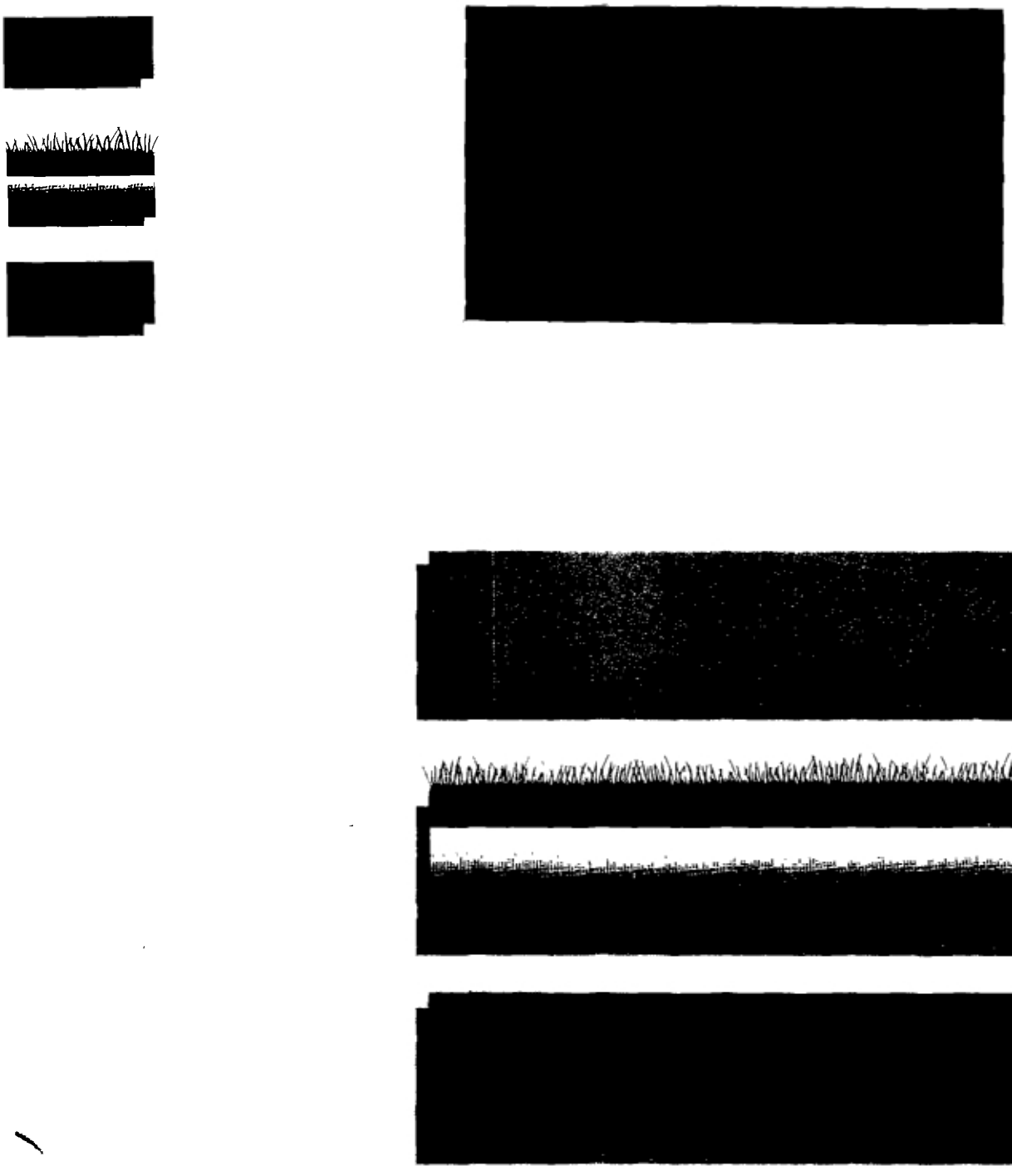

Client : Kreditanstalt für Wiederaufbau (KfW)
Frankfurt am Main
Federal Republic of Germany

INFRASTRUCTURE IN DISTRICT CENTRES, GHANA

Improvement of Water Supply and Sanitation

Final Report

70.00089 February 1994

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GLOSSARY

COM	Community Ownership and Management
CWSD	Community Water Supply and Sanitation Division
CWSP	Community Water Supply and Sanitation Project
DA	District Assembly
DCD	Department of Community Development
GOG	Government of Ghana
GWSC	Ghana Water and Sewerage Corporation
KfW	Kreditanstalt für Wiederaufbau
KVIP	Kumasi Ventilated Improved Pit
MLG&RD	Ministry of Local Government and Rural Development
MWH	Ministry of Works and Housing
NGO	Non Government Organization
NTC	Network Training Centre
SIP	Strategic Investment Programme
TAT	Technical Advisory Team
UNDP	United Nations Development Programme
VRA	Volta River Authority
WHO	World Health Organization
WUA	Water User Association
WUG	Water User Group

CURRENCY

US$ 1.00 = Cedis 800 (dec '93)

1. INTRODUCTION

The Government of Ghana (GOG) and the Kreditanstalt für Wiederaufbau (KfW) consider the possibilities of cooperation for the upgrading of the district capitals of Atebubu, Ejura, Kintampo en Nkoranza. As a first activity in this framework, an identification mission has been fielded in february 1993 in order to identify the potential fields of collaboration for upgrading the infrastructure in the 4 towns (Schmidt-Kallert & Oberländer, 1993). As a follow-up to this mission, a second mission composed of mr. H.A. Heckman (mission leader/institutional expert), mr. G.J.M. Cremers (sanitary engineer) and mrs. L. Owusu (schedule officer MLG&RD) has been charged to investigate the possibilities of improving the supply of drinking water and sanitation in the towns (refer to Appendix 1 for the Terms of Reference of the Mission).

The objective of the Mission is to elaborate institutional and technical proposals for the appropriate establishment of decentralized water systems at district level; the proposals will refer to the implementation of the future water supply project as well as to the subsequent management and operation of the systems in the towns of Atebubu, Ejura, Kintampo, and Nkoranza. The Mission shall equally review the need for sanitation (human waste and drainage).

The nature of this mission and quality of available data do not permit to establish the feasibility of the proposals with sufficient reliability; it represents an experts opinion on realistic technical and institutional solutions in the Ghanaian context. The principle that the water supply systems should be managed by the communities will have consequences for the choice of technology. It has been decided, in consultation with the KfW and the MLG&RD, that complex water treatment (and thus the use of surface water as source) will not be considered.

The Mission has collected information in Accra and on site and has held discussions with officials from the Ministry of Local Government and Rural Development (MLG&RD), the Ministry of Works and Housing (MWH), the Ghana and Water Sewerage Corporation (GWSC), the Groundwater Resources Research Institute, the Technical Services Centre, the Water and Sanitation Group of the UNDP/World Bank, the Network Training Centre, the Volta River Authority (VRA), officers of the District Assemblies and elected members, and the population (refer to Appendix 2 for a list of persons met).

The Mission took place during the period 23 november - 13 december 1993 (refer to Appendix 3 for the detailed programme of the Mission). The preliminary conclusions of the Mission have been duly discussed with the Chief Director of the MLG&RD and agreed upon (refer to Appendix 4 for the Summary Record of Discussions).

The Mission still adheres to these conclusions but requires after examination of the available information, verification of the demand for piped water supply and the availability of ground water. The main differences between the Summary Record of Discussions and the Mission Report are as follows:

- Preliminary investigations will be required to assess the real demand for piped water supply and the availability of ground water;
- Instead of recommending one system, the Report identifies 3 possible scenarios; the final option will be determined on the outcome of the preliminary investigations;
- No definitive completion date of the project is mentioned; the duration of the project is estimated at 24 months.

The Mission Report has the following structure:

- Chapter 2 provides a diagnosis of the actual situation; it supplies subsequently background information on the project (para 2.1.), a review of the sector policies and organization, and an assessment of the actual conditions in the project area (para 2.3.). This chapter ends with an overview of technological and institutional options for water supply and sanitation.
- Chapter 3 starts with the proposed project strategy (para 3.1.). The possible solutions will be presented as scenarios in para 3.2. while para 3.3 deals with sanitation. The institutional aspects are treated in para 3.4, the Plan of Operations is presented in 3.4 while the aspects of implementation are covered in para 3.5.
- Chapter 4 finally deals the justification and risks associated with this project.

The Mission would like to extend its appreciation for the warm welcome received and for the many efforts rendered by the various officers for supplying the requested information. In particular, we would like to thank the Chief Director of the MLG&RD, mr. S.Y.M. Zanu, for the very open discussions. In goes without saying that the input of our fellow mission-member, mrs. L. Owusu, has been very valuable, and a special words of thanks goes for her dedication.

2. DIAGNOSIS

2.1 PROJECT DESCRIPTION

The project under consideration has been identified in february 1993 by the mission Schmidt-Kallert & Oberländer and concerns the upgrading of the infrastructure of the district capitals of Atebubu, Kintampo, and Nkoranza (all situated in the Brong Ahafo Region) and Ejura (Ashanti Region) (refer to fig. 1. for the project towns). This project has been motivated by the current programme of decentralization which will amount to an important devolution of many functions of central to local government at district level. A programme for upgrading the physical infrastructure of the district capitals will be necessary to permit them to play their role.

The most relevant findings of the mission Schmidt-Kallert & Oberländer are enclosed as Appendix 6. The major economic potential of the towns is the agricultural surplus production in their hinterlands. The Mission Schmidt-Kallert & Oberländer have identified a number of potential projects which should be scrutinized during a detailed feasibility study; these potential projects comprise:

- Commercial Facilities;
- Access Infrastructure;
- Residential development;
- District Assembly development;
- Public Utilities;
- Social facilities.

Water supply was indicated as the main problem in three of the four towns, Kintampo being the exception with water supply ranking at the fourth place.

Contrary to the recommendations of the mission Schmidt-Kallert & Oberländer, it has been decided to start with water supply and sanitation as the first batch of the project.

The executive agency of the GOG will be the MLG&RD at national level and the 4 concerned District Assemblies (DAs) at district level. The MLG&RD is involved in the similar Local Government Development Project (Urban III Project) for 11 medium-sized cities co-financed by the World Bank and KfW. This project does not include water supply; this component is taken care of by other projects.

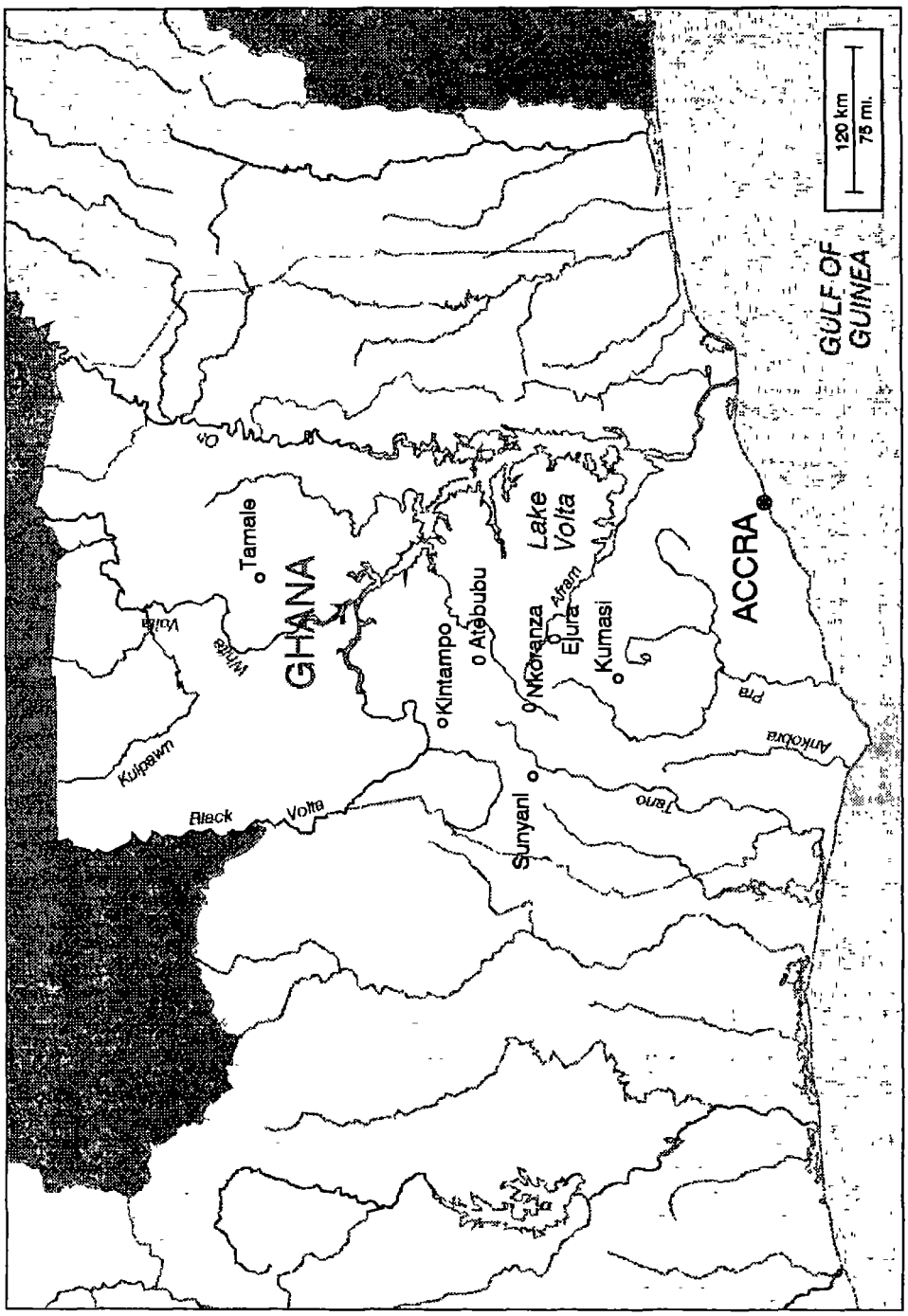


Figure 1: Project towns

2.2 THE WATER SUPPLY AND SANITATION SECTOR

2.2.1 Sector Policies

The Water Supply and Sanitation Sector is presently influenced by 2 complementary tendencies which constitute:

- decentralization
  The programme for decentralization has prompted the transfer of many functions of central to local government. Water supply is not yet a decentralized subject but there are no technical reasons to oppose decentralization as has been shown in many countries where it is a municipal responsibility. Sanitation on the other hand is clearly a local government responsibility and the reinforcement of local government will lead naturally to more activities in this field.

- Community Ownership and Management (COM)
  The principle of COM has already been widely applied for rural water supply in many countries but it is only very recently that this concept is systematically developed and rigorously applied for rural and semi-urban water supply in Ghana. Not much experience has been gained in the last sub-sector but the GOG seems prepared to investigate the possibilities of COM.

These complementary influences induce an environment where water supply enters the domain of local government and where the community will be intensively involved in its management. This will require a consultation at district level to arrive at an adequate definition of the roles of the various parties.

An important policy document for the mission has been the recently formulated Strategic Investment Programme (SIP) for community water supply and sanitation which applies to rural communities less than 5,000 persons. There exists no similar document for the water supply and sanitation of secondary towns, although the SIP makes some references to semi-urban systems (target group 5,000 - 15,000 persons). The SIP has been approved by the GWSC and waits formal approval by the MWH.

The main elements of the SIP which could be applied to the 4 towns under consideration are:

- the communities will be required to pay 7.5% of the capital cost of a water supply system for the basic service level plus one half of the added costs of higher level of service;
- over time ownership and management of rural and semi-urban systems will be shifted to individual communities;
- mechanisms will be put in place to ensure that households would be eligible to receive a construction grant for one half of the cost of a household latrine.

A key concept of the SIP is the concept of Community Ownership and Management (COM). It is important to note that water supply is not a decentralized subject and that the Ghana Water and Sewerage Corporation (GWSC) bears the final responsibility for the sector development. The strategy adapted by the GWSC opts, however, for a transfer of ownership of the smaller systems to the individual communities. Many important managerial decisions, including price setting, are left in this way to the communities.

The role of the GWSC is being redefined in the sense that it will concentrate itself on the management of the larger urban systems (75 - 100 systems). Its rural water supply department will receive a more autonomous position with a.o. a separate bank account and will be renamed the Community Water and Sanitation Division (CWSD). Its task will be the promotion of rural water supply and sanitation schemes and to monitor and evaluate progress in this sector.

The Managing Director of the GWSC confirmed to the Mission the position of the GWSC that the communities in the 4 towns should manage the water supply in these towns and that the GWSC permits the integration of existing GWSC equipment in the systems to be constructed. The MLG&RD will request the GWSC to confirm this position in writing.

These principles are being tested in two pilot districts in the Brong Ahafo Region by the Community Water Supply and Sanitation Project, sponsored by the World Bank, which comprises a.o. piped water supply systems for communities up to 15,000 persons.

The application of the concepts established in the SIP in the 4 earmarked District Centres requires careful consideration. It is evident that the principle of COM is widely supported but unfortunately experience with systems of comparable size does not exist in Ghana. On the other hand, an infrastructure which will permits its application is being put in place and valuable experience will become soon available.

2.2.2 Sector Organization

The tendencies of decentralization and COM will require a dynamic institutional framework which will be able to adapt itself to changing conditions and insights. The main actors in this respect are:

- the Ministry of Local Government and Rural Development
  The MLG&RD is responsible for administering Ghana's decentralization programme. As such it is it is responsible for developing policies and legislation with respect to DAs and assisting, supervising, monitoring and auditing DAs as well as allocating financial transfers to them from central government.

  The implementing capacity of the MLG&RD is weak; so will the Technical Service Centre, on behalf of the MLG&RD as the responsible sector ministry, assume overall responsibility for management, coordination, monitoring, accounting, procurement, and contract administration. The Ministry has no experience with water supply and only a limited experience in the field of sanitation.

- the Ghana Water and Sewerage Corporation
  The GWSC falls under the MWH which has primary responsibility for urban development, sets urban and housing policy, and oversees the activities of the various parastatal agencies. Among these is the GWSC, established in 1965 and responsible for urban and rural water supply as well as for piped sewerage. Its functions include sector policy formulation, External Support Agency and NGO coordination, planning, construction and operation and maintenance.

In addition to the systems serving the four metropolitan areas, the GWSC is responsible for the operation of some 200 smaller systems which mainly serve urban and semi-urban areas, and for the maintenance of about 7,500 drilled wells fitted with hand pumps that serve rural communities. GWSC currently has a staff of over 4,000. It has a head office in Accra, nine regional offices, an area office for Accra/Tema, regional stores, district maintenance centres, and a drilling unit. Of particular interest for the project are the training centres located at Weija and Owebi and the Regional Offices in Kumasi (for Ejura) and Sunyani (for Atebubu, Kintampo, and Nkoranza).

The GOG will contract the GWSC by means of a performance contract to manage the National Community Water Supply and Sanitation Programme. An elaborate structure (refer to Appendix 5) will be established within the GWSC for this purpose comprising:

- CWSD National Office (national level);
- CWSD Zonal Support Teams (covering several regions);
- CWSD Regional Office (per region);
- District water and Sanitation team (per district).

The GWSC has an important role in the Sector to play in the fields of policy formulation, Human Resources Development and the provision of specific services dealing with planning, maintenance, etc. Within the Ghana governmental bureaucracy, the GWSC is the only agency capable of managing the implementation of more complex water supply schemes.

- the District Assembly
  The DAs were created under PNDC Law No. 207 (1988) and elected in February 1989. They are mandated to "plan, initiate, coordinate, manage, and execute policies in respect of all matters affecting the people within their areas with a view to ultimately achieving localization of those activities". The DAs have the ability to pass legislation, award contracts, loan or borrow funds, and to levy taxes. They are thus the key legislative and administrative bodies having both legal and executive authority over all developmental activities in their district.

  During the last four years, the DAs have been established and are functioning. Their executing capacities are limited; major problems encountered are the limited resources (funding from central government, qualified personnel, etc.) and the coordination of district-level staff of the 22 centralized Departments whose responsibilities have been formally transferred to the DAs.

  A key person is the District Secretary who is the senior officer and who determines to a large extent the quality of the Government Administration at District level.

- the private sector
  The SIP puts much emphasis on stimulating the private sector to take a lead role in planning, construction, maintenance, and equipment distribution for water supply and sanitation facilities. Private firms and artisans would be contracted to provide these services and where necessary would be given practical training and financial assistance through hire-purchase arrangements. As far as possible reliance will be placed on existing NGOs and private companies. Contracts would be awarded on basis of competitive bidding in which the GWSC could also participate.

  Specific inputs would be required for the construction of the systems (water supply and sanitation), supply of equipment and spare parts, and maintenance and repairs.

- Non-Government Organizations
  There are 33 NGOs actively involved in water supply in all regions of the country. The most active NGOs working in this sector are Water Aid through local NGOs, the Catholic Church, and World Vision International. The SIP assigns a particular role to NGOs in the field of community development.

- the communities
  It is nothing new for communities to manage its water supply but this experience is mostly limited to simple technologies (dugwells or hand pumps). A case has been known for the community of Mafi-Kumase (Volta Region) where 9 villages have been connected to a piped water supply system (Ampadu, 1990).

  The basic planning unit of the SIP is the Water User Group (WUG) which comprises a contiguous set of houses, which collectively plan a water supply in their area. Each would form a Water and Sanitation Committee (WATSAN) to represent it during the planning process, to organize revenue collection, and to facilitate hygiene education within the community. In the case of piped water supply systems serving more than one WUG, a Water User Association (WUA) will be responsible for the overall system management.

2.3 THE PROJECT AREA

2.3.1 The Socio-Economic Setting

Demography
The figures used by the mission Schmidt-Kallert & Oberländer (refer to table 2.1) are based on the results of the census of 1984 corrected for an estimated population growth. The basis for this estimate is unknown. The Mission was not able to support the figures with other evidence; hence, the figures of Schmidt-Kallert & Oberländer will be used with the remark that these data will require confirmation.

Table 2.1 Population of the 4 towns

	Atebubu	Ejura	Kintampo	Nkoranza
Population 1984	9.825	18.775	13.943	15.065
Population 1993 (est)	12.488	26.264	20.719	23.577
Population growth	2.7 %	3.8 %	4.5 %	5.1 %

Source: Schmidt-Kallert & Oberländer (1993)

Income statistics
The Mission was unable to trace any useful survey or study on household incomes, either at national scale or in the project area. The SIP estimates the average annual household income for rural Ghana at 175,000 Cedis (1992 prices). It is evident that households spend significant amounts on water and sanitation but it is impossible to quantify these amounts with any certainty. We can, however, safely assume that these amounts surpass the ceiling set by the World Bank (3 - 5% of a household income).

Health
Health conditions in Ghana are poor but improving, with infant mortality falling from 120 to 90 per 1000 births between 1965 and 1988. In comparison, the infant mortality rate in 1988 was 110 in West Africa, 50 in middle income countries and 10 in high income countries. In Ghana the rate is about 25% higher in rural areas than in urban areas. This mortality rate is in large measure attributable to child health care practices and is associated with poor quality drinking water and inadequate sanitation facilities. Related diseases include diarrhoea, dysentery, typhoid, cholera, schistosomiasis, and guinea worm. Dehydration caused by infant diarrhoea is the main cause of death and could be largely avoided by simple methods of oral dehydration.

Comprehensive health statistics at district level are unavailable but the Mission has been able to collect data on cases admitted to hospitals. These figures confirm the general picture that water-related diseases appear prominently among the main causes of illnesses. Many factors such is nutrition, hygiene, etc may contribute to a state of illness and it is very difficult to isolate one specific disease as the cause. One hospital doctor, however, estimated that 50% of the hospital admissions were water-related and that young children were the main victims. A major concern is the prevalence of the guinea worm and most towns had a special eradication programme.

Energy
All the 4 towns have been recently connected to the national power grid. House connections have been heavily subsidized but have resulted in an impressive coverage (Kintampo 1069, Nkoranza 752, Ejura 961 and Atebubu 636 house connections). The VRA indicated no particular problems with revenue collection.

Local capacities
The mission report Schmidt-Kallert & Oberländer already evaluated the capacities of the DA which has been rated as weak.

The private sector in the 4 towns should also be classified as weak; there exists a heavy dependence on particularly Kumasi. For the future Water Supply and Sanitation schemes this will mean:

- suppliers (spare parts)
  Spare parts will either have to obtained in Kumasi or Accra. The GWSC reported to encounter no problems in finding the required spare parts on the local market in Ghana.
- contractors and/or skilled craftsmen
  All 4 towns rely on Kumasi for electro-mechanical expertise. There is capacity for small civil works but training for specific works (construction of small water supply systems and latrines) would be required.

Town lay-out
All 4 towns show a settlement pattern (refer to Appendix 7 for the town maps) with a central core area containing about 3/4 of the households which could possibly be efficiently served by a water supply system. The much larger and less densely populated surrounding area is unlikely to be economically served by a piped system. For these households separate water points like hand pumps or dug wells are a feasible option. The shape of the built up area can be predominantly linear or nucleated, which means that the shape and the density of a community therefore has a pronounced effect on the cost for the pipe distribution component and also on the total system cost.

2.3.2. Water Resources

Data on water resources have been collected during the field visits and discussions have been held with the hydrogeological department of GWSC and the Water Resources Research Institute. Information of this Institute on existing boreholes in the 4 towns are presented in Appendix 8. A summary of available water sources is given in table 2.2.

Table 2.2: Summary of available water sources in the 4 towns

Description	Atebubu	Ejura	Kintampo	Nkoranza
Existing boreholes	13 registered yields ranging from 0.1 to 4.8 m^3/h average: 1.5 m^3/h	11 registered yields ranging from 2.8 to 8.6 m^3/h average: 6.1 m^3/h	12 registered yields ranging from 0.3 to 5.04 m^3/h average: 2.2 m^3/h	6 registered yields ranging from 0.8 to 8.2 m^3/h average: 5.0 m^3/h
Shallow groundwater	available but limited	not available	available	not available
Surface water	small dam + river at 20 km	small stream east of town	river east of town	river at 4 km
Spring	no	very small spring with limited yield	2 small springs with limited yields	2 good springs with good yields

The 4 towns are located within the Voltaian Sedimentary Basin, which covers 43% of the total area of Ghana. It appears that the sandstone formation is more favourable than shales because of the occurrence of fissures and fractures developed by tectonic activity. Therefore, sandstone might be a good formation for abstracting large quantities of water depending on the degree of fracturing.

The Water Resources Research Institute did not dispose of detailed information on water quality per borehole. Some internal unpublished studies of the Institute of data from the 3.000 wells drilling programme, which has been executed within the Brong Ahafo Region, permit some general observations on the water quality of the groundwater in the region.

- the pH shows acceptable water quality and falls within the range of 6.5-8.5 which is also recommended by the WHO;
- soft water with a total hardness less than 50 mg/l CaCO3 has been found in the majority of the sources (78%). 20% of the wells had moderately hard water with values ranging between 50-150 mg/l; still below WHO-guideline of 500 mg/l;
- total iron concentration of most of the wells were within standards of 0.3 mg/l, the range being 0.01-0.3 mg/l, while the WHO-recommendation is 0.3 mg/l. In some very exceptional cases high concentrations have been found which causes a pungent or metallic smell and stain laundry;
- the manganese concentration ranged from 0.0-11.0 mg/l,while the WHO has recommended 0.1 mg/l.
- in general the chloride concentration is very low. Analyses from most of the wells show values between 0.0-20 mg/l; WHO has recommended 250 mg/l;
- nitrate concentrations are low ranging from 0.0-29.0 mg/l; for WHO the upper limit of concentration is 45 mg/l;
- no bacteriological data available.

It appears that the quality of groundwater in the region is generally good except for the presence of iron and manganese in very exceptional cases. Excess iron in the water itself does not pose a serious health hazard, but it does affect the acceptability by the consumers. This problem has been encountered during the field visit in Kintampo: many consumers prefer water from streams as groundwater contains iron.

2.3.3. Water Supply

An overview of the existing sources of drinking water utilized by the population, is given in table 2.3.

Table 2.3: Existing sources of drinking water in the 4 towns

	Atebubu	Ejura	Kintampo	Nkoranza
Piped water supply	System operated by GWSC; 58 house connections, 6 public taps	System no longer functional	System no longer functional	System operated by the DA, 3 public taps
Other sources	7 boreholes with hand pumps majority households have shallow wells surface water from the dam	12 boreholes with hand pumps surface water from the stream east of the town	12 boreholes with hand pumps (6 out of order), many shallow wells spring surface water from the river	11 boreholes with hand pumps; 2 springs surface water from the river

All 4 towns once disposed of a piped water supply system installed either during colonial times or in the sixties but have become obsolete in 3 towns and were consequently abandoned. The existing system of Atebubu consists of full treatment of surface water, operates at a loss, and does not have the capacity to cover the effective demand of the town and therefore needs upgrading. The town of Nkoranza has a recently constructed piped system with the assistance of a Dutch NGO (ORION) which is managed by the DA. Other NGOs (World Vision, Catholic Mission) have installed hand pumps.

Most households who do not have their own water source, fetch the water from a hand pump and pay for it. In general a price of 10 Cedis per bucket is being paid. Water vendors are rare. Water from springs or streams is also being used, mainly for washing purposes but sometimes also due to non-acceptability of water from the hand pumps (iron contents).

The lack of information do not permit to estimate the existing water demand with great accuracy. An extensive field survey carried out in the framework of the establishment of the SIP estimates that the per capita consumption at 20 l/c/d (with some wide variations). This implies that the actual daily demand in the 4 towns would range in the following order:

Atebubu : 250 m^3/day
Ejura : 526 m^3/day
Kintampo : 414 m^3/day
Nkoranza : 472 m^3/day

2.3.4 Sanitation

Environmental sanitation consists of the following components:

- disposal of excreta;
- disposal of solid waste;
- drainage of surface water;
- sullage disposal.

A detailed description of the sanitary situation in the 4 towns is presented in Appendix 6.

Disposal of excreta
A summary of the sanitary facilities in the 4 towns is presented in table 2.4.

Table 2.4: Existing sanitary facilities in the 4 towns

	Atebubu	Ejura	Kintampo	Nkoranza
Public sanitary facilities	4 bucket latrines 1 KVIP latrine 1 latrine with sceptic tank	3 bucket latrines 5 KVIP latrines 3 latrines with sceptic tank	7 KVIP latrines	6 KVIP latrines 6 bucket latrines
Private sanitary facilities[1)]	± 40 bucket latrines	16 WCs with sceptic tanks 10 KVIP latrines ± 30 bucket latrines	some bucket latrines	some water closets with septic tanks

The functioning of public latrines is remarkable; in all 4 towns people reported wide-spread utilization. In general 10 Cedis is charged for a visit; children may use the latrines free of charge. Public latrines may well produce a handsome profit.

The most common private sanitary facility is the bucket latrine; a common problem encountered with this technology is the difficulty to find labourers to empty the buckets, which induces environmental health hazards. A strong demand exists in the 4 towns for more private sanitary facilities.

A case study on improved sanitation in Kumasi shows that most households are very much interested in improved sanitation services and that only modest subsidies are required to achieve relatively high levels of coverage with KVIPs. Apparently it is the privacy which is most appreciated by the users.

Disposal of solid waste
All 4 towns have reserved sanitary sites for the dumping of solid waste. These sites contain the sanitary facilities as well as a location for solid waste dumping. In each town about 10 sites have been found of which only a few have been legalized. Local authorities as well as the MLG&RD expressed a need for support in this field.

Drainage of surface water
Visits to the 4 towns have shown that drainage of surface water is not a problem from a public health point of view. The phenomenon of stagnant water has not been found. In all towns, except for Atebubu, erosion patterns are quite well developed because of the relatively steep gradients in these towns.

[1)] As registered with the DA

Sullage disposal
No serious problems have been encountered with the sullage disposal. The quantity of sullage will increase, however, with the installation of house connections.

2.3.5 Conclusions

During the field surveys it became very clear that the population in the 4 towns do not dispose of a satisfactory basic water supply service, which is defined as a protected year-round supply of 20 litres per capita per day, preferably within 250 metres and not exceeding 500 metres of all households and serving 250 to 300 persons per outlet (SIP). We note that this is a minimum service level based on the hand pump option where the capacity of the pump is the limiting factor.

There is a need for a reliable source of drinking water, especially during the dry season. Unfortunately, the basic data from which the water demand could be estimated (demography, income statistics, etc.) lack. This will require a socio-economic survey before a decision on the configuration of new system is made.

The following remarks can be made concerning ground water:

- the information which has been obtained shows that ground water is available but sometimes in limited quantities (Atebubu and to a certain degree Kintampo). Hydrogeological investigations will be required to determine possible locations and expected yields of boreholes, if necessary confirmed by test boreholes.
- although the quality of ground water is generally good, the possibility of the occurrence of localized high iron concentrations exists. In these exceptional cases water treatment in the form of iron removal will have to be investigated.

2.4 MODEL FOR SYSTEM SELECTION

2.4.1 Water supply

Considerations
The final selection of the most appropriate system in each town will depend on a number of considerations dealing with a.o. the availability of water resources, the ability and willingness of the population to pay, the social context, existing water sources, etc. The option retained will specify the technology and the managerial set-up of the system. A principle of over-riding importance is that the technology should be as simple as possible in order to permit the community as much as possible to operate and maintain the selected system.

The concept of COM assumes that programmes are demand-driven, i.e. the community will decide themselves how to improve their water supply. This requires adequate information and the presentation of a catalogue of clear options to the population.

Technical options

The 4 towns under consideration have a significantly larger population than the towns considered by the SIP. It will therefore be necessary to investigate piped systems which will permit COM, in more detail. The following packages, including the first four which have been identified in the SIP, will be investigated:

- dug well with bucket;
- dug well with hand pump;
- borehole with hand pump;
- small piped systems;
- nuclear piped systems ;
- "conventional" piped systems.

The first three options are universally applied in rural water supply and represent a mounting service level. A dug well represents the lowest investment per capita ($8/cap) and is even used by individual households. A disadvantage is that wells may easily become polluted and are liable to run dry during the dry season. The option to equip deep wells with a hand pump will reduce the risk for contamination but will on the other hand increase waiting times. The third option of a deep well equipped with hand pump requires already a significant outlay; typical investment fall in the order of $ 40/cap but may range widely. The possibilities for contaminated water are limited.

Instead of a borehole equipped with a hand pump, the borehole can be equipped with a mechanized pump and supply a limited area through a small distribution network. Limitations and configuration will be determined by the community.

A "nuclear" piped system should bridge the gap between the option of a small piped system and a conventional piped system and comprises a simple production unit (in principle based on ground water with no elaborate treatment) and a rudimentary distribution system (i.e. the central system). The central system will supply water in bulk (metered) to a number of sub-systems whose configuration (public taps, house connections, etc.) is determined by the population of the service area. The central system should be slightly over-dimensioned as to permit a flexibility for the WUGs to install increasingly house connections.

The nuclear system can be considered as a main distribution scheme with bulk water supply at various points to the community areas. The system consists of the following elements:

- water source as the production unit;
- piping system, to transport the water to the various supply areas;
- storage, to balance the difference between production and demand;
- electro-mechanical equipment to run the system on electricity;
- connections (house connections and public taps).

Institutional proposals

COM will require the communities to be involved from the very start of a project. Communities should be fully involved in the selection of the technology and the managerial set-up of the system. In this process, the limitations of the communities should be clearly recognized and the appropriate solutions adapted. This will require the establishment of appropriate communal groups to manage, operate, and maintain the systems. Depending on the complexity of the tasks, counselling, recruitment of specific jobholders, and training will be necessary. For some complex tasks dealing with planning and maintenance, it will be hard to mobilize the skills at community level. The SIP relies in this respect on the private sector: these services will be contracted to contractors.

The identified options represent a sliding scale of increasingly more complex technology which in turn will require a more sophisticated management structure.

The first three options represent simple technology and can be handled without any problem by the WATSAN Committees. Although the technology is widely known, the maintenance of hand pumps may pose problems. This will require an adequately functioning WATSAN, the availability of skilled pump mechanics and an adequate supply of spare parts.

The fourth option of small piped system will require specific skills dealing with pump operations, revenue collection, financial management, and routine maintenance. Complex maintenance will be during a first assured by a specialized contractor.

The option of nuclear piped system recognizes the fact that a town is heterogeneous and composed of many different ethnical groupings and factions. Collaboration at town level may be complicated and prone to conflicts. The community will therefore be organized on basis of distinct and convenient social entities (the WUG) who will decide on the configuration of the "sub-system" in their area (public taps, house connections, etc.) and revenue collection. The central system managed by an overall coordinating committee (the WUA), will supply water in bulk (metered) to each sub-system and will charge them for this water.

The final decision to equip house connections with water meters rests with the community; the project policy would be to discourage the use of water meters for house connections in view of the required complex operations and costs.

The WUA will have to employ personnel of sufficient qualifications to operate the system and to execute routine maintenance; the more complicated maintenance shall be contracted out to contractors or certified local plumbers (leakage, small extensions, and connections). A separate bank account will be operated by the WUA, which will be audited annually and approved by the DA; its revenues shall be sufficient to meet all expenditures for operations and maintenance while preferably allowing for sufficient reserves for the short-term replacement investments for electro-mechanical equipment.

The final option of a conventional piped system managed by the GWSC will not be considered in this context. Presently, all small systems managed by the GWSC, operate at a loss and there is no reason to assume that conventional systems installed in the 4 towns would be different. It is, however, quite possible, that the nuclear piped systems will continue to grow and increase in complexity in such a way that a professional management will be required. An option would then to pass a management contract with the GWSC (or any other interested contractor) to operate and maintain the system.

Conclusions

The characteristics of the various options are presented in table 2.5.

Table 2.5: Options for water supply

Technology	dug well with bucket	dug well with hand pump	borehole with hand pump	small piped system	nuclear piped systems	"conventional" piped systems
O&M	WUG / WATSAN	WUG / WATSAN	WUG / WATSAN	WUG / WATSAN	WUG / WATSAN / WUA	GWSC / contractor
Target population	165 persons	165 persons	300 persons	2,400 persons	>2,400 persons	say >15,000 persons
Investment/cap	8 US $	12 US $	40 US $	83 US $	> 70 US $	> 125 US $
Conditions	hydrogeology WATSAN functions	hydrogeology WATSAN functions	hydrogeology WATSAN functions	hydrogeology WATSAN functions	demand (willingness and ability to pay) hydrogeology potential for COM	demand (willingness and ability to pay)

It should be noted that the various options constitute a "growth" model in which simple systems are superseded by more complex ones. They could also co-exist. The important aspect is that the concepts should be applied in such a flexible way as to permit a community to "grow" its way from simple solutions with low service levels to the more complex solutions with higher service levels.

The principle that this project should be demand-driven makes it difficult to pronounce on the final configuration of the system. Objective criteria for system selection would include:

- Investment per capita;
- Cost price: determines the price a consumer has to pay for his water;
- Service level; relevant in particular are here walking distances and waiting times; water quality is not yet seen as important criterium;
- Flexibility: a technical criterium which indicates the possibilities of expansion;
- O&M: indicates the requirements for operations and maintenance.

2.4.2 Sanitation

Although sanitation comprises 4 components (see para 2.3.4), the system selection will only consider disposal of excreta by means of individual facilities. Systems can be classified as on-site or off-site:

- on-site systems dispose of excreta on the household plot;
- off-site systems incorporate collection by truck, pipe or bucket for treatment and disposal elsewhere.

Another classification is wet or dry systems:

- wet systems require water for flushing;
- dry systems do not require water.

The following alternatives can be selected for households without a water connection (water), where the sanitation systems dispose of excreta only, and as an alternative for households with a water connection where the system must dispose of both excreta and sullage.

Sanitation systems for households without a water connection
For households without a water connection the only alternative is the Kumasi Ventilated Improved Pit Latrine (KVIP). The KVIP latrine is a dry on-site system. Pits are normally 2.5-3.5 m deep and some 3 m^3 in volume, providing over 4 years of use for an average household of 10 persons before closing or a new pit is required. The alternating double pit latrine is an alternative to the single pit KVIP. It comprises two separate large pits under seats or squat plates. The two pits are used alternately. When the first is nearly full it is closed and the contents allowed to digest and dewater while the second pit is being used. On filling the second, after one or two years the first is opened and its contents emptied, used as a fertilizer or otherwise disposed of. This system permits the householder to empty the pit himself.

The KVIP latrine is a technically acceptable system because it safely and effectively removes excreta from the household environment and is socially acceptable. It can be upgraded into a pour-flush toilet. The choice between single pit with a superstructure that can eventually be moved to a second pit, a single pit with permanent superstructure requiring mechanical emptying by contract or double pit and householder emptying depends on cost and space availability and should be left to the owner.

For the construction of a KVIP latrine the following investment costs have been derived from the Strategic Investment Plan:

- construction of a simple basic facility: a one-pit KVIP: 100 US$;
- conversion of a bucket latrine to KVIP: 250 US$;
- construction of KVIP latrine with superstructure: 420 US$.

For this project the cost estimate for the sanitation component will be based on 420 US$ per facility, of which amount 50% will be subsidized.

Pilot units should be constructed to verify costs and fabrication capabilities locally. There is a real possibility that costs of fabrication could be reduced through modular design and precast concrete fabrication of key components, such as the floor slab, the foundations, and the superstructure. The construction should last for about 15 years.

Sanitation systems for households with a water connection
The following alternatives for an individual facility can be distinguished:

- Pour-flush toilet with sullage soakaway
  A house with a water connection can have separate systems for the disposal of excreta (the pour-flush toilet) and of sullage (the soakaway). Both are on-site wet systems. The function of the sullage soakaway is to percolate only sullage into the subsoil, which takes place more rapidly than sewage. A large soakaway would be 2 m in diameter and 5,5 m deep, and could accommodate about 650 l/d of sullage. The pour-flush toilet and sullage soakaway combination is a technically acceptable alternative for households with a water connection.

- Water closet with septic tank
  The septic tank, which is a wet on-site system, is a technically acceptable sanitation system in areas where densities are low (household plot sizes are large enough to accommodate the necessary seepage trenches), and where soil permeability is high. A household discharging 350 l/d requires some 50 m of seepage trench, given the medium permeability of the soil. It all depends on sufficient land availability on the household compound for a large enough seepage trench. A septic tank can be converted into an interceptor tank for a small bore sewer by desludging and connection of the effluent pipe directly to the sewer.

The water closet with septic tank is an individual facility which, on the long run, can be upgraded to an off-site system, the small bore sewers.

Small bore sewers, like conventional sewers, are used to collect waste water from individual properties and convey to a central location for treatment and disposal. The principal difference between conventional and small bore sewers occurs at the top end of the system, on the individual property and in the street sewers. Small bore sewers, as the name implies, have significantly smaller diameters than conventional sewers because the small bore sewers are designed to carry only liquids. Solids in the waste water are settled in an interceptor tank. The septic tank on the household plot can serve as an interceptor tank, while the effluent is discharged through the sewerage system.

The characteristics of the abovementioned alternatives are summarized in table 2.6.

Table 2.6: Characteristics of options for sanitary facilities

Technology	On-site			Off-site
	Dry	Wet		
	KVIP	Water closet septic tank	Pour flush + sullage	Small bore sewerage
Population density	low	low	low	high
Water use	n.a.	high	low	high
Soil permeability	low	high	high	n.a.
Emptying required	no	yes	no	yes
Investment costs per household (US$)	450	5.500	3.000	1.000
Expected life (years)	15	20	20	30

Although all these options qualify for subsidies, it should be emphasized that the KVIP-latrine will be the basic facility. In case households prefer other solutions, the additional costs should be born by themselves.

3. PROPOSAL

3.1 STRATEGY

The principles set out in the SIP and discussions held by the Mission lead to the following strategy for water supply in the towns under consideration:

- the objective shall be the creation of sustainable water supply systems on basis of community ownership and management (COM);
- the systems shall be owned and managed by the community under the supervision of the District Assembly;
- the technology shall be sufficiently simple to permit the community to operate and maintain the system; in principle only ground water systems shall be considered;
- the communities will be organized on basis of distinct and convenient social entities (the Water User Groups (WUGs)); the areas of the unit committees may well provide such a basis
- In case of piped systems serving the whole town:
  - an overall coordinating committee (Water User Association or WUA) which will employ full-time staff, will be required for system management and maintenance;
  - the WUGs will decide on the configuration of their sub-system (public taps and house connections) and revenue collection mechanism; the central system will supply water in bulk (metered) to each sub-system and will charge them for this water;
  - the WUA will operate a separate bank account, which will be audited annually and approved by the DA; its revenues shall be sufficient to meet all expenditures for operations and maintenance while preferably allowing for sufficient reserves for the short-term replacement investments for electro-mechanical equipment; a management audit, executed either by MLG&RD or GWSC, will be required;
  - the WUA shall employ two mechanics of sufficient qualifications to operate the system and to execute routine maintenance; the more complicated maintenance shall be contracted out (to the GWSC or other qualified contractors) or certified local plumbers (leakage, small extensions, and connections).
- the contribution of the population will be determined by the following formula:
  - 7.5 % of the production works and the distribution system.
  - the superstructure and piping of public taps will be supplied by the population and is deemed to form part of the 7.5 % cited above;
  - 100 % of the house connections;

The sanitation component shall in accordance with the strategies laid down in the SIP, comprise the following elements:

- the component will be a demonstration project aimed at covering at 20% of the population;
- a health education component promoting proper sanitary practices, household drainage and the promotion of household latrines;
- a financing mechanisms for individual households entitling them to a construction grant for one half of the cost of a household latrine; the additional costs for higher service level will be borne entirely by the household;
- training and certifying of local artisans.

The formula for the contribution of the population is based on the SIP which related to rural water supply and which will mostly be rendered in kind. Urban water supply will be different; a reasonable contribution will be necessary to promote the necessary sense of ownership. The MLG&RD should insist that the population will finance at least the piping and superstructure of the public taps it uses and that a token contribution of some significance is paid to the construction of the system. The ability of the population to contribute the exact amounts stipulated above will need to be verified during a first base-line survey and could be revised.

3.2 WATER SUPPLY

Noting the uncertainty of the demand and the (willingness and) ability of the population to pay, the Mission proposes to examine 3 scenarios applying the different options identified in para 2.4.1. The 3 scenarios are the following:

- provision of drinking water by means of hand pumps (the basic condition);
- application of several small piped systems with an isolated service area;
- application of a centralized nuclear piped system with 2 options: a low and a high demand.

The 3 scenarios will be based on the parameters elaborated in table 3.1.

Table 3.1: Parameters for the 3 options

Description	Atebubu	Ejura	Kintampo	Nkoranza
1. Population 1993	12.500	26.300	20.700	23.600
2. Population growth (%)	2,7	3,8	4,5	5,1
3. Population 2000	15.000	34.200	28.200	33.400
4. Coverage (%)	60	60	60	60
5. Population served	9.000	20.500	16.900	20.100
6. Built-up area (km^2)	5,2	1,4	6,0	6,4

Hand pump option
The most basic option to be applied is the hand pump option. The assumption is that, to satisfy the demand, a certain number of boreholes will be drilled and equipped with hand pumps. An average of 300 people per hand pump will be applied. The number of 300 persons per hand pump is based on the assumption that the pump is being operated for 8 hours a day with a capacity of 12 l/min. This means a production of 5.760 litres per day. With a human consumption of 20 l/c/d 288 persons can make use of the pump on daily basis.

The cost price for the drilling of a borehole and the equipment with hand pump is estimated at US$ 15.000.

Small piped system
Application of the small piped system on communal basis in the 4 towns will be based on the following criteria:

1. Population : 2.400 people
2. Consumption : 20 l/c/d

This means a total distribution capacity of 60 m³/day (including leakages of 20%). The investment costs for such a small system has been estimated as follows:

1. Borehole equipped with submersible pump	:	20.000	US $
2. Piping system: 1.000 m ϕ 80 mm PVC	:	50.000	US $
3. Reservoir (30 m³)	:	80.000	US $
4. Electro-mechanical equipment	:	50.000	US $
		200.000	US $

Nuclear piped system

The scenario of a nuclear piped system will consider 2 options: a low and a high demand. The difference between the 2 options has been expressed in the design criteria concerning the type of connections to the system and the specific consumption per person:

Low demand:
- 100% public taps; consumption 15 l/c/d;

High demand:
- 80% public taps; consumption 30 l/c/d;
- 20% house connections: consumption of 75 l/c/d.

Results

The results for the 4 towns have been summarized in table 3.2 for the option of low- and high demand (refer to Appendix 9 for a break-down of the cost estimates).

Table 3.2: Results of the 3 options

A. Hand pump option	Atebubu	Ejura	Kintampo	Nkoranza
1. Required hand pumps	30	69	57	67
2. Existing hand pumps	7	12	12	11
3. Additional hand pumps	23	57	45	56
4. Investment costs (US $)	345.000	855.000	675.000	840.000
B. Small piped system				
1. Required systems	4	9	7	8
2. Investment costs (US$)	800.000	1.800.000	1.400.000	1.600.000
C1. Nuclear system high demand				
1. Required demand (m³/day)	441	999	824	978
2. Investment costs (US$)	1.580.618	1.389.603	1.816.971	2.064.394
3. Investment/capita (US$)	175	68	108	103
4. Contribution/capita (US$)	13	5	8	8
C2. Nuclear system low demand				
1. Required demand (m³/day)	169	384	317	376
2. Investment costs (US$)	1.444.486	1.119.238	1.617.216	1.683.399
3. Investment/capita (US$)	160	55	96	84
4. Contribution/capita (US$)	12	4	7	6

Evaluation
An evaluation of the 4 scenarios is presented in table 3.3.

A financial evaluation of the various options is presented in Appendix 10.

Bearing in mind that the consumer pay actually 1.000 Cedis per m^3 (corresponding to 10 Cedis per bucket), the recurrent costs per m^3 is significantly lower than actually paid. It is suggested that this advantage is passed on to the consumer which in turn will also increase the demand. A system of tickets as used in Nkoranza, would probably the most appropriate solution.

Table 3.3: Evaluation of the scenarios for water supply

Scenario	hand pumps	small piped system	nuclear piped system low demand	nuclear piped system high demand
Investment/cap (US $)				
• Atebubu	38	89	160	175
• Ejura	42	88	55	68
• Kintampo	40	83	76	108
• Nkoranza	42	80	84	103
Service level	fair	good	good	very good
Flexibility	none	some	good	good
O&M	++	+	O	O
O&M (Cedis/m^3)				
• Atebubu		156	192	83
• Ejura		156	93	45
• Kintampo		156	112	53
• Nkoranza		156	104	55
Recurrent costs (Cedis/m^3)				
• Atebubu		469	433	176
• Ejura		469	199	86
• Kintampo		469	241	103
• Nkoranza		469	213	97

It appears from this table that a nuclear piped system in the towns of Ejura, Kintampo, and Nkoranza clearly the most attractive option; in Atebubu a nuclear piped system requires higher investment but could result in a lower O&M costs. The unknown parameter in this respect is the effective demand which should be determined at the early stages of this project. The hand pump option is the most attractive scenario from a financial point of view but will quite probably not accepted by the population.

The application of a nuclear piped system implies that a water supply scheme is only feasible within the built-up area of the 4 towns (population density is the criterium here). We estimate that 60% of the total population will utilize the system; a figure still to be confirmed during the additional socio-economic surveys. The remaining 40% live either in the built-up area but do not wish to use the system, or outside the built-up area. In this area, the hand pump option seems to be the appropriate solution. This solution can be realized through successive relatively cheap interventions. Interventions by other donors and/or NGOs are possible. We therefore recommend to consider only the capital-intensive options in the framework of this project, i.e. the upgrading the physical infrastructure of the 4 towns, and to utilize the remaining project funds for the other infrastructural components.

For future planning, we propose to retain the scenario of a nuclear piped system in all 4 towns; the final option to retain should be determined during an inception phase.

3.3 SANITATION

The construction of sanitary facilities concerns mainly domestic unities for a single household. Only in some exceptional cases public facilities can be considered. The process of assignment of the facilities will be demand-driven which means that households have to show their interest before being taken into consideration.

The most prominent option to be promoted will be the KVIP latrine, which is a dry on-site system. This system is already very well known in Ghana and is being applied for public as well as domestic facilities.

The investment costs per latrine is 420 US $ of which amount 50% will be subsidized. The promotion of these sanitary facilities will be considered as a demonstration project aimed at covering 20% of the population in 1995. On the basis of 10 people per household, this means the following number of latrines per town:

Table 3.4: Sanitation component

Town	Population 1995	Number of latrines	Subsidy (US $)
Atebubu	13.700	269	54.600
Ejura	28.300	560	117.600
Kintampo	22.600	450	94.500
Nkoranza	25.800	510	107.100
Total	89.900	1.780	373.800

The other options which have been mentioned can also be taken into consideration; the amount of the maximum subsidy (50 % of the investment KVIP latrine) will be maintained and the additional costs will have to be born by the owner.

3.4 INSTITUTIONAL ASPECTS

3.4.1 General

A major effort of the project will be dedicated to assure the sustainability of the project results. This will require activities to:

- mobilize and organize the communities: key concepts here are the WATSAN Committees and the WUAs;
- reinforce the implementing capacity of involved government institutions: this involves the MLG&RD at national level and the DWSTs at district level.
- create an "enabling environment" which supports the community-level organizations in its functioning; key concepts are here involvement of the private sector and sectoral support.

3.4.2 Mobilization and Organization of the Communities

Water User Associations

The retained option of a nuclear piped system should be operated by a WUA. A WUA is an autonomous body with its own charter, adopted by resolution under the laws and jurisdiction of the DA so that it will be able to act as a legal entity (e.g. opening bank accounts, hiring and firing personnel, entering in contractual arrangements, etc.).

Important issues which will require additional investigations:

- the relation with the DA: the WUA should be autonomous and not under the control of the DA; the DA, however, should be able to nominate its representatives in the general meeting of the WUA;
- the ownership of the system: COM assumes ownership by the community. This is clearly the case with the sub-systems but could lead to controversies with regard to the central system. Solutions could either be situated in lease-arrangements between the Government and the WUA for the central system and/or conditional transfer, implying the transfer as soon as the WUA meets certain requirements (e.g. financially break-even, technical adequacy, etc.).

The WUA will comprise of a general meeting, an office of elected officers, and directly engaged personnel. The final composition of the general meeting will depend on the social structure of the town; minimally each WATSAN Committee should have its representative in the meeting; additional members could be nominated by the DA or other important social groups (business, religious leaders, youth groups, etc.). The office consists of regularly elected officers whose mandate will be defined in the Charter. The Office will minimally comprise of a President, a Secretary, and a Treasurer.

The tasks of the WUA include:

- to operate and maintain the central system to ensure a reliable supply of water of an acceptable quality;
- to collect sufficient revenues to assure the operating costs are met as well as future major repairs and replacements;
- to promote, approve and supervise (eventual) extensions of the system;
- to take all appropriate actions to ensure the sustainability of the system.

The Office will hire and direct personnel for operating the system. We estimate that considering the technology proposed, two mechanics sufficient. Simple maintenance could be carried out by them but complex maintenance will be contracted out to contractors (The contract for the installation of the electro-mechanical works will comprise a maintenance contract for one year, renewable for another year). The collection of revenues will be primarily done by the WATSAN Committees who will settle their actual consumption with the WUA; the accounting will be the responsibility of the Office but an intermittent intervention of a clerk/accountant is foreseen.

The establishment of the WUA should be realized as soon as project conditions permit. This will provide the project a vehicle to mobilize and coordinate the community but will also permit to mobilize and prepare the mechanics for O&M.

WATSAN Committees

Each WUG should create its own WATSAN Committee to improve and manage its water supply and sanitation. As with the WUA, a WATSAN Committee should be registered as an autonomous entity adopted by resolution under the law and jurisdiction of the DA so that it is able to open a bank account.

The role of the WATSAN Committee in the programme could comprise the following elements:

- to plan the improvement of water supply and sanitation; an important part would be the decision to participate in a nuclear piped system and the determination of the final configuration of the sub-system but also improvements in environmental sanitation (e.g. drainage, solid waste collection, public latrines, etc.) could form part of such a plan;
- to implement the planned improvements; here again, an important aspect would be the implementation of the nuclear piped system (e.g. the collection of the contribution of the population (in money or kind), the organization of self-help activities, and the contracting of local contractors/craftsmen);
- to operate and maintain the improved facilities; this will require for the nuclear piped system the collection of revenues, the maintenance of the created water points (hygiene, working order) and the integrity of the sub-system (leakage, illegal connections): the first 2 activities will be normally contracted to attendants who will work on commission base (20%);
- to facilitate hygiene education.

The WATSAN Committees should be established as soon as project conditions permit. This is essential for launching the water supply component but they will also provide a means to promote the sanitation component

Sequencing
The promotion of the WUAs and the WATSAN Committees will require a sequence of well planned interventions which are interrelated. We foresee the following interventions:

Preliminary investigations
Surveys will be required to assess the real demand for improved water supply and sanitation and the (willingness and) ability of the population to pay for these improvements (socio-economic survey). An assessment of the social structure of the communities will be required to map the social structures, to define the most appropriate unit areas for WUGs, and to identify the community leaders who might take a role in either a WUG or the WUA. The results of these surveys represent important data when considering the final option for the water supply system.

Preparation
Before informing the communities on the proposition of the project, a field manual containing the project strategy, the planned interventions, and supporting materials must be prepared. Important components of the field manual comprise:

- a sequence of activities;
- a catalogue with options containing standard designs, specifications and cost estimates:
  - water supply;
  - sanitation;
- an organizational set-up of a WUA comprising a charters, guidelines for its composition, organization charts, job descriptions and qualifications of key personnel; a similar set-up should also prepared for a WATSAN Committee;
- a design of a hygiene education programme.

The results will require close consultation with the MLG&RD and the DWSTs which should be mobilized by then. The DWSTs, supported by the project, shall be the principal agents for the next stages.

Mobilization

The WUGs will be visited by the a DWST and guided through a process of community meetings that would identify or establish a WATSAN Committee to lead the community in the project. Some basic hygiene education would be introduced to help people understand the links between water, sanitation, and health and the importance of hygiene education.

In a series of consultations between representatives of the newly established WATSAN Committees, the DA, and the project, the WUA will be established and its composition determined. Necessary decisions should be passed by the DA to affirm the autonomous position of the WUA and the WATSAN Committees.

Planning and strengthening

The details of the project in the community must be prepared next. The DWST will lead the WATSAN Committees through a series of activities to identify community needs and preferences. A community survey would be conducted by the WATSAN Committee. The DWST will present the catalogue of available options and explain the technical limitations and the implications for the community in terms of initial commitment fees and recurrent O&M payments. The results of these discussions would be laid down in a "Facilities and Management Plan" which will cover at least water supply but could also include environ,mental sanitation (communal sanitary facilities, drainage, and waste collection and dumping). This phase culminates in a request from the WATSAN Committee to the WUA with a detailed proposal and the confirmation of the community that it agrees to conditions set by the WUA. The WUA will examine and duly approve in close consultation with the project the proposal and pass a contract with the WATSAN Committee.

The WATSAN Committees and the WUA will be strengthened during this stage. This will comprise for the WUAs assisting in the recruitment and selection of its personnel (i.e. 2 mechanics will be required per system), training and organization development. The WATSAN Committees will be trained to strengthen its leadership and organizational skills.

Implementation of the water supply component

The implementation will need to follow the rhythm of the construction of the central system by international contractors. The construction of the sub-systems will be done by local contractors and/or craftsmen and managed by the WATSAN Committees and can therefore follow the natural process determined by the communities itself. Piped and accessories will be supplied by the project; self-help in the form of digging trenches, etc. is possible in this stage. The WUA will supervise the construction and approve the realized works before they are connected to the central system. Much depends during this stage on the performance of the WATSAN Committees as they will organize the inputs of the communities and liaise with the WUA for overall coordination.

The WUA will be closely associated with the design and construction of the central system. Their personnel will be made available to the project as supervisors in order to obtain full familiarity with the system. Induction training by the GWSC will be provided by them. The WUA will be a full participant during the commissioning and handing over of the systems. Training will aim at preparing the WUA (and WATSAN Committees to a limited extent) for operations and maintenance.

Operations and Maintenance of the water supply system

The WUA will be in full charge of the new system. The staff is qualified for operations and routine maintenance; complex maintenance will be handled by qualified contractors (the contract for the supply and installation of the electro-mechanical equipment will include a full-year warranty and a one year service contract renewable by the WUA for two years).

Accounting will be done under the responsibility of the treasurer; a part-time intervention of an accountant might be required.

An important tool of management will be a monitoring system; this system will be simple but comprise the most relevant performance indicators. It will be necessary to have an annual audit of the accounts followed by a management audit of the total system performance. This should be based on a participative evaluation which could be carried out by the MLG&RD, the zonal team of the Community Water and Sanitation Division of the GWSC and the WUA.

Training during this stage would comprise call-back visits to review systems performance and problem solving.

Sanitation and Hygiene Education

From the very start of the programme the WATSAN Committees shall participate in hygiene education and sanitation. The construction of household latrines is a decision of the individual households but the WATSAN Committees could assist in providing the households with the necessary information and decision making.

3.4.3 Reinforcement of the implementation capacity

Ministry of Local Government & Rural Development

The MLG&RD has no previous experience in water supply and sanitation but will require the expertise to implement and monitor water supply and sanitation projects. A light structure in the MLG&RD should suffice. It is proposed that the required professional staff for this activity would be attracted through this project and will be absorbed within the Ministry after completion of this project. Training of this staff would mainly comprise training on-the-job.

District Water and Sanitation Team

The DA will mobilize a District Water and Sanitation Team (DWST) comprising existing district personnel and locally-bases line-ministry staff (e.g. Ministry of Health, Department for Community Development, etc). The tasks of the DWST comprise:

- implementation of the planned interventions of the community development package;
- focal point of the water supply project; responsible for the design and quality of the sub-systems ("inspection");
- management of the sanitation component;
- implementation of the hygiene education programme.

The DWST will be supported by technical assistance and a comprehensive training programme will be required to ensure the long-term viability of this concept.

3.4.4 Enabling Environment

Private sector

The SIP includes a private sector development component to encourage communities to pay directly for services and to promote private sector involvement in planning, construction, maintenance and spare parts distribution. A relevant role for the (local) private sector in this project would be situated in:

- construction of the sub-systems (pipe-laying reticulation system, installation of public taps and house connections, construction of sanitary facilities (latrines));
- maintenance (complex maintenance, pipe repairs);
- supply of materials and spare parts (small diameter pipes and accessories, sanitary equipment).

The project will stimulate the engagement of local contractors and/or craftsmen and will assist them technically and financially and by practical training.

Sector support
The SIP (and the CWSP) have proposed an institutional framework which is presented in Appendix 5. The CWSP has started its first activities and will probably fully operational by mid 1994; relevant experiences will therefore be available when this project commences.

The project should therefore make full use of these accomplishments which will be situated in:

- the experiences gained with piped water supply in small urban communities (up to 15,000 inhabitants);
- the developed approaches and materials (technical specifications, promotion materials and training materials);
- the zonal support teams, especially important for advice on system extensions/sub-systems, monitoring and follow-up.

3.4.5 Training

Training will comprise a major activity of the project and will cover the target groups identified above. It should be noted that a training network has been established in the framework of the SIP; the training in the project should therefore utilize as much as possible training approaches and curriculum already established. It is therefore recommended to associate the Training Network Centre for Water and Waste Management of the University of Kumasi with the training contents of this project.

An indicative assessment of training needs is given in table 3.5.

Table 3.5 Indicate assessment training needs

TARGET GROUP	TRAINING NEEDS	TRAINING METHODS
National (MLG&RD) • Sanitary engineer • Community Development Coordinator	• Project planning, implementation, monitoring and evaluation, • Low-cost water supply and sanitation (SE only), • Principles of community management; • Performance monitoring	Training on-the-job, Specialized courses
District (DWST)	• Project planning, implementation, monitoring and evaluation; • Low-cost water supply and sanitation; • Needs assessment and demand promotion; • User capacity building for community management	Training on-the-job, Specialized courses, Counselling
District (DA)	• Orientation low-cost water supply and sanitation, • Principles of Community management, • Sector policies, • Roles and responsibilities of involved actors	Workshop
Community groups (WATSAN Committee)	• Orientation low-cost water supply and sanitation, • Principles of Community management, • Communication skills, • Hygiene education, • Roles and responsibilities of involved actors	Workshop
Community groups (WUA) • Office holders	• Orientation low-cost water supply and sanitation; • Principles of Utility management· - O&M, - Accounting, - Planning; - Consumer relations • Communication skills; • Roles and responsibilities of involved actors	Workshop Specialized courses
Community groups (WUA) • Mechanics	• Principles of water supply • Operations of a water supply systems, • Routine maintenance and trouble-shooting, • Plumbing and leakage control,	Induction training GWSC, Assist in supervision during construction, Training on-the-job
Private sector • local contractors, • craftsmen	• Skills training - pipe laying and plumbing, - public taps and house connections, - KVIP latrines, • Small business administration and marketing	Practical training Counselling

3.5 PLAN OF OPERATIONS

The project comprise 3 clusters of activities which follow each a different rhythm of implementation and require careful synchronization for that reason. These clusters constitute:

- the **institutional strengthening** component comprises the establishment of an efficient implementing organizations at different levels (national and district) which will continue the activities after completion of the project. This activity follows a sequence of mobilization, training, and transfer of responsibilities.
- the **water supply** component entails the implementation of a major infra-structural works. Efficiency and tight schedules which do not allow outside interferences, are essential for its implementation. This cluster follows a sequence of activities dealing with data collection, design, construction, and commissioning.
- the **community development** component aims at permitting the communities to plan, improve, and manage its water supply and environmental sanitation. Its rhythm is determined by the recipient communities. This component follows a sequence of information, mobilization, action planning, and implementation.

The earmarked activities have been grouped together in logical elements with clearly distinguished outputs and are indicated in the barchart of activities (see table 3.6 and Appendix 11 for a detailed description of identified activities).

Preliminary investigations comprising a socio-economic survey and hydrogeological surveys will be necessary before the final option can be identified and the project appraised.

A preliminary time schedule would read as follows:

- preliminary investigations and project appraisal : 6 months
- project approval : 2 months
- negotiations : 6 months
- selection of consultants : 4 months
- mobilization : 1 month
- preliminary design : 2 months
- detailed design : 4 months
- preparation of tender documents : 1 month
- tendering : 4 month
- construction : 9,5 months
- sanitation component : 18 month

This time schedule is based on the assumption that the Government of Ghana will request the KfW and will be granted a Project Preparations Facility to start project preparations. This would permit mobilization immediately after completion of project negotiations; if this is not possible, all dates will be delayed by 4 months.

An Inception Report shall be submitted after two months after mobilizationn and shall comprise

- detailed proposals for the water supply systems (preliminary design with cost estimates);
- detailed proposals for the management of the proposed systems;
- detailed proposal for sanitation;
- detailed plan of operations.

Table 3.6: BARCHART OF ACTIVITIES

Year	Year 1												Year 2											
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
MOBILIZATION																								
INSTITUTIONAL STRENGTHENING																								
Implementing Organization																								
Training Plan																								
Training																								
Counselling and Performance Monitoring																								
WATER SUPPLY																								
Topographic Survey																								
Preliminary Design																								
Detailed Design																								
Tender Documents																								
Tendering drilling																								
Drilling																								
Tendering other components																								
Construction:																								
• electro-mechanical																								
• pipe laying, incl. supply																								
• civil works																								
Commissioning and handing over																								
Training																								

Year	Year 1												Year 2											
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
COMMUNITY DEVELOPMENT																								
Assessment Social Structure		■	■																					
Development of Strategies		■	■																					
Implementation:				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
• water supply				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
• sanitation				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
• hygiene education				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

3.6 IMPLEMENTATION

3.6.1 Implementing Organization

The implementing agency will be the MLG&RD which will assisted by a Technical Assistance Team (TAT) comprising an expatriate advisor and supporting staff (TA). He will be assisted by Ghanaian professional staff (a coordinator community development and a sanitary engineer). The sanitary engineer will be temporarily financed through the project but who will be absorbed within the Ministry after completion of the project.

The tasks of the MLG&RD will be:

- project management and coordination of the involved parties;
- approval of technical proposals and reports;
- tendering;
- acceptance of completed works;
- progress monitoring and evaluation;
- consolidation of DA accounts for sanitary facilities.

The scope of these tasks is limited and does not require an elaborate implementing organization. The example of the Local Government Development Project where the TSC acts as implementing agency on behalf of the MLG&RD does not hold as that project is much more complex. The MLG&RD does, however, require specifics inputs for the water supply component. A direct collaboration with the GWSC who is the only governmental agency with the required expertise would be preferable, especially as the TSC lacks the specific capacity for water supply and sanitation. It should be also noted the MWH is upgrading the GWSC (i.e. the CWSD) to implement community water and sanitation projects.

The counterpart of the MLG&RD at district level will be the DA. The DA will mobilize a District Water and Sanitation Team (DWST) comprising existing district personnel and locally-bases line-ministry staff (e.g. Ministry of Health, Department for Community Development, etc). The tasks of the DWST comprise:

- implementation of the planned interventions of the community development package;
- focal point of the water supply project; responsible for the design and quality of the sub-systems ("inspection");
- management of the sanitation component;
- implementation of the hygiene education programme.

The TAT will manage and coordinate the inputs of the various parties indicated in table 3.7 and advise the MLG&RD on all matters pertaining to the project.

Table 3.7: Required project inputs

Activity	Actor
Project management and coordination	MLG&RD / TAT / National Professional Personnel
Engineering design and supervision during construction	Consultants / GWSC
Community mobilization	DWST /DCD / DA / NGO
Training	TNC / GWSC
Construction of the water supply system	Contractors
Hygiene Education	DWST / DA / TNC
Financing mechanism for sanitary facilities	DWST / MLG&RD
Construction of sanitary facilities	Local contractors / artisans
Operations and routine maintenance of the system	Community
Complex maintenance and repairs	Contractor and/or GWSC

Consultancy services should be provided by a (consortium of) consulting firm(s) which will provide local and international expertise. Special attention should be given to the community development component where the deployment of a NGO could be advantageous. In that case would the NGO have to participate in the consortium.

The Training Network Centre for Water and Waste Management (TNC) at the University of Sciences and Technology in Kumasi is the leading institute in the field of training of rural water supply and sanitation. The TNC is a.o. charged with the implementation of the training component of the CWSP. They have no experience in urban water supply operations; this expertise rest solely with the training department of the GWSC. It is therefore proposed that a consortium of TNC/GWSC with TNC as lead firm, will be commissioned for the training component and the hygiene education programme.

The construction of the central water supply system will be done by international contractors. The partition in contracts should be carefully examined in order that such contracts may prove to be sufficient attractive to an international contractor. The contract for the supply and installation of electro-mechanical equipment would include a full one year warranty, and a one year service contract renewable by the community for two years.

Drilling comprises a limited number of boreholes and should be contracted locally. A contribution in kind by the population (e.g. digging of trenches, etc.) is not foreseen.

The construction of the sub-systems and sanitary facilities will be done by local contractors and/or artisans. They will be supported by a programme of training and certification. A contribution in kind by the population is possible.

3.6.2 Monitoring and Evaluation

A monitoring system will be established which will cover the main areas of project intervention comprising at least:

- specific project targets;
- project expenditure;
- performance of specific project target groups
  - WUA;
  - WUGs;
  - Plumbers;
  - Artisans;
- system performance.

The project should be supervised regularly (preferably twice per year).

The regular monitoring and evaluation after completion of the project will be of the utmost importance to guarantee proper performance. It would be wise to have to annual audit of the accounts be accompanied by a management audit of the total system performance. This should be based on a participative evaluation which could be carried out by the MLG&RD, the zonal team of the Community Water Supply and Sanitation Team of GWSC and the WUA.

3.7 COST ESTIMATES

The detailed cosst estimates are presented in Appendix 9 and amount to:

Component	Foreign currency (US $)	Local currency (*1.000 Cedis)
• Water supply	4.871.400	869.200
• Sanitation	0	373.800
• Consultancy	973.075	0
• Operating costs and miscellaneous	195.000	93.200
Physical contingencies	789.114	153.276
Price contingencies	509.534	288.833
TOTAL	7.338.123	1.778.883
GRAND TOTAL (all in US $)	9.561.654	

4. PROJECT JUSTIFICATION AND RISKS

4.1 JUSTIFICATION

The financial evaluation presented in Appendix 10, demonstrates that it possible to operate piped water supply systems at a sound financial basis. Recurrent cost per m^3 is significantly lower than the actual price paid for water and only in the most unfavourable case (Atebubu scenario: nuclear piped system-low demand) would the cost price approach the actual water price. By passing this advantage to the consumers it is quite possible that the demand will be stimulated. The WUAs are authorized to determine their own tariffs; these tariffs would fall in the range of 200 - 450 Cedis/m^3 (or 2 - 5 Cedis/bucket) in the case of the low demand scenario for nuclear p[iped system.

The project will reduce water related expenditures by providing cheaper water to the consumers and will therefore have a positive impact on household incomes.

The project would assist to improve the health status of the population by improving hygiene through increasing the quantities of water consumed, and changing behaviour through hygiene education, by improving the quality of drinking water, and by improvements in sanitation. All diarrhoea related diseases would be expected to decline. Improved sites around water points would interrupt the transmission of guinea worm.

The project reinforces the policy of decentralization by involving the DAs in water supply and sanitation.

4.2 ENVIRONMENTAL CONSIDERATIONS

It goes without saying that the installation of a water supply system will induce larger quantities of water to be used by the population. This means that more attention should be paid to the problem of sullage disposal. Furthermore the installation of improved sanitary facilities like KVIPs and soakaway pits will create a danger of groundwater pollution. This problem has already been brought forward in Atebubu. In case of a central water supply system protection of the water source should be envisaged.

4.3 RISKS

Risks will be situated in:

- the availability of ground water (sufficient yields, quality, etc.);
- the application of the concept of Community Ownership and Management in towns of this size;
- the implementing capacity of the MLG&RD.

These risks can be mitigated by:

- the availability of ground water will have to be assessed in a special ground water study;
- the concept of COM will have to be introduced by a comprehensive programme of community information, training and education;
- the MLG&RD will attract a qualified sanitary engineer and request the technical expertise of the GWSC for the implementation of the water supply component.

APPENDICES

Appendix 1

Terms of Reference

Enclosure 1

TERMS OF REFERENCE

IDENTIFICATION OF IMPROVING THE WATER SUPPLY OF THE SECONDARY CENTRES OF ATEBUBU, EJURA, KINTAMPO AND NKORANZA

1 INTRODUCTION

The Government of Ghana (GOG) and the Kreditanstalt für Wiederaufbau (KfW) consider the possibilities of cooperation for the upgrading of the secondary towns of Atebubu, Ejura, Kintampo and Nkoranza[1]. As a first activity in this framework, an identification mission will be fielded to identify the possibilities for improving the supply of drinking water in the 4 towns.

2 OBJECTIVE

The objective of the identification mission is to elaborate institutional and technical proposals concerning the appropriate establishment of decentralized water supply systems on the district level; the proposals will refer to the implementation of the future water supply project as well as to the subsequent management and operation of the systems in the 4 towns. For this purpose the mission will regard the present situation of water supply and sanitation and the socio-economic environment in the above mentioned towns as well as the new strategy for the rural water supply sector in Ghana.

3 OUTPUT

The Mission will provide a comprehensive report which will contain at least:

* a description of the possible technical improvements with cost estimates;
* a description of the institutional set-up and the requirements in terms of institutional arrangements, regulation and resources;
* a justification of the proposed investments (hard and soft component) in terms of financial and social feasibility;
* an assessment of inherent risks and means to reduce the risks;
* a Plan of Implementation and Operations comprising a planning of required activities and the modalities of execution.

The proposal shall be in line with the existing policies of the GOG and be based on the principles of Community Ownership and Management (COM)

[1] Refer to the mission report of messrs. Schmidt-Kallert and Oberländer, Project Identification Mission Promoting Secondary Towns in Ghana, Final Report, April 1993.

4 APPROACH

The Mission will:

* review relevant literature and reports on the water sector in Ghana, the relevant institutions, and any other study pertinent to the investment under consideration;

* conduct interviews with representatives of involved agencies and/or institutions and other interested persons and assess the situation on site;

* establish a model of feasible technological and institutional options and the conditions under which the identified options can be applied;

* identify the feasible options for improving the water supply of the 4 concerned towns and the conditions which have to be met.

The final option for each town will be based upon

* a review of the existing situation in the 4 towns in terms of:

  - water supply systems: condition, quality, coverage, service levels;

  - water consumption: sources, quantities, usage, hygiene;

  - users contribution: actual payments, income levels;

  - O&M: involved institutions, available resources (human & financial), available spare parts, institutional arrangements;

  - sanitations and waste conditions

  - urban planning: existing infrastructure, economic activities, existing plans.

* an assessment of the future demand for drinking water considering the demographic, urban, and economic developments of the 4 towns concerned (planning horizon: 5 - 10 years);

* a review of the environmental consequences of the proposed systems and the need for sanitation (human waste and drainage);

* a proposal of the required institutional arrangements and the feasibility of its application at local level (i.a. role of district authorities, GKSC and private sector; institutional partners for project implementation and operation);

* an appraisal of technical and institutional feasible systems considering available water resources and national design criteria as well as local absorption capacity;

* a financial analysis of the proposed systems.

5 ORGANIZATION

The GOG will charge the Ministry of Local Government to assist the Mission in all matters concerning policies, logistics and organizational matters and will nominate one senior officer as mission member on a full-time basis.

The Mission will present its preliminary findings to the Ministry of Local Government at the completion of its stay in Ghana and a jointly signed summary record of discussions will be duly submitted to the KfW.

The mission will be composed of an institutional expert and a sanitary engineer. Its duration is scheduled for a period of 3 weeks; the draft mission report will be submitted three weeks after completion of the mission.

Frankfurt, 16 November 1993

Appendix 2

List of persons met

ACCRA

Ghana Water and Sewerage Corporation

M.A. Adombire	Ag Director (Planning Development)
Damesi	Director of Administration
E.K.U. Dovlo	Ag Managing Director
mrs. E. Ewotwi	Head of Training Section
E.O. Yoely	Tahal Consulting Engineers Ltd.
S.G. Stav	Tahal Consulting Engineers Ltd.
R.K.D. van Ess	Principal Hydrogeologist

German Embassy

M. Sonn	Counsellor

Ministry of Local Government

M.K. Mensah	Head Planning Unit
mrs. L. Owusu	Planning Unit
S.Y.M. Zanu	Chief Director

Ministry of Works and Housing

G.G. Nai	Technical Director Water
J.P. Wartemberg	Project Coordinator/Ag Director Technical Services Centre

World Bank/UNDP Water and Sanitation Group

C.K. Annoh	Country Coordinator
A. Brown	Former Country Coordinator

Water Resources Research Institute

N.B. Ayibotele	Director

KUMASI

GWSC

P. Appiah-Kubi	Regional Director
D.K. Bainson	Ag. Regional Engineer

Water Supply Rehabilitation Project

C.A. Mayers	Civil Engineer (Gibb Africa International)

ATEBUBU

T. Takyi	District secretary
Dr. W.K. Nutaker	District medical Officer
C. Frempong	District Hospital Secretary
J.K. Anane	Revenues Officer GWSC
I. Tijani	DDAO
A. Zakaria	District Administrative Officer
A. Nark	Secretary Sub-Committee Technical Infrastructure
F. Adama	Chairman Sub-Committee Technical Infrastructure

EJURA

C.E. Broni	District Secretary
Dr. P. Amadu	District Medical Officer
Y. Asamoah	District Planning Officer
S.A. Kantanka	Deputy District Administrative Officer
V.K. Agbesingde	District Administrative Officer
S. Nyantakyi Baafi	Principal Environmental health Officer

KINTAMPO

A.B. Amoah	District Secretary
A.K. Bawinia	District Environmental Health officer
W. Agalga	District Guinea Worm Coordinator
J. Adabio	Accountant DA
K. Osman	Deputy District Administrative Officer
A.Z. Yakuba	District Administrative Officer
A.Y. Housseini	Assembly Man Fanyinama Masalaji Electoral Area
A. Foster	Assembly Man Sawal Electoral Area
A.U. Jysi	Chairman Youth Association
A. Fordjor	Secretary Youth Association

NKORANZA

D. Adjei-Duffori	District Secretary
E. Osei	Presiding Member DA
N.S. Effah	Assembly Member
N. Mpomiahene	Urban Council Member
Y. Ohsu	Urban Council Chairman
Dr. H. Adu-Dapaah	
M.M. Diawvo	Sr. Works Supt. DA
K. Bo atenf	Protocol Officer DA
K.K. Kissieh	District Town and Country Planning
E.G. Fremais	Assembly Member
K.A. Turmasi	
A.B. Boobbey	
I. Bosman	Medical Doctor St. Thomas Hospital

SUNYANI

GWSC

F. Mensah	Regional Medical officer
J.J. Yeboah	Project & Development Officer
M.B. Baido	Distribution Engineer
Mrs. L. Perbi-Nyarko	Commercial manager Sunyani District

VRA

A.A. Papenko	Area Engineer

Appendix 3

Programme of the mission

November 23, 1993	Arrival in Accra
November 24, 1993	Accra Meetings with MLG&RD, German Embassy, TSC
November 25, 1993	Accra Meetings with MLG&RD, GWSC, World Bank, Water Resources Research Institute
November 26, 1993	Accra Meetings with MWH, MLG&RD, GWSC
November 27, 1993	Accra
November 28, 1993	Accra
November 29, 1993	Travel to Atebubu by car Short visit to Kumasi: GWSC, NTC
November 30, 1993	Atebubu Meeting with DA-Atebubu, site inspection
December 1, 1993	Travel to Ejura Meeting with DA-Ejura, site inspection
December 2, 1993	Meeting with DA-Ejura Travel to Kintampo
December 3, 1993	Meeting with DA-Kintampo, site inspection
December 4, 1993	Travel to Nkoranza Meeting with DA-Nkoranza, site inspection
December 5, 1993	Meeting with DA-Nkoranza Travel to Sunyani
December 6, 1993	Sunyani Meeting with GWSC, VRA Travel to Kumasi
December 7, 1993	Kumasi Meeting with GWSC, NTC, Water Supply Rehabilitation Project
December 8, 1993	Accra Meetings with MLG&RD, GWSC, World Bank
December 9, 1993	Accra Meetings with MLG&RD, GWSC, Water Resources Research Institute

December 10, 1993	Accra Meetings with MLG&RD, GWSC, German Embassy
December 11, 1993	Accra Final meeting with MLG&RD
December 12, 1993	Accra Departure for the Netherlands

Appendix 4

Summary record of discussions

SUMMARY RECORD OF DISCUSSIONS
APPRAISAL MISSION MLG&RD/MFW WATER SUPPLY AND SANITATION
FOUR DISTRICT CAPITALS BRONG AHAFO AND ASHANTI REGIONS

METHODOLOGY

1. The objective of the mission is to elaborate institutional and technical proposals for the appropriate establishment of decentralized water systems at district level; the proposals will refer to the implementation of the future water supply project as well as to the subsequent management and operation of the systems in the towns of Atebubu, Ejura, Kintampo, and Nkoranza. The mission will equally review the need for sanitation (human waste and drainage).

2. The mission has collected information in Accra and on site and has held discussions with officials from the Ministry of Local Government and Rural Development (MLG&RD), the Ministry of Works and Housing (MWH), the Ghana and Water Sewerage Corporation (GWSC), the Groundwater Resources Research Institute, the Technical Services Centre, the Water and Sanitation Group of the UNDP/World Bank, the Network Training Centre, the Volta River Authority (VRA), officers of the District Assemblies and elected members, and the population.

3. Although useful information has been collected, the mission has not been able to encounter reliable data such as up-to-date population figures, household income statistics, and has therefore been forced to guesstimate the effective demand for piped water supply.

STRATEGY

4. An important policy document for the mission has been the recently formulated Strategic Investment Programme (SIP) for community water supply and sanitation which applies to rural communities less than 5,000 persons. There exists no similar document for the water supply and sanitation of secondary towns.

5. The main elements of the SIP which could be applied easily to the 4 towns under consideration are:
quote
   a. the communities will be required to pay 7.5% of the capital cost of a water supply system for the basic service level plus one half of the added costs of higher level of service;
   b. over time ownership and management of rural and semi-urban systems will be shifted to individual

c. mechanisms will be put in place to ensure that households would be eligible to receive a construction grant for one half of the cost of a household latrine;

unquote

6. These principles are being tested in two pilot districts in the Brong Ahafo Region by the Community Water Supply and Sanitation Project, sponsored by the World Bank, which comprises a.o. piped water supply systems for communities up to 15,000 persons.

7. These principles and verification on site lead to the following strategy for water supply in the towns under consideration:

a. The objective shall be the creation of sustainable water supply systems on basis of community ownership and management (COM);

b. The systems shall be owned and managed by the community under the supervision of the District Assembly;

c. The technology shall be sufficiently simple to permit the community to operate and maintain the system; in principle only ground water systems shall be considered;

d. The communities will be organized on basis of distinct and convenient social entities (the Water User Groups (WUGs)); the areas of the unit committees may well provide such a basis; an overall coordinating committee (Water User Association or WUA) which will employ full-time staff, will be required for system management and maintenance;

e. The WUGs will decide on the configuration of their sub-system (public standpipes and house connections) and revenue collection mechanism; the central system will supply water in bulk (metered) to each sub-system and will charge them for this water;

f. The contribution of the population will be determined by the following formula:

i. 7.5 % of the production works and the distribution system;

ii. the superstructure and piping of public standpipes will be supplied by the population and is deemed to form part of the 7.5 % cited above;

iii. 100 % of the house connections;

g. The WUA will operate a separate bank account, which will be audited annually and approved by the DA; its revenues shall be sufficient to meet all expenditures for operations and maintenance while preferably allowing for sufficient reserves for the short-term replacement investments for electro-mechanical equipment; a management audit, executed either by MLG&RD or GWSC, will be required;

h. The WUA shall employ two mechanics of sufficient qualifications to operate the system and to execute routine maintenance; the more complicated maintenance shall be contracted out (to the GWSC or other qualified contractors) or certified local plumbers (leakage, small extensions, and connections);

8. The sanitation component shall in accordance with the strategies laid down in the SIP, comprise the following elements:
   a. The component will be a demonstration project aimed at covering at 20% of the population
   b. A health education component promoting proper sanitary practices, household drainage and the promotion of household latrines;
   c. A financing mechanisms for individual households entitling them to a construction grant for one half of the cost of a household latrine; the additional costs for higher service level will be borne entirely by the household;
   d. Training and certifying of local artisans;

9. The ability to contribute will have to be verified during a base-line survey.

EVALUATION OF THE FOUR TOWNS

Designation	ATEBUBU	EJURA	KINTAMPO	NKORANZA
Availability of alternative sources to the population	GWSC-system; handpumps 0	perennial stream; handpumps 0	dugwells, perennial stream, handpumps +	piped system, handpumps 0
Availability of ground water	groundwater resources limited -	groundwater available 0	groundwater available +	springs; 0
Possibilities for community mobilization / management	+	+	+	existing water committee ++

- \- unfavourable;
- 0 average;
- \+ favourable;

++ very favourable

10. The availability of ground water in the four towns is not too certain will have to be assessed in a special groundwater study.

11. The existing system of Atebubu is probably obsolete, comprises full treatment of surface water, operates at a loss, and does not have the capacity to cover the effective demand of the town. It is proposed that a new piped water supply system using ground water on COM basis and covering the entire town will be established.

12. The possibilities of integrating existing overhead tanks in the new systems will have to be investigated; this will require the collaboration of the GWSC.

13. The mission encountered in at least one of the towns (Ejura) as well as at MLG&RD Accra a desire to start the market and lorry park component of the project concurrently with the water supply and sanitation project.

SYSTEMS CHARACTERISTICS

Designation	ATEBUBU	EJURA	PRANTAMPO	NKORANZA
Coverage	60%	50%	40%	60%[1]
Required capacity (m^3/day)	270	513	338	603
Source	ground water	ground water	ground water	ground water
Cost estimates (US $)	1.234.680	1.122.000	1.412.040	1.330.200
Contribution of the population (US $/cap)	10	5	9	5

14. The planning horizon will be 2000 (5 years of operations).

15. The following design criteria will be applied:
    a. 10% house connection and 90 % public standpipes;
    b. specific consumption will be
        i. public taps: 15 l/c/d;
        ii. house connections: 75 l/c/d;

---

[1] Including the exiting Orion-system

c. leakage: 15%

16. The source of energy of the systems will be electricity (VRA) with a generator-set as stand-by; it will be worthwhile for the MLG&RD to investigate with the VRA whether the systems could be classified as industrial users instead of non-domestic.

17. The final decision to equip house connections with water meters rests with the community; the project policy would be to discourage the use of water meters for house connections in view of the required complex operations and costs.

IMPLEMENTATION

18. The implementation agency will be the MLG&RD which will require reinforcement by one experienced sanitary engineer; the MLG&RD will collaborate with GWSC for supervision of the water supply component. The TSC lacks the specific capacity for water supply and sanitation.

19. The following main activities have been identified:
    a. a base-line survey to determine the ability and willingness to pay and to identify the most appropriate unit areas;
    b. design and construction of the water supply systems comprising:
        i. a ground water study;
        ii. detailed design of the production units and distribution network;
        iii. detailed design of the configuration of the sub-systems (participative design);
        iv. preparation of tender documents;
        v. supervision during construction;
        vi. commissioning and handing over to the WUA;
    c. community mobilization comprising:
        i. information to the population on the project objectives;
        ii. formation of a WUA and WUGs;
        iii. a health education programme;
        iv. a financing scheme for the construction of sanitary facilities;
    d. training comprising:
        i. DA;
        ii. WUA and WUGs;
        iii. Pump drivers cum fitters;
        iv. Local plumbers (leakages, small extensions, and connections);;
        v. Local artisans (latrines and septic tanks);
        vi. Project staff at national level (MLG&RD) and district level (District Water and Sanitation Team, etc.);

20. The implementation of the project will require inputs from a number of different actors:

Activity	Actor
Project management and coordination	MLG&RD with Technical Assistance and GWSC / National Professional Personnel (sanitary engineer)
Engineering design and supervision during construction;	Consultants
Community Development	Dept of Community Development / NGO / DA / DWST
Training	TNC / GWSC
Construction of the water supply system	Contractors
Health Education	TNC / Officers MoH and Community Development / DWST / DA
Construction of sanitary facilities	Local contractors/ artisans
Operations and routine maintenance of the system	Community
Complex maintenance and repairs	Contractor and/or GWSC

21. A preliminary time schedule would read as follows:

a. project negotiations : feb '94
b. approval of the project (6 months): jul '94
c. recruitment of consultants (4 months): jul '94
d. field investigations (2 months): sep '94
e. preliminary design (2 months): nov '94
f. tendering drilling (locally) (2 months): oct '94
g. drilling (2 months): dec '94
h. detailed design (4 months): apr 95
i. preparation of tender documents (1 month): may '95
j. tendering (4 months): aug 95
k. electro-mechanical works (including supply)(5 months): jan '96
l. pipe laying (including supply): (8 months): may '96
m. civil works (6 months): mar 96
n. commissioning and handing over (1 months): jun '96
o. preparation sanitation component (2 months): sep '94
p. testing in one pilot town (3 months) dec '94
q. implementation in 4 towns (18 months): jul '96

This time schedule is based on the assumption that the Government of Ghana will request the IFW and will be granted a Project Preparation Facility to start project preparations. In case this is not possible, all dates will be delayed by 4 months.

22. Indicative cost estimates amount to the following amounts:
    a. water supply: 4,877,000. US $
    b. sanitation; 315,000. US $
    c. consultancy and supplementary measures: P.M.

    These estimates will require additional analysis.

23. The administration of project funds will be handled by the MLG&RD; the DA will submit their claims for "sanitation" grants to the Ministry and will be duly reimbursed.

24. The MLG&RD stresses the need for overall sanitation and in particular the need for waste collection and controlled dumping; it would be worthwhile to include a mission of an expert to review the waste disposal mechanism of the four town and identify the sites for controlled dumping.

OPERATION AND MAINTENANCE

25. An indicative estimation of the O&M costs (personnel, energy, and maintenance) of the 4 towns would show the following figures:

    a. Atebubu: 870.000 C (107 C/m3)
    b. Ejura 950.000 C (62 C/m3)
    c. Kintampo 850.000 C (84 C/m3)
    d. Nkoranza 970.000 C (54 C/m3)

    This compares favourable with the price of about 5 C/10 l (or 500 C/m3) paid actually at the standpipes and justifies the conclusion that O&M costs will be covered.

26. The establishment of a capable O&M organization will require coordinated action from the very start of the project. It will be necessary to nominate the technical staff at an early moment in order to permit training with the GWSC and participation in the supervision during construction. Complex maintenance will be contracted out to a qualified contractor or GWSC; it should be investigated whether a maintenance contract could be passed between the contractor who will execute the project.

MONITORING AND EVALUATION

27. A monitoring system will be established which will cover the main areas of project intervention comprising at least:
    a. specific project targets;
    b. project expenditure;
    c. performance of specific project target groups
        i. WUA;
        ii. WUGs;
        iii. Plumbers;
        iv. Artisans;
    d. system performance.

28. The project should be supervised regularly (preferably twice per year) by a joint mission of IFW and MLG&RD.

29. The regular monitoring and evaluation after completion of the project will be of the utmost importance to guarantee proper performance. It would be wise to have to annual audit of the accounts be accompanied by a management audit of the total system performance. This should be based on a participative evaluation which could be carried out by the MLG&RD, the zonal team of the Community Water Supply and Sanitation Team of GWSC and the WUA.

CONCLUSIONS

30. The following observations justify this project:
    a. the actual conditions of water supply and sanitation in the four towns;
    b. the systems will be able to cover its operating expenditures;
    c. the project reinforces the policy of decentralization by involving the DAs in water supply and sanitation;

31. Risks will be situated in the ability of the communities to operate and manage piped water supply systems of this size, including the mobilization of the necessary financial resources. These risks can be mitigated by introducing the concept of COM by a comprehensive programme of community information, training and education; its application will be monitored by the DAs and the MLG&RD.

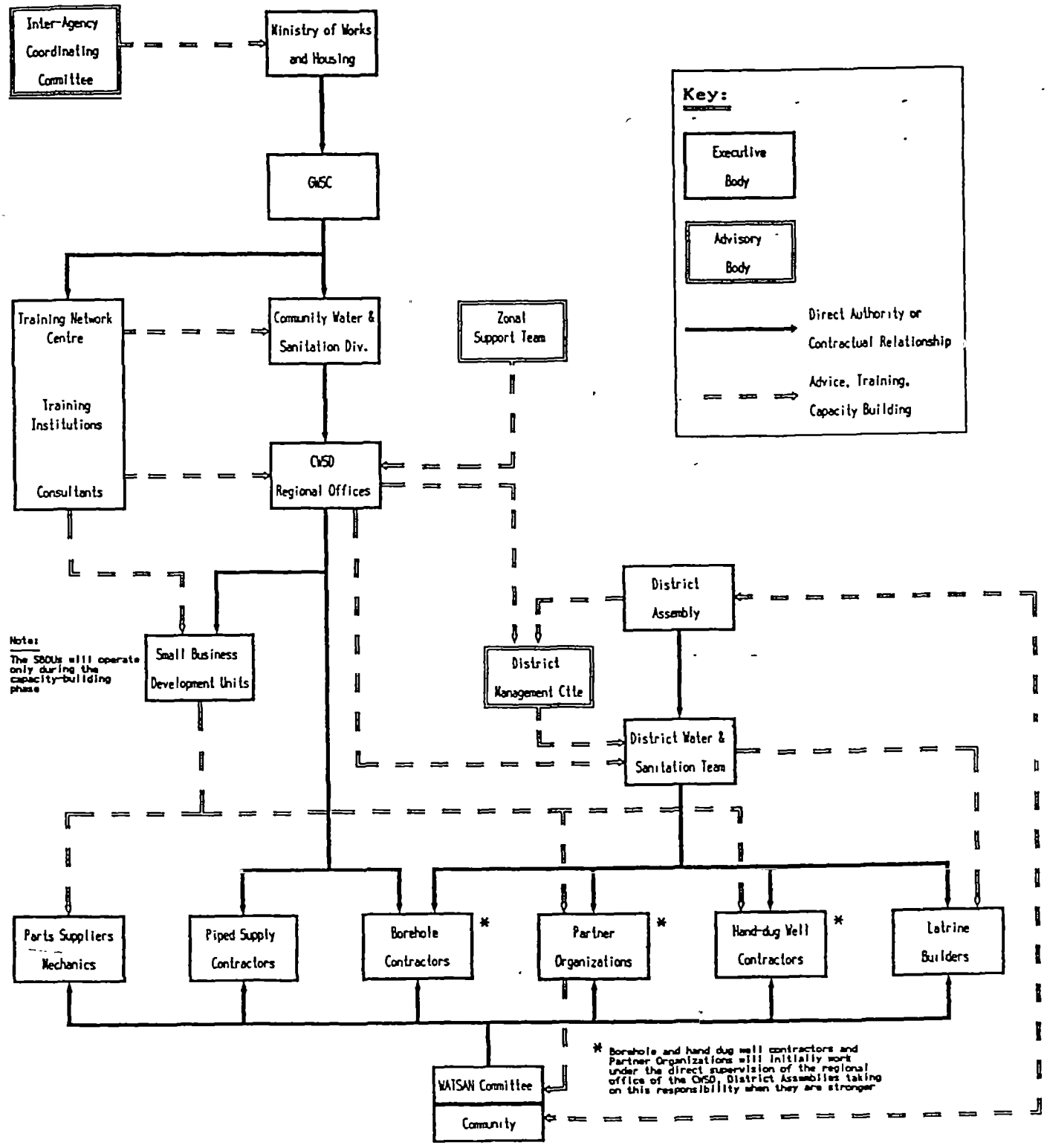
Accra, 11 December 1993

S.Y.M. Zanu
Chief Director
Ministry of Local Government and
Rural Development

H.A. Heckman
Mission Leader

Appendix 5

Organizational framework CWSP
Source: Strategic Investment Programme


Inter-Agency Coordinating Committee
Ministry of Works and Housing
GWSC
Training Network Centre
Training Institutions
Consultants
Community Water & Sanitation Div.
Zonal Support Team
CWSD Regional Offices
Small Business Development Units
District Assembly
District Management Cite
District Water & Sanitation Team
Parts Suppliers
Mechanics
Piped Supply Contractors
Borehole Contractors
Partner Organizations
Hand-dug Well Contractors
Latrine Builders
WATSAN Committee
Community
Key:
Executive Body
Advisory Body
Direct Authority or Contractual Relationship
Advice, Training, Capacity Building
Note:
The SBDUs will operate only during the capacity-building phase
* Borehole and hand dug well contractors and Partner Organizations will initially work under the direct supervision of the regional office of the CWSD, District Assemblies taking on this responsibility when they are stronger

Appendix 6

Basic data of the 4 towns

(Source: Schmidt-Kallert & Oberländer, 1993)

Table 2: Summary of Findings of Towns Visited as per Interview Schedule Applied

No. Subject	Atebubu (12.2.93)	Ejura (13.2.93)	Kintampo (16.2.93)	Nkoranza (18.2.93)
1. Demography				
1.1 Total population				
District 1984	104.139	61.000	108.000	93.800
'' 1993 (estimate)	132.361	85.333	160.488	146.797
District Capital 1984	9.825	18.775	13.943	15.065
'' 1993 (estimate)	12.488	26.264	20.719	23.577
1.2 Population growth	2,70%	3,80%	4,50%	5,10%
1.3 Migration	from north for farming, settle	from north for farming, settle	from north for farming, settle	from north for farming, settle
1.4 Ethnic composition				
Indigenous	majority	majority	85%	80%
Northeners	minority	minority	15%	20%
1.5 Other towns in District	Yeiji, 25.000	Sekyedumase Anyinasu	Jema Babatukuma	Nkwabeng Busunya
2. Economy				
2.1 Major crops				
- Maize	- surplus	1 - surplus	3 - surplus	1 - surplus
- Yam	1 - surplus	2 - surplus	1 - surplus	3 - surplus
- Cassava	3 - surplus	surplus	2 - surplus	2 - surplus
- Vegetable	surplus	3 - surplus	surplus	surplus
- Fish	2 - surplus	n.a.	n.a.	n.a.
2.2 Production of major crops				
- Maize	6,800 acres	24,000t 50% 2)	1) 65,000 t	50,000 t
- Yam	40,000 acres	12%	280,000 t	25,000 t
- Cassava	12,000 acres	n.a.	240,500 t	30,000 t
- Vegetable	n.a.	9%	480 t	5,000 t
- Fish	9,032 t	n.a	n.a	n.a
2.3 Surplus sold on market				
- Maize	yes	15,000 t	1) 61,750 t	45,000 t
- Yam	yes	yes	252,000 t	15,000 t
- Cassava	yes	yes	120,250 t	20,000 t
- Vegetable	yes	yes	466 t	2,000 t
- Fish	yes	n.a	n.a	n.a
2.4 Catchment area of local marke				
Sellers from:	whole district	whole district	whole district	whole district
Buyers from:	Mampong area	whole country	whole country	whole country
2.5 Food processing facilities	not operational	none	PTC	PTC, LDC
Food storage facilities	yes, under cons	Ejura farms	poor facilities	GFDC, 6,000 t
2.6 Other manufacturing establ.	none	none	none	none
2.7 Small scale industries	none special	agric. college	none special	saw-mills
2.8 Credit facilities	most banks	most banks	most banks	most banks
2.9 Other commercial facilities				
- Filling station	yes, 1	yes, 1	yes, 2	yes, 1
2.10 Main traffic links				
- North	HW, poor	HW, poor	HW, good	FR, poor
- South	HW, poor	HW, poor	HW, good	FR, poor
- East	FR, very poor	FR, very poor	FR, poor	FR, rehab. o-g
- West	FR, very poor	HW, under const	FR, poor	FR, rehab. o-g
Bus service	priv. BS n-s	priv. BS n-s	STC, priv. BS	TATA, priv. BS

Note: 1) source DA, believed to be too high,
2) excluding Ejura Farm

HW - Highway, FR - Feeder Road, o-g - on-going
BS - Bus Service

... - 2 -

PTC - Pioneer Tobacco Company

Table 2 continued

No.	Subject	Atebubu (12.2.93)	Ejura (13.2.93)	Kintampo (16.2.93)	Nkoranza (18.2.93)
3.	Local Government				
	Old District Capital	Yes	No	No	No
3.1	District Assembly	65 members	54 members	66 members	63 members
	Language	E, Twi, Haussa	Akan, English	Twi, English	Twi, English
3.2	Government Dept. in Town	most Dept.exist	16 Dept.	some exist	some exist
3.3	Key personnel posted				
	- Budget officer	yes	no	no, BO Wenchi	no, BO Wenchi
	- Planning officer	yes	yes	no, PO Wenchi	no, PO Wenchi
3.4	Impact Mobile Planning Team	1 visit, no fb	no visit yet	collapsed	2 visits, no fb
3.5	Last budget				
	- 1992 (estimate)		55.9 mio	90.0 mio	
	- 1992 (actual)	54.0 mio	39.9 mio	50.0 mio	51.0 mio
3.6	District Development Plan	None	progressing	none, PO Wenchi	none, PO Wenchi
3.7	Sources of revenue				
	- Basic rates	2.70 mio	1.0 mio	< 3.0 mio	0.80 mio
	- Property rates	0.84 mio	2.2 mio	3.0 mio	0.14 mio
	- Market fees	n.a.	9.5 mio	n.a.	1.70 mio
	- Levy farm produce	17.80 mio	n.a.	n.a.	8.20 mio
	- Charcoal, licenses	8.20 mio	14.8 mio	6.0 mio	4.00 mio
	- ceded revenue	17.00 mio	17.0 mio	17.0 mio	22.96 mio
	Breakdown of Expenditures 3)				
	- Salaries	n.a.	10.4 mio	n.a.	20.0 mio
	- Maintenance	n.a.	4.5 mio	n.a.	1.6 mio
	- Recurrent Expenditure	n.a.	4.4 mio	n.a.	n.a.
	- Education	n.a.	6.0 mio	n.a.	n.a.
	- Transport & travel	n.a.	n.a.	n.a.	2.2 mio
	- Construction projects	n.a.	7.8 mio	n.a.	19.4 mio
3.8	Decentr. below District level	progressing	progressing	progressing	progressing
3.9	Relations district-trad.auth.	pending case	cordial	2 diff. chiefs	cordial
3.10	Self-help organizations	yes	yes	yes	yes
	Unions	usual	usual	usual	usual
	NGO	WV, ADRA, G2000	WV, Luke, G2000	WV	APPLE, WV, ADRA
3.11	Main problems				
	1	Water Supply	Water Supply	Roads, Drainage	Water Supply
	2	Housing	Market	Education	Housing
	3	Sanitation	Roads, Drainage	Health	Sanitation
	4	Community Centr	Sanitation	Water Supply	Transport
	5	Distr. Hospital	Feeder roads	Housing	Communication
3.12	Main potentials				
	1	Agriculture	Market& Lorry P	Human resources	Agriculture
	2	Human resources	Agro-processing	Agriculture	Human resources
	3	B & T soil	Labour force	Aquifer	Irrigation
	4		Sand, Gravel	Tourism	Clay deposits
	5		Loc. Contractor		

Abbreviations: BO - Budget Officer, PO - Planning Officer, fb - feed-back
B&T - Brick & Tile making, DH - District Hospital
3) Available figures only fragmentary

... - 3 -

Table 2 continued

No.	Subject	Atebubu (12.2.93)	EJura (13.2.93)	Kintampo (16.2.93)	Nkoranza (18.2.93)
3.13	Proposed solutions & projects				
	1	Cashew tree pl.	New Market	Roads, Drainage	Bore-hole WS
	2	KVIP	Pipe borne WS	Health, no DH	Agro-processing
	3	Water supply	Staff quarters	Education	Mech. services
	4	Drainage	Roads, Drainage	Water supply	Storage facilit
	5	Community Centr	Vocational Inst	Market	New market site
	6	New Market		Storage facilit	B & T making
	7	Roads, Drainage		Sanitation	Vocational Inst
	8			B & T making	Drainage
	9				Sanitation
	10				Rental accommod
4.	Physical conditions				
4.1	Road network	generally poor	generally poor	UR - most poor	UR - most poor
4.2	Drainage	generally poor	generally poor	most poor	most poor
4.3	Water supply system				
	Abandonned pb-WS	no	no	yes	yes
	Existing WS	pb-WS, poor	from river & bh	from bh	spring, bh, con
4.4	Power supply system	1992, ext. req.	1992, ext. req.	since 1992	since 1992
4.5	Sanitation	generally poor	generally poor	generally poor	fairly poor
4.6	Waste Management	none	none	1 refuse truck	poor
4.7	Post office	yes, fair	yes, fair, 1w	yes, fair, 1w	yes, poor, 2w
	Telephone	poor, c/mw	fair, c/mw	none	none
4.8	Health	DH, poor	DH, conv. on-go	HC, no DH	DH R/C mission
4.9	Education				
	J.S.S.		4,	no workshops	EEC, no furnitu
	Secondary School	1, 765st, vpoor	1, 250st., new	2, n.a.	1, 581st.
	Teachers Training College	1, 300, fair	none	none	none
	Vocational Training School	none	ATS, 54, poor	private ones	none
4.10	Market				
	General Market	yes, 84 stalls	yes, poor facil	yes, poor facil	yes, fair
	Yam Market	yes	yes, poor facil	yes, vpoor faci	yes, fair
	EEC stalls	yes, 24 stalls	no	yes, 36 stalls	yes, 36 stalls
	New site proposed	yes	yes	yes	yes
4.11	Supermarkets, sp. shops	none	none	1 wholesale	none
4.12	Lorry park	yes, no facilit	yes, no facilit	yes, no facilit	yes, hostel
4.13	Hotel / Guest House	none	2 motels	1 priv. hotel	few exist
4.14	Housing				
	Private housing	congested	unsatisfactory	unsatisfactory	bad, expensive
	Government housing	few	inadequate	inadequate	inadequate
4.15	Government offices	small	reasonable, ext	1 big off. bloc	old structure
4.16	Churches	most, mosque	most, mosque	most, mosque	most, mosque
4.17	Cultural and sports facilitie	football field	football field	CC, football f.	football field
4.18	Access to land	no problem	no problem	no problem	no problem
	Compensation	no case	no case	no case	1 case

Abbreviations: pb - pipe-borne, c/mw - connected with microwave, bh - borehole, i.d. - in district

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Table 2 continued

No. Subject	Atebubu (12.2.93)	Ejura (13.2.93)	Kintampo (16.2.93)	Nkoranza (18.2.93)
5. Social Problems				
5.1 Inter-ethnic relations	Cordial	Cordial	chieft. problem	inter-marriage
5.2 Chieftaincy disputes	yes, pendg case	no inter-marria	chieft. problem	not reported
5.3 Seasonal migration	farming season	farming season	farming season	farming season
5.4 Social cleavages	none	none	none	none
6. Projects				
6.1 On-going				
EEC - MPP	yes, most i.d.	no	Yam stalls, JSS	EEC prime site
World Vision Intern.	yes, boreholes	rural ws, 60 bh	not reported	not reported
Global 2000	Guinea worm era	no	not reported	not reported
ADRA	prim. school	no	not reported	not reported
ASA	maize/yam farm	no	not reported	not reported
IFAD	agric. credits	no	not reported	not reported
PAMSCAD		schools	not reported	Habitat
6.2 Committed		IFAD	DANIDA, hostel	Water catchment
			Rural Craft TS	DH 5 Dev. Plan

Abbreviations: bh - borehole, i.d. - in district

Appendix 7

Description of the 4 towns

ATEBUBU

Water supply

An existing water supply system, managed by GWSC, is present which dates from the early sixties. The system has been out of order for a long time, but has been upgraded after the installation of electricity in Atebubu in January 1993. Since then the system is running for 16 hours every day. The supply area has been divided in 4 zones and each zone is being supplied during 4 hours.

The system operates at a loss; the profit & loss statement for the first 9 months of 1993 shows a loss of 7.8 millions Cedis, excluding depreciation and overheads.

The water is abstracted from a dam through a 150 mm galvanised iron pipe using a pump set. Due to the absence of a water meter the capacity of the system is not known. The system is connected to the national electricity grid of Atebubu.

The raw water is pumped over a distance of 2.3 km through a sedimentation and flocculation tank into an elevated steel reservoir of 10.000 gallons capacity.

Water from the overhead tank is distributed into a distribution network which covers only a small part of the town. The system accounts for 58 house connections and 6 public taps. It has been reported that on monthly basis a flat rate of 1.279 Cedis is paid by the households and 2.320 by the public places like bars. There seems to be a high demand for new house connections but due to the limited capacity of the system no extensions are possible.

Shallow ground water is available for a few months. Apparently, the majority of the households has a shallow well, which runs dry rather quickly. From january up till june all the wells are dry.

Furthermore, 7 boreholes exist equipped with hand pumps. For the water from the hand pumps the people are paying 10 Cedis for a bucket of 10 litres and 250 Cedis for a drum. 5 Hand pumps are managed by public institutions and the remaining 2 by the area councils.

Sanitation

The following public facilities are available:

- 4 public bucket latrines, each with 20 seats;
- 1 KVIP latrine with 20 seats;
- 1 septic tank latrine also with 20 seats;

For each facility the seats are equally divided between men and women. For all facilities people are paying 10 Cedis for a visit.

A quick calculation of expenditure and revenues of 1 public latrine learns the following: On an average day (except market days) 150 people pay a visit. This means that the revenues amount to 45.000 Cedis per month. The person in charge of the latrine receives a commission of 6.000 Cedis a month as well as 4.000 Cedis for cleaning. This means that a profit of 35-40.000 Cedis (including market days) can be made.

Furthermore, around 40 households have a domestic bucket latrine, which is being emptied during the night. It seems to be very difficult to find the conservancy labourers to empty the buckets. At the moment these people are being employed by the district assembly and are being paid 15.000 Cedis a month. Plans do exist to privatise this activity.

Due to the very shallow ground water the people are reluctant to construct a latrine on their compound for fear of polluting their drinking water.

All latrines are installed on so-called sanitary sites, which comprise also a waste dumping site. In Atebubu there are 10 existing dumping sites, of which only 3 are officially approved.

EJURA

Water supply

In the early seventies a water supply system had been installed by GWSC. A borehole had been equipped and connected to an elevated reservoir of 10.000 gallons. After some years of functioning the system has been dismantled; according to the information from GWSC due to technical difficulties. At the moment only the reservoir is remaining.

Also the hospital had their own water scheme, managed by a hospital committee: water pumped from a borehole to a 10.000 gallons tank on the hospital compound. Also this system does not function anymore since 1983 due to technical problems.

Also 12 hand pumps are presently managed by so-called WATSAN committees. For some pumps people are paying 5 Cedis per bucket while for other pumps money is being collected in case of a breakdown. The majority of the boreholes have been constructed by World Vision.

The WATSAN committees are functioning already for some years and, considering the state of the hand pumps, quite satisfactorily. The committees seem to be able to generate enough money for the necessary maintenance.

Sanitation

Sanitation: the following existing facilities have been registered:

- 5 KVIP latrines, each with 10 seats;
- 3 septic tank latrines also with 10 seats each;
- 3 bucket latrines with 12 seats each;

For each facility the seats are equally divided between men and women. Although a number of 10 conservancy labourers are available, it is still very difficult to establish a proper disposal system. To improve this system for the bucket latrines a pit has been dug behind the latrine for emptying the buckets. When the pit is full it can be emptied by a truck. For the public facilities people are paying 10 Cedis for a visit.

According to the information all the money which is being collected through the latrines and the hand pumps is being deposited at the bank. This money is being used for repair works.

The following facilities have been registered as domestic utilities;

- 16 water closets with septic tanks;
- 10 KVIP domestic latrines;
- an estimated 30 bucket latrines.

A KVIP latrine has been found under construction by the local people. The people were doing all the work themselves and no contractor was involved. All latrines are installed on so-called sanitary sites, which comprise also a waste dumping site. In Ejura there are 10 existing dumping sites, of which only 4 are officially approved.

NKORANZA

Water supply

Financed by a dutch NGO ORION a water supply system has been installed in Nkoranza, about 3 years ago. Orion had supplied the construction material, while the District Assembly had organised the local material and the local labour. The system consists of a spring protection from where the water is being pumped to a small reservoir at ground level. The water is being supplied to the people through 3 public taps, located within the built-up area. A committee has been formed by the local community to manage the system, which is already functioning for 3 years. The water is being pumped with a generating set and the intention is in the near future to realise a connection with the electricity-grid.

The water sellers sell tickets books comprising 10 tickets of 10 Cedis to the consumers; these tickets in turn are given to the security (in most cases or the seller) when water is collected.

The following persons are employed to run the system:

- 2 pump attendants;
- 3 water sellers;
- 1 watchman for the pump;
- 4 security men.

All these people are paid a salary.
The 2 pump attendants have been trained for the daily maintenance, while repairs are being carried out by a private organization in Kumasi, Hospital Engineering Services.

Also GWSC has been involved, during the eighties, in the construction of a water supply system with the following components:

- an intake at a river at a distance of 3.5 km from the town;
- a rising main with 150 2mm AC-pipes;
- an elevated steel reservoir of 20.000 gallons.

The system never functioned properly. According to the information, only once the water was pumped to the reservoir, but after some efforts the system has been abandoned. Afterwards GWSC did not have the means to carry out any repairs.

Furthermore, during the course of time, 12 boreholes have been drilled and equipped with a hand pump by GWSC and World Vision. The pumps are being managed by the local community and people are paying 10 Cedis for a bucket of water. 6 Pumps are out of order already for a long time. Repairs are not taking place, because the people do not like the quality of the water.

Sanitation
Concerning the public sanitation facilities the following can be reported:

- 6 KVIP latrines with 10 seats each;
- 6 bucket latrines also with 10 seats each.

As domestic facilities the people demand for water closets with septic tanks. Also in Nkoranza people are paying 10 Cedis for a visit to a public facility.

KINTAMPO

Water supply
At the moment the town does not have a functioning water supply system. During the colonial times a small scheme had been installed, but at the moment only 2 elevated reservoirs of 10.000 gallons each are remaining. The water had been pumped from a small spring. The system has been abandoned already for a long time. According to the information GWSC did not have the means for upgrading the existing system or installing a new scheme.

A great number of houses in Kintampo, especially in the lower part of the town, have dug wells with a very shallow ground water table (5-10 meters). On top of the wells a head wall has been installed with a pulley and a bucket. Most of the people show a certain awareness for clean water and try to protect the water from their wells against impurities.

Furthermore a number of 11 boreholes have been drilled during the course of time and have been equipped with a hand pump (India Mark II). All these boreholes have been drilled by the Catholic Mission. The hand pumps are being managed by representatives of the District Assembly. People are paying 10 Cedis for a bucket of water.

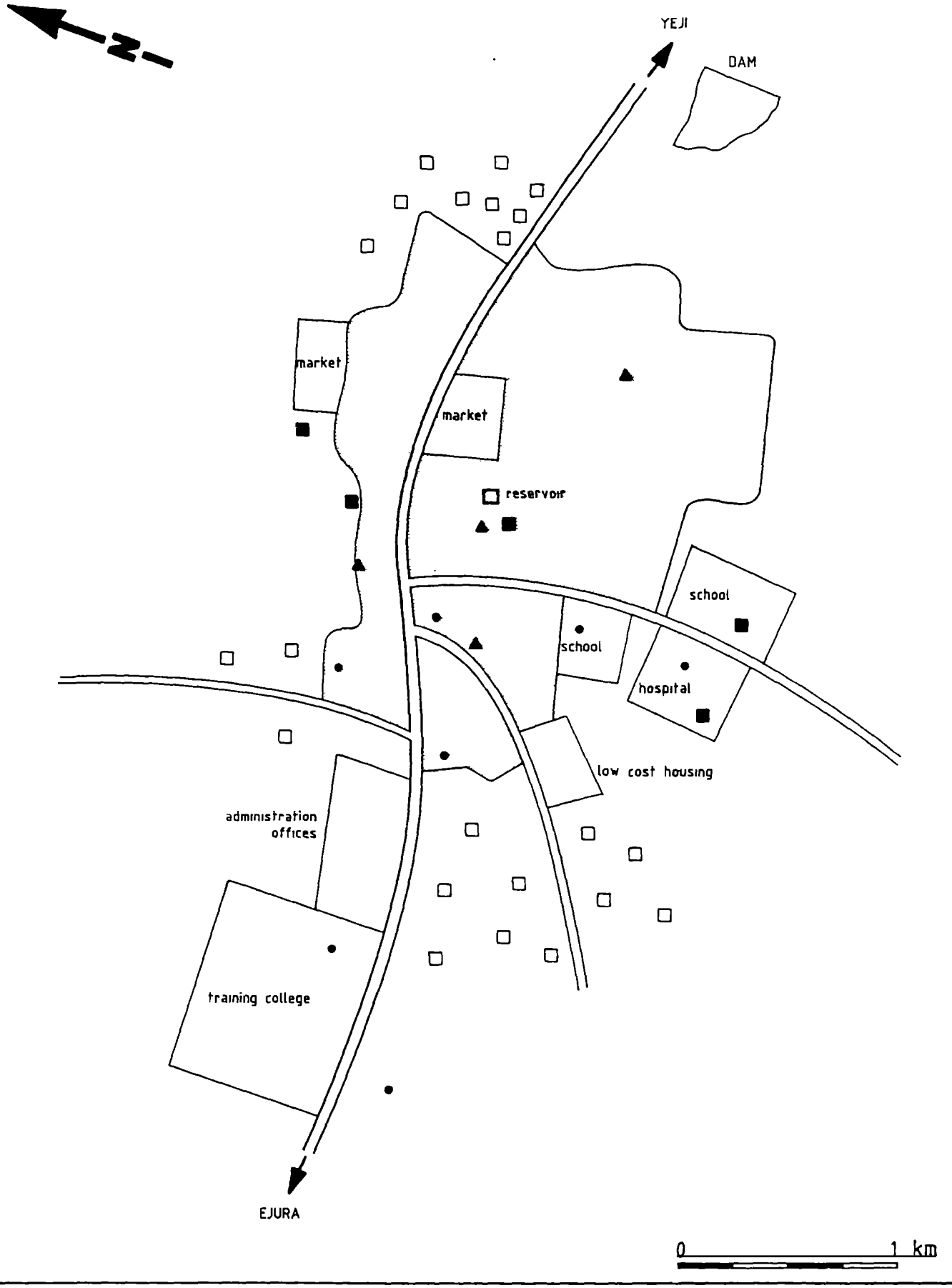
GWSC has no representative in this town. They have not been engaged in the drilling of boreholes as well.

Sanitation
As public sanitation facilities only KVIP-latrines have been constructed and no bucket-latrines. In total 7 KVIP-latrines with 22 seats each have been installed. People are paying 10 Cedis for a visit. The latrines are being managed by the local communities. During the discussions about a future sanitation project the people showed great interest in domestic KVIP-latrines, although still a few additional public facilities will be necessary. Even water closets with septic tanks have been requested by the people.

Some households do have a bucket-latrine but they do not like it very much. According to the information the idea of pit-latrines seems to be widespread within the district: every village has a pit-latrine and makes use of it.

A district assembly representative who has 3 KVIP-latrines in his area informed the mission that he collects an average of 50.000 Cedis every month for each latrine. This money is put on a bank account.

Like in the other 3 towns the District Assembly has organised sanitary sites within the town. On these sites the latrines have been constructed as well as dumping sites for solid waste.

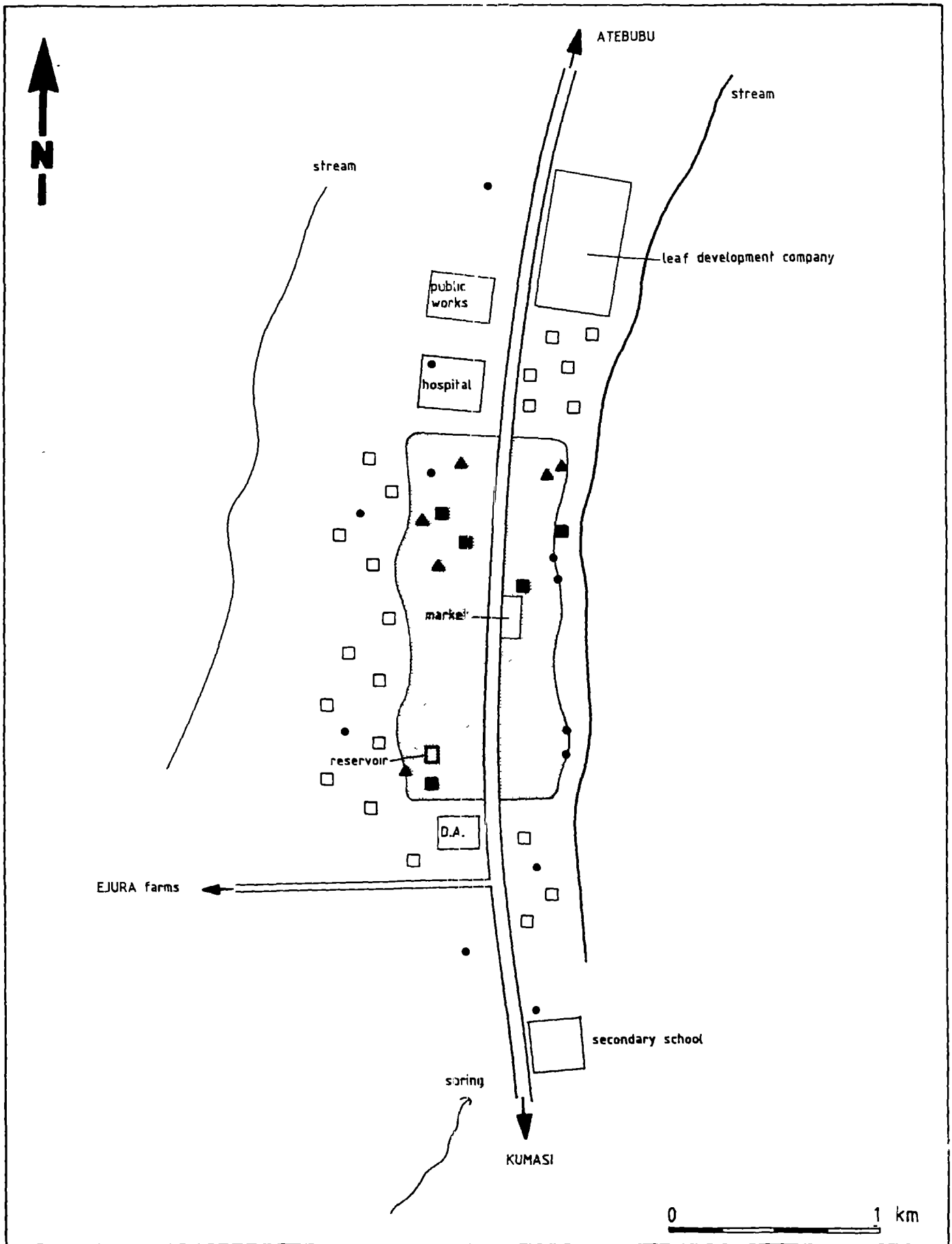


Legend:

- handpump
- KVIP latrines
- pan latrines
- built up area
- scattered habitation

Figure 1 Town map of ATEBUBU scale 1 : 25000

01-'94

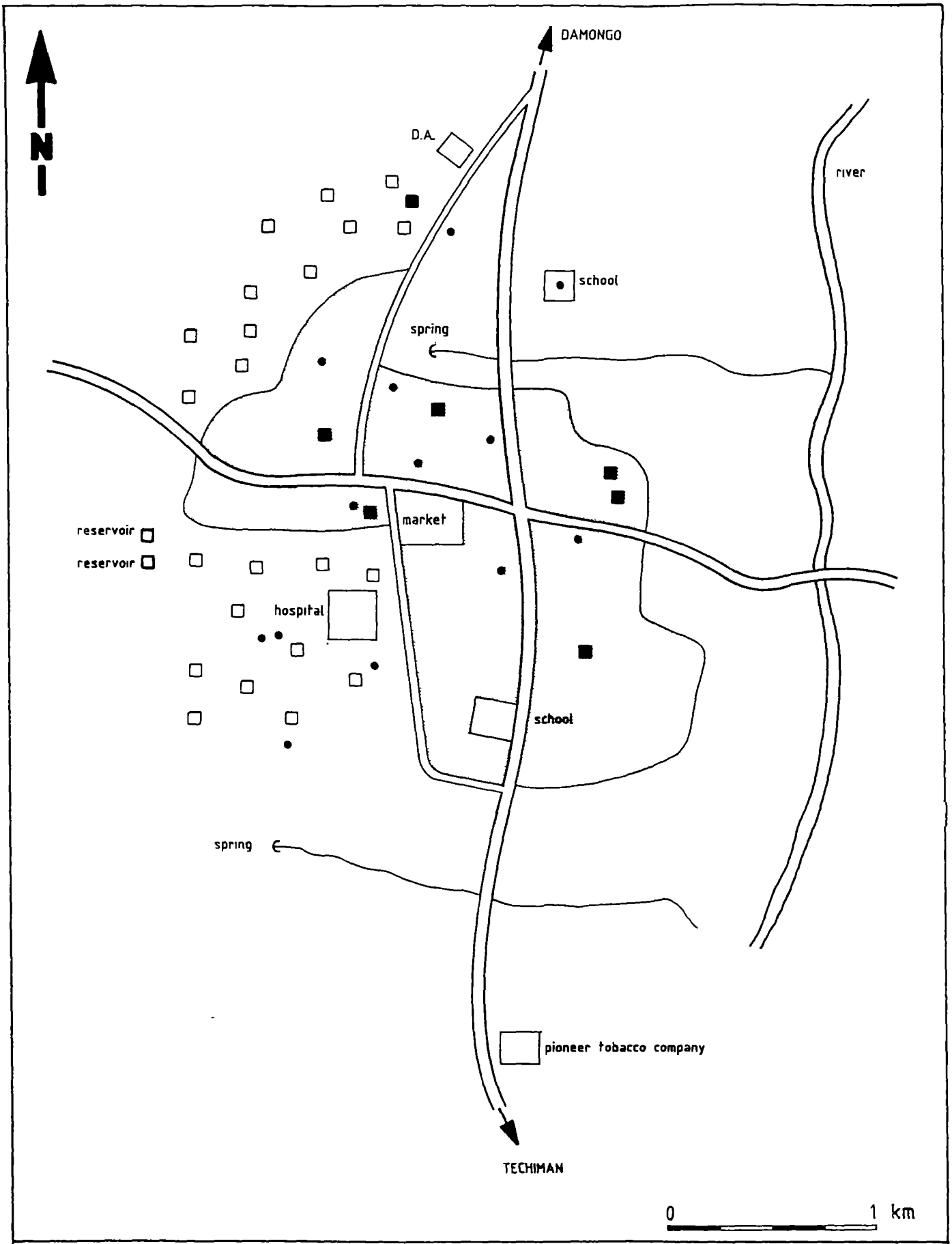


Legend:

- handpump
- KVIP latrines
- pan latrines
- built up area
- scattered habitation

Figure 2 Town map of EJURA scale 1 : 25000

01-'94

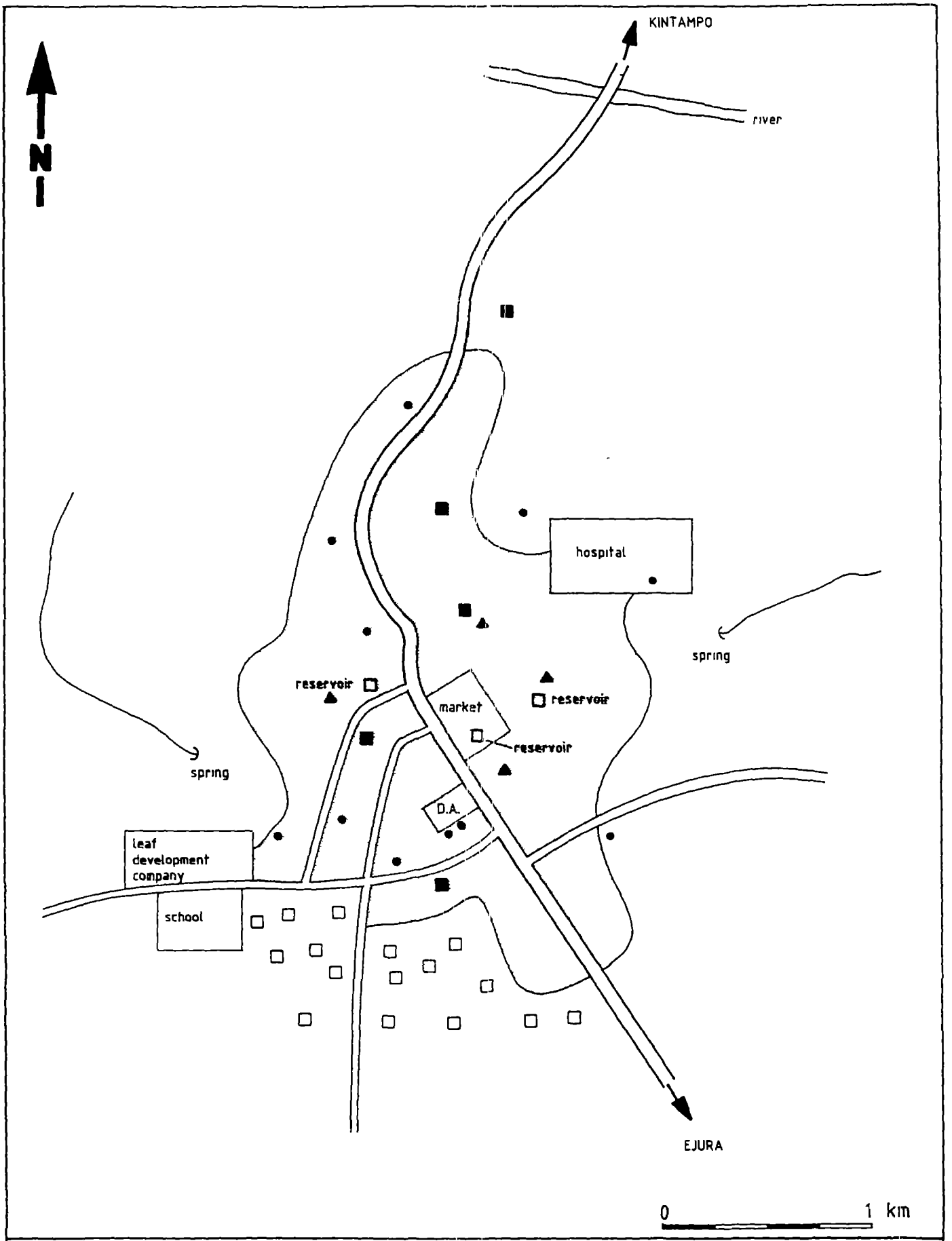


Legend:

- handpump
- KVIP latrines
- pan latrines
- built up area
- scattered habitation

Figure 3 Town map of KINTAMPO scale 1 : 25000

01-'94



Legend:

- handpump
- KVIP latrines
- pan latrines
- built up area
- scattered habitation

Figure 4 Town map of NKORANZA scale 1 : 25000

Appendix 8

Data of existing boreholes

Town/District	BH No.	Date of drilling	Borehole depth (m)	SWL (m)	Aquifer horizon (m)	Aquifer material	Yield (m^3/h)
Atebubu	BA/SB 123	29/10/1987	67.06	9.14		Clay	0.54
Atebubu	DS 27	06/12/1984	31	7.17	19 - 29	Decomposed Shale	0.48
Atebubu		07/12/1984	76				
Atebubu	A 10	28/08/1957	71.32	6.71	9.14 - 42.67	Shale	4.77
Atebubu			181				
Atebubu	DS 11	25/07/1984	160	13.89			0.036
Atebubu (Health Centre)	BA/SB 119	04/08/1987	36.58	10.67		Phyllite	2.7
Atebubu (Mission)		27/07/1984	178				
Atebubu (Mission)		23/07/1984	67				
Atebubu (School)		18/07/1984	142				
Atebubu (Sec. Sch.)	DS 19	21/08/1984	61	6.96	43 - 59	Sandy Shale	0.07
Atebubu (Training Co)	D 59	17/07/1984	103	7.13	97 - 100		0.1
Atebubu (USAID)	BA 57	07/08/1978	89.92	4.88		Shale	3.18
Ejura	A/2	07/01/1955	101.19	27.99		Sandstone/Shale	2.79
Ejura	A/80	18/12/1978	73.15	8.53			7.09
Ejura	A/95	10/06/1983	82.30	19.81			7.78
Ejura	A/65	18/05/1968	85.34	17.07		Phyllite/Sandstone	4.45
Ejura	A/3	12/03/1955	106.68	3.05			2.97
Ejura	A/94	16/08/1982	97.54	15.54			8.55
Ejura	A/85	18/05/1979	64.92	2.74			7.63
Ejura	A/9	08/02/1957	175.26	10.36			6.75
Ejura	A/93	02/04/1984	71.02	12.8			8.03
Ejura	A/78a	08/04/1978	63.09	Overflow		Sandstone	7.65
Ejura (Ejura Farms)	BA 66	30/06/1982	91.44	5.49		Phyllite	3.71

Kintampo	132	25/03/1988	45.72	15.24			1.62
Kintampo	BA/SB 129	04/03/1988	22.86	12.19		Clay/Granite	2.16
Kintampo	130	15/03/1988	32.0	13.72			3.24
Kintampo	131	17/03/1988	32.0	15.24			2.70
Kintampo	133	11/04/1988	60.96	18.29			1.08
Kintampo	BA 54	31/08/1977	121.92	16.46			5.04
Kintampo	134	13/04/1988	54.86	15.24			1.62
Kintampo (Health)	BJ 77	02/09/1985	30.5	15.9	20.7 - 22.9	Sandstone	
Kintampo (Middle)	BJ 76	30/08/1985	48.8	6.1	19.5 - 21.3	Clay	0.33
Kintampo (Mission)	DS 60	24/08/1988	49	28.27	40 - 47	Sandstone	4.2
Kintampo (Mission)	BJ 75	29/08/1985	42.7	15.9	22.9 - 39.6	Sandstone/Shale	0.9
Kintampo (Sch of Health)	BJ 145	21/04/1986	30.5	12.8	22.9 - 27.4	Sandstone	0.79
Nkoranza	BA 29		152.40	10.36		Sandstone	4.1
Nkoranza	BA 36		152.40	20.12	6.1 - 152.4	Sandstone	8.0
Nkoranza	BA 37		158.50	17.37	3.05 - 158.5	Sandstone	8.2
Nkoranza	BA 38		158.50	31.39	11.28 - 125.0	Sandstone	2.36
Nkoranza	BA 53	12/02/1975	148.74	12.80	45.7 - 74.7	Sandstone	6.61
Nkoranza (Hospital)	BJ 144	17/04/1986	68.6	22.9	45.7 - 57.9	Sandstone	0.79

Appendix 9

Cost Estimates

COST ESTIMATES

In order to calculate the cost estimates for the different options for a water supply scheme, various projects, executed by GWSC, have been examined. Unit rates have been derived from the report: "Planning Report on Dunkwa Water Supply" by JWP Watertech - Posch & Partners.

All construction cost figures used within this study are adjusted to a price level of the years 1994, 1995 and 1996 with the following inflation rates mentioned:

Inflation rates

Year	Foreign	Local
	Inflation rate (%)	Inflation rate (%)
1991	4.1[1)]	18.0[2)]
1992	4.1[1)]	10.0[2)]
1993	4.0	11.0[2)]
1994	4.0	10.0[2)]
1995	4.0	10.0
1996	4.0	10.0

1) Source: "Planning Report on Dunkwa Water Supply"
2) Source: Country report Ghana, 2nd quarter 1993, the Economist Intelligence Unit

The following unit rates have been utilized; in the prices for the PVC-pipes accessories are included. Physical contingencies have been estimated at 15% of the total amount for the construction works.

Unit rates

Description	Unit	1994	
		Unit price foreign US$	Unit price local Cedi (*1 000)
I **Water source**			
1 Borehole	LS		20 000
2 Spring protection	LS		12 000
II **Piping system**			
1 PVC ϕ 200 mm	m'	76	12
2. PVC ϕ 150 mm	m'	56	10
3. PVC ϕ 100 mm	m'	49	8
4 PVC ϕ 80 mm	m'	41	7
III **Reservoir**			
1. V = 50 m³	LS	105.000	19 000
2. V = 100 m³	LS	120 000	24.000
3. V = 200 m³	LS	165.000	36.000
4 V = 300 m³	LS	205.000	44.000
IV **E/M equipment**			
1 Power line 3 kV (1 km)	km	30 000	
2. Cable (1 km)	km	30 000	
3 Switch board	LS	20.000	
4 Standby genset	LS	15 000	

Table 1: DESIGN CRITERIA FOR LOW DEMAND OPTION

CRITERIA	ATEBUBU	EJURA	KINTAMPO	NKORANZA
1.POPULATION				
Population 1993	12,500	26,300	20,700	23,600
Population growth (%)	2.70	3.80	4.50	5.10
Population 2000	15,063	34,146	28,170	33,430
Coverage (%)	60	60	60	60
Population served	9,038	20,487	16,902	20,058
2.CONSUMPTION (l/c/d)				
Ratio h.c. (%)	0	0	0	0
Ratio p.t. (%)	100	100	100	100
Consumption hc (l/c/d)	75	75	75	75
Consumption pt (l/c/d)	15	15	15	15
3.SYSTEM CAPACITY				
Domestic demand (m3/d)	136	307	254	301
Leakage (%)	20	20	20	20
Total demand (m3/d)	169	384	317	376
Total demand (l/sec)	2.35	5.34	4.40	5.22

Table 2: COST ESTIMATES FOR LOW DEMAND OPTION

DESCRIPTION	UNIT RATES		ATEBUBU			EJURA			KINTAMPO			NKORANZA		
	US$	Cedis (*1.000)	QUAN	US$	Cedis (*1 000)	QUANT	US$	Cedis (*1 000)	QUANT	US$	Cedis (*1 000)	QUANT	US$	Cedis (* 1 000)
1.WATER SOURCE														
Borehole	20 000	0	2	40.000	0	3	60 000	0	3	60.000	0	0	0	0
Spring protection	11 000	600	0	0	0	0	0	0	0	0	0	2	22 000	1 200
Iron-removal Unit	100 000	0	0	0	0	0	0	0	0	0	0	1	100 000	0
2 PIPING SYSTEM														
PVC-diam 200/m	76	12	0	0	0	0	0	0	0	0	0	0	0	0
PVC-diam 150/m	56	10	0	0	0	1 500	84.000	15 000	4.300	240 800	43 000	0	0	0
PVC-diam 100/m	49	8	3.300	161.700	26.400	3.500	171.500	28 000	2.200	107 800	17.600	5 800	284 200	46.400
PVC-diam 80/m	41	7	11.500	471.500	80.500	6.000	246.000	42.000	8.300	340.300	58.100	9 500	389 500	66.500
3.RESERVOIR														
V= 50 m3	105.000	19 000	1	105.000	19.000	0	0	0	0	0	0	0	0	0
V=100 m3	120 000	24.000	0	0	0	1	120.000	24.000	1	120.000	24.000	1	120 000	24 000
V=200 m3	165.000	36.000	0	0	0	0	0	0	0	0	0	0	0	0
V=300 m3	205.000	44 000	0	0	0	0	0	0	0	0	0	0	0	0
4.E/M EQUIPMENT	95.000		1	95.000	0	1	95.000	0	1	95.000	0	1	95.000	0
5.CONNECTIONS														
House connection	p m.	p.m.												
Standpipe	3.500	1 600	41	143.500	65 600	11	38.500	17.600	48	168 000	76.800	51	178 500	81 600
SUB-TOTAL				1.016.700	191.500		815 000	126.600		1.131.900	219.500		1 189.200	219 700
PHYSICAL CONTINGENCIES (15%)				152.505	28 725		122.250	18.990		169 785	32.925		178 380	32.955
TOTAL				1 169 205	220.225		937 250	145.590		1.301.685	252 425		1.367.580	252.655
GRAND TOTAL (US$)				1.444.486			1.119.238			1.617 216			1.683 399	

Table 3: DESIGN CRITERIA FOR HIGH DEMAND OPTION

CRITERIA	ATEBUBU	EJURA	KINTAMPO	NKORANZA
1.POPULATION				
Population 1993	12,500	26,300	20,700	23,600
Population growth (%)	2.70	3.80	4.50	5.10
Population 2000	15,063	34,146	28,170	33,430
Coverage (%)	60	60	60	60
Population served	9,038	20,487	16,902	20,058
2.CONSUMPTION (l/c/d)				
Ratio h.c. (%)	20	20	20	20
Ratio p.t. (%)	80	80	80	80
Consumption hc (l/c/d)	75	75	75	75
Consumption hc (l/c/d)	30	30	30	30
3.SYSTEM CAPACITY				
Domestic demand (m3/d)	352	799	659	782
Leakage (%)	20	20	20	20
Total demand (m3/d)	441	999	824	978
Total demand (l/sec)	6.12	13.87	11.44	13.58

Table 4: COST ESTIMATES FOR HIGH DEMAND OPTION

DESCRIPTION	UNIT RATES		ATEBUBU			EJURA			KINTAMPO			NKORANZA		
	US$	Cedis (*1 000)	QUAN	US$	Cedis (*1 000)	QUANT	US$	Cedis (*1 000)	QUANT	US$	Cedis (*1 000)	QUANT	US$	Cedis (*1.000)
1.WATER SOURCE														
Borehole	20.000	0	4	80 000	0	5	100 000	0	4	80 000	0	3	60 000	0
Spring protection	11.000	600	0	0	0	0	0	0	0	0	0	2	22 000	1.200
Iron-removal Unit	100.000	0	0	0	0	0	0	0	0	0	0	1	100.000	0
2 PIPING SYSTEM														
PVC-diam 200/m	76	12	0	0	0	1 500	114 000	18.000	3.700	281.200	44 400	0	0	0
PVC-diam.150/m	56	10	2.800	156 800	28 000	2.300	128 800	23 000	1 700	95.200	17.000	4.900	274.400	49.000
PVC-diam 100/m	49	8	3 800	186.200	30.400	1.700	83.300	13 600	1.100	53.900	8.800	4.700	230.300	37.600
PVC-diam 80/m	41	7	8.200	336.200	57.400	6.000	246.000	42 000	8.300	340.300	58 100	7 300	299 300	51.100
3 RESERVOIR														
V= 50 m3	105 000	19 000	0	0	0	0	0	0	0	0	0	0	0	0
V=100 m3	120.000	24.000	1	120.000	24 000	0	0	0	0	0	0	0	0	0
V=200 m3	165 000	36.000	0	0	0	0	0	0	1	165 000	36 000	0	0	0
V=300 m3	205.000	44.000	0	0	0	1	205 000	44.000	0	0	0	1	205 000	44.000
4.E/M EQUIPMENT	95.000		1	95.000	0	1	95.000	0	1	95.000	0	1	95 000	0
5.CONNECTIONS														
House connection	p.m	p.m.												
Standpipe	3.500	1.600	41	143 500	65 600	11	38 500	17 600	48	168.000	76 800	51	178.500	81 600
SUB-TOTAL				1.117.700	205 400		1.010.600	158.200		1.278 600	241.100		1 464 500	264.500
PHYSICAL CONTINGENCIES (15%)				167 655	30.810		151 590	23.730		191.790	36.165		219.675	39.675
TOTAL				1 285.355	236.210		1.162.190	181.930		1.470 390	277 265		1.684.175	304.175
GRAND TOTAL (All in US$)				1 580 618			1.389 603			1.816.971			2 064 394	

Table 5: Consultancy

Description	Unit	Quantity	Unit rate	Amount	Sub-totals
Technical Assistance					
- Technical Advisor	month	24,0	15.000	360.000	
- Tickets Europe - Ghana	ticket	8,0	3.000	24.000	
					384.000
Engineering Consultants					
- Socio-economist (E)	month	3,0	15.000	45.000	
- Hydrogeologist (E)	month	3,0	15.000	45.000	
- Sanitary engineer (E)	month	4,5	15.000	67.500	
- Hydrogeologist (G)	month	3,0	3.500	10.500	
- Topographic surveyors	month	2,0	2.000	4.000	
- Sanitary Engineer (G)	month	7,5	3.500	26.250	
- Assist. Engineers	month	4,0	2.000	8.000	
- Draftsmen	month	8,0	1.500	12.000	
- Supervisor	month	36,0	2.000	72.000	
- TBN (E)	month	2,0	15.000	30.000	
					320.250
Community Development					
- Social Scientist (E)	month	6,0	15.000	90.000	
- Community Development Officers	month	24,0	2.000	48.000	
					90.000
Training					
- Training Specialist	month	12,0	2.500	30.000	
- Resource persons	month	12,0	2.500	30.000	
					60.000
Transportation and per-diems					
- transportation	month	24,0	1.000	24.000	
- per diems (month)	month	108,5	200	21.700	
- DSA	month	16,5	2.250	37.125	
- Tickets Europe-Ghana	ticket	12,0	3.000	36.000	
					118.825
Miscellaneous					
- Office costs	month	24,0	1.000	24.000	
- Fotocopies	LS		50.000	50.000	
Total					973.075

All amounts in US $

Table 6: Operating costs TAT/DWSTs and Miscellaneous

Description	Unit	Quantity	Unit rate	Amount	Sub-total
Miscellaneous					
- Geo-physical surveys	LS		15.000	15.000	
- Pumping test existing boreholes	LS		15.000	15.000	
- Test boreholes	LS		50.000	50.000	
- Training	LS		40.000	40.000	
- Contingencies and rounding (5%)				5.000	
Total					125.000
Operating Costs TAT/DWSTs					
TAT Personnel					
- Sanitary Engineer	month	24,0	250	6.000	
- CD Coordinator	month	24,0	250	6.000	
- Accountant	month	24,0	150	3.600	
- Secretary	month	24,0	100	2.400	
- Driver (2)	month	48,0	50	2.400	
					20.400
Investment					
- Officer furniture, photocopier, computer	LS		20.000	20.000	
- 4 wheel drive	LS		30.000	30.000	
- car	LS		20.000	20.000	
					70.000
Operating costs					
- TAT	month	24,0	2.000	48.000	
- DWST (4)	month	96,0	500	48.000	
					96.000
Total					311.400

All amounts in US $

N.B.

Foreign currency component (US $):	195.000
Local currency component (Cedis):	93.120.000

Table 7: Investment Schedule

Description	1995 Foreign	1995 Local	1996 Foreign	1996 Local
Water Supply				
Water sources	320.000		122.000	1.200
Piping system			2.825.900	478.400
Reservoir			695.000	148.000
E/M Equipment			380.000	
Connections			528.500	241.600
Sub-total	320.000	0	4.551.400	869.200
Sanitation		160.200		213.600
Consultancy	546.075		427.000	
Operational costs & Miscellaneous	195.000	46.560		46.560
Physical Contingencies				
Water supply (15%)	48.000	0	682.710	130.380
Sanitation (5%)	0	8.010	0	10.680
Consultancy (5%)	27.304	0	21.350	0
Operational costs (5%)	9.750	2.328	0	2.328
Sub-totals				
Water supply	368.000	0	5.234.110	999.580
Sanitation	0	168.210	0	224.280
Consultancy	573.379	0	448.350	0
Operational costs	204.750	48.888	0	48.888
TOTAL	1.146.129	217.098	5.682.460	1.272.748
Price contingencies				
Factor	1,04	1,10	1,08	1,21
Amount	45.845	21.710	463.689	267.277
GRAND TOTAL	1.191.974	238.808	6.146.149	1.540.025
GRAND TOTAL (all in US $)	1.490.484		8.071.180	

Appendix 10

Financial Evaluation

SPECIFICATION OF THE MODEL FOR FINANCIAL EVALUATION

- Personnel:
  Small piped system
  - 50.000 cedis/month (1 mechanic, occasional labour);
  Nuclear piped system:
  - 200.000 cedis/month (2 mechanics, occasional labour, allowance WUA office and accountant);
- Energy: 35 Cedis/KWh
- Maintenance: annual costs correspond with 5% of the value of electro-mechanical;l equipment;
- Miscellaneous: 200,000 cedis/month (lump sum covering administrative expenditures and overheads); nuclear piped systems only;
- Depreciation: linear;
  economic life electro-mechanical equipment: 7 years;
  economic life other equipment: 40 years;
- Selling expenses: cost estimates include a commission of 20% for tap attendants and/or collectors.

1 US $ = 800 cedis

The 3 following tables give for each scenario a model profit & loss statement for one month, assuming that water consumption is in line with the assumptions of the scenario.

Also O&M costs, recurrent costs and full costs per m^3 have been established. Recurrent costs are the O&M costs and the depreciation for equipment with a short economic life expectancy, i.e. the electro-mechanical equipment.

Scenario: Small piped system

Specific Consumption (l/c/d)	20
Population served	2.400
Water sold (m^3/month)	1.464
Water losses (month)	
- %	20%
- m^3	366
Water produced (m^3/month)	1.830
Costs	
- Personnel	50
- Energy	22
- Maintenance	167
- Depreciation	
- E/M Equipment	476
- Other assets	250
- Total	965
Cost price (cedi/m^3)	
- O&M	156
- Recurrent costs	469
- Full costs	633
Investments (US $)	
- E/M Works	50.000
- Other Works	150.000
- Total	200.000

Scenario: Nuclear piped system - low demand

Town:	Atebubu	Ejura	Kintampo	Nkoranza
Annual Growth	12.500	26.300	20.700	23.600
Population 1993	2,7%	3,8%	4,5%	5,1%
Population 2000	15.063	34.146	28.170	33.430
Coverage (%)	60%	60%	60%	60%
- Public Taps	100%	100%	100%	100%
- House Connections	0%	0%	0%	0%
Specific Consumption (l/c/d)				
- Public Taps	15	15	15	15
- House Connections				
Population served	9.038	20.487	16.902	20.058
- Public Taps	9.038	20.487	16.902	20.058
- House Connections	0	0	0	0
Number of connections				
- Public Taps	30	68	56	66
- House Connections	0	0	0	0
Water sold (m^3/month)	4.135	9.373	7.733	9.176
- Public Taps	4.135	9.373	7.733	9.176
- House Connections	0	0	0	0
Water losses (month)				
- %	20%	20%	20%	20%
- m^3	1.034	2.343	1.933	2.294
Water produced (m^3/month)	5.168	11.716	9.666	11.471
Costs				
- Personnel	200	200	200	200
- Energy	62	141	135	229
- Maintenance	364	364	364	364
- Miscellaneous	200	200	200	200
- Depreciation				
- E/M Equipment	1.040	1.040	1.040	1.040
- Other assets	2.225	1.683	2.513	2.624
- Total	4.092	3.629	4.453	4.658
Cost price (cedi/m^3)				
- O&M	192	93	112	104
- Recurrent costs	433	199	241	213
- Full costs	950	372	553	487
Investments (US $)				
- E/M Works	109.250	109.250	109.250	109.250
- Other Works	1.335.236	1.009.988	1.507.966	1.574.149
- Total	1.444.486	1.119.238	1.617.216	1.683.399

Scenario: Nuclear piped system - high demand

Town:	Atebubu	Ejura	Kintampo	Nkoranza
Annual Growth	12.500	26.300	20.700	23.600
Population 1993	2,7%	3,8%	4,5%	5,1%
Population 2000	15.063	34.146	28.170	33.430
Coverage (%)	60%	60%	60%	60%
- Public Taps	80%	80%	80%	80%
- House Connections	20%	20%	20%	20%
Specific Consumption (l/c/d)				
- Public Taps	30	30	30	30
- House Connections	75	75	75	75
Population served	9.038	20.487	16.902	20.058
- Public Taps	7.230	16.390	13.522	16.046
- House Connections	1.808	4.097	3.380	4.012
Number of connections				
- Public Taps	24	54	45	53
- House Connections	225	512	422	501
Water sold (m^3/month)	10.733	24.366	20.095	23.851
- Public Taps	6.616	14.997	12.372	14.682
- House Connections	4.118	9.370	7.723	9.168
Water losses (month)				
- %	20%	20%	20%	20%
- m^3	2.683	6.092	5.024	5.963
Water produced (m^3/month)	13.416	30.458	25.118	29.813
Costs				
- Personnel	200	200	200	200
- Energy	161	365	352	596
- Maintenance	364	364	364	364
- Miscellaneous	200	200	200	200
- Depreciation				
- E/M Equipment	1.040	1.040	1.040	1.040
- Other assets	2.452	2.134	2.846	3.259
- Total	4.418	4.304	5.003	5.659
Cost price (cedi/m^3)				
- O&M	83	45	53	55
- Recurrent costs	176	86	103	97
- Full costs	395	170	239	228
Investments (US $)				
- E/M Works	109.250	109.250	109.250	109.250
- Other Works	1.471.368	1.280.353	1.707.721	1.955.144
- Total	1.580.618	1.389.603	1.816.971	2.064.394

Appendix 11

Project Activities

PRELIMINARY INVESTIGATIONS

1. Socio-economic survey
   - Map the "zero" situation of 4 towns:
     - demography (inhabitants per unit area, composition, household size, witnessed growth, etc.);
     - household budgets (family budgets, water and sanitation related expenditures, source of income, etc.);
     - economic activities;
     - water usage (actual (specific) consumