in the watersheds every dry season, inducing higher evaporation losses. The raw water sources therefore keep depleting. The legislation on bush fires and farming activities around river catchments should be enforced through the District Assemblies and through to the chiefs.

Power Sources

Only four of the water systems in Northern Ghana are connected to the National Electricity Grid, and one system is on solar power. The power to run the pumps in the remaining systems is

provided by small diesel engines and diesel generating sets. It has been established that the single largest component of the water plant operation cost is the fuel and lubricants for the diesel engines. Fuel and lubricant cost is up to 40% of the total operating cost.

Studies conducted at Zabzugu showed that the cost of operating and maintaining these diesel engines which drive the pumps directly (no electric generators or electric motors) is more than eight times the cost of NED/VRA electricity needed to power electric motors to drive the same pumps. Consequently, the cost of production is much higher than the tariff collected by GWSC. Therefore, operational self sufficiency is not possible in the systems where power to run the pumps is provided by diesel engines and generator sets: the systems are uneconomic. To give examples of uneconomic systems in the Northern Region, we shall look at operations in Saboba and Zabzugu. (Table I)

Table 1. Revenue and Operation Cost (in Cedis) in Saboba and Zabzugu. October, 1990 - September, 1991

Town	O&M Cost	Population	Billing	Collection	O&M/Billing Ratio	O&M/Collection Ratio
Zabzugu	6,548,500	4,160	1,594,699	1,095,206	4.0:1	6.0:1
Saboba	6,604,800	5,370	1,415,982	1,116,616	4.7:1	5.9:1

Source: SSDP Report 1992

These systems are uneconomic because no commercial miracle can raise revenue to equal operation and maintenance cost. The maximum revenue for Saboba was 1.1 million Cedis while operation and maintenance cost stood at 6.5 million Cedis. All efforts should therefore be made to connect these systems where possible to the NED/VRA grid power. It is hoped that the Government policy of extending electricity to the District Capitals will address this problem.

Spare Parts Acquisition

Makes and models of mechanical equipment in the water systems are many and varied, originating from diverse geographic areas such as the United Kingdom, Canada, Germany, Japan, Denmark and the USA, depending on which country provided aid, etc. Most often local agents of the suppliers of the equipment are small, disorganised and under-financed and do not have a ready supply of spare parts. Initiating orders of spare parts and expediting orders can take about nine months. If parts cannot be purchased locally, then there is a long down time when a machine breaks down. There should be an active program to standardise the equipment. Local manufacture of water works equipment should also be encouraged.

"Free Water" Notion

Programs to increase the perception and recognition of water as a manufactured commodity entailing costs have achieved little success in Northern Ghana. Water is still widely seen as a free gift of nature. In rural areas, the distinction between treated water and untreated water is not the essence. To these people, water is water, if it can serve their purpose. The long term and widespread use of dirty water and the ignorance of water borne diseases reinforces the above. There are others who still believe that potable water is being offered free by government, with GWSC acting as an agent of government benevolence, and not being a self-sustaining enterprise.

This situation has been compounded in the past by some unguarded political aspirants who use water as a tool for winning political office, promising rural dwellers free water when they know very well that it is impracticable.

Uncoordinated water supply development in the small towns also lends support to the "Free Water" notion. In most of these places where GWSC has water supply systems, NGOs have also developed water systems. These are basically boreholes fitted with handpumps which are being used freely by the inhabitants. It must be stated that in some instances minimal deposits are required before installations begin. It is obvious then that payment for a similar water supply from GWSC will be difficult. The net result is antagonism and suspicion of GWSC by the customers. A situation that is basically anti-commercial.

Government Control

Government control also constitutes another source of concern for commercial optimisation. The tariffs of GWSC are regulated by government, without whose approval tariffs cannot be increased. The market forces are not allowed to determine the price of treated water, nor can the corporation manipulate the pricing structure to achieve maximum gain.

Related to this is the fact that non-viable systems, with their miserable revenue base, cannot be closed down, due to legislature that gives to GWSC the responsibility of producing and supplying potable water in all communities.

Cultural Practices

Family

Strong family ties, as well as the culture of not denying anyone water, has also created a problem for the commercial department. If customers fail to honour their bills and are subsequently disconnected, the effect is very minimal, as they resort to drawing water from neighbours free of charge. This is against the background of a corporation that is unable to meter every consumer. In any case metering small systems tends to be expensive in the long run. The disconnected customers get water free of charge while their debts remain outstanding.

There are others who take advantage of disconnected and unserved customers in the urban towns like Yendi and Damongo to initiate water vending, which deprives GWSC of revenue.

Meters

Water meters are seen by customers to be instruments of extortion. A lot of people equate water meters with high bills and not high consumption with high bills. Remarks like "the meter reads fast", "the meter is recording air" or "the meters turn when there is no flow", have created their own headaches. There is little confidence in the meter in the Northern Ghana, yet it is the instrument needed to ensure accurate billing, so as to reduce underbilling and unaccounted for water.

Family Head

In Northern Ghana the landlord, or leader of the family or compound, pays for all water bills regardless of the number of occupants in the house and their economic status vis-a-vis the landlord

or leader. Women, who are sensitive to the issue of water, are not supposed to pay water tariffs, and the same applies to working children. In most situations the landlord may be well advanced in age and incapable of work. It becomes obvious that he may not be able to honour his bills. Against this background, a survey was conducted at Yendi which indicated that on the average, each compound has four working people who could share the burden of payment, instead of letting it fall on one person. If this were to happen, arrears would stop escalating.

Factionalism

Traditional factionalism also plays a leading role in disrupting commercial improvement activities. For example, an experiment to determine the relationship between reliability of water supply and payment of water tariffs failed in Nalerigu/Gambaga on account of traditional factionalism. The reliability of water supply was improved greatly, but unfortunately instead of revenue collection increasing, it remained at the pre-improvement level, and even decreased. The system, located at Nalerigu, serves the twin towns of Gambaga and Nalerigu. Antagonism between the two towns threw all planned activities into disarray.

Though this experiment was a failure, it showed that social issues play a great role in water supply sustainability.

SOLUTIONS

In this portion an attempt is made to highlight some of the issues raised and see if solutions can be found.

Water Vending

One commercial issue worth looking at is the institutionalisation of water vending in Northern Ghana. To some, water vending is a way of life, to others a source of livelihood, and to yet others, a matter of necessity.

There are various forms of water vending ranging from trucks carrying water drums, the use of buckets to draw from standpipes for resale, direct sales at private standpipes, and the use of water tankers. Stopping it will be a herculean task.

One idea is to create public standpipes where sales would be made by members of the community. This was tried in several villages and towns in Northern in Region. The result was not satisfactory. The approved standpipes suffered from underpricing by people without meters. In other instances those who acted as collecting agents made use of monies, thus becoming indebted to GWSC. Untreated water vending also competed with treated water vending. Pay-as-you draw is seen as alien to the cultures of the North.

Another option is to institutionalise what is being practised, identify people with private connections involved in water vending, and give them special reduced rates to continue selling from their private connections that are metered.

Water hydrants can be installed for water tanker use and appropriate rates charged. This

can be done in consultation with the District Assemblies, especially when by laws are made to this effect.

Another option is for GWSC to produce the water and sell in bulk to private entrepreneurs or a community organisation, so that distribution and sale will be done by private entrepreneurs or the community. This is being envisaged in Navrongo under GWSC Assistance Project.

Government Involvement

Another issue is whether government should continue to play the leading role in water supply, or should adopt one of monitoring water supply management which would be in the hands of private entrepreneurs, with profit as the moving force?

Probably it is time water supply became a matter of commerce. What can be done in the interim is to distinguish between water supply management as a social service for the rural areas, and as a commercial venture for the urban areas. In most rural areas, potable water is a means of eradicating water borne diseases like guinea worm, etc, which have an effect on the nation's productivity levels. It therefore means that water for rural areas and small towns has a social value and therefore the cost must be borne by all Ghanaians through indirect taxes and not only the villagers.

In the coordinating role of the government, emphasis should be placed on the activities of NGOs involved in water supply development to bring maximum benefit to the nation.

Cost of Collection

The present cost of revenue collection is very high; for example, about 36 staff are directly responsible for revenue collection in Northern Region. Their salaries, medical bills, overtime, night allowances, etc, constitute an ever increasing cost of revenue collection. Logistic requirements for effective revenue collection such as vehicles, meters, etc, have very high cost. The solution might be to privatise or employ cost saving methods.

In view of the above, it is becoming clear that privatising certain aspects of the commercial section like meter reading, etc, in the small communities would be very economical and yield efficient results. There are some who are even advocating wholesale privatisation of the commercial section. An alternative to privatisation is the computerisation of the commercial section where a lot of the workload like billing, recording, controls, and information on customers would be computerised. This will reduce the revenue staff strength by about 2/3. With good training on the computers, this would be a substantial gain.

Debt Management

Another issue is to deal with the huge debt accumulation. For example, at the end of December 1992, the debt for GWSC Northern Region stood at 103 million Cedis, with the small urban systems debt contributing 9.9 million Cedis¹. General write offs may not be effective, as they encourage others to renege on tariff payments. The flip side of it is that these debts may

¹ In August 1993 700 CEDIS = 1 US\$

remain unpaid for a very long time, thus causing external monitors to think that GWSC is not efficient, and therefore government may not agree to tariff increases.

In an attempt to address this issue, some authorities have advocated a *laissez faire* approach, which is interpreted as no-disconnection of the customers. Their contention is that when the person is disconnected, the moral duty to pay is lost; if not disconnected, at one point in time, his conscience will prick him to pay. Legal action must be strengthened by making laws that empower imprisonment for non-payment, on confiscation of assets, etc. Empowering laws are needed to enhance optimal commercial operation for Northern Ghana.

CONCLUSION

Logistic and Human Resource Development

In Northern Ghana under the GWSC Assistance Project (GAP), funded by CIDA vehicles have been provided to enhance the efficiency of the technical and commercial departments. Also under GAP, a commercial optimisation program has been put in place with the view to raising the status of the commercial department. This includes extensive training and computerisation, provision of vehicles for the Regional Commercial Managers, radios for communication, motorbikes for the meter readers, etc.

In an attempt to decentralise the central maintenance unit, workshops have been constructed in some of the district capitals, vehicles have been provided under GAP for the District Managers of GWSC for technical operation, and to improve communication with the regional office of GWSC radios have been installed at all the district capitals.

Currently there is an extensive metering programme. This will enable GWSC to have a greater percentage of customers metered and billed accurately.

During the redeployment exercise, certain weak elements in the commercial and technical department were affected, and this has provided room for energetic workers to be recruited. There is however the need to review salaries to help motivate workers in GWSC.

Commercial/Community Management

If GWSC in Northern Ghana is to be fully commercialised, then it must address some of the issues raised. One way of doing this is to encourage community management. This will relieve GWSC of the obligation to provide water service to the rural communities and small towns that see water supply management as a social service, and allow GWSC to concentrate on the urban centres on a purely commercial basis devoid of government intervention. This means that GWSC would have to go public, with a national monitoring and control unit established by government to monitor and control the activities of water supply managers. This will be the period of commercialisation. From the technical point of view, the situation is not different. From the preceding technical discussion, it can be seen that there is no way GWSC can operate these small remote systems on sustainable basis.

The community based management of the small piped systems should be encouraged because if the responsibility for managing the system lies with the community, they will always find ways of making the operation viable. If most of the management and operating tasks are performed

by the local people living in the community, operation costs will be reduced significantly.

The time and cost of travel from GWSC Regional Offices for plant repairs, revenue collection, etc, add significantly to the systems' operating cost. These outside services should only be employed when the tasks (major repairs) cannot be handled by the community, possibly on a cost-recovery basis.

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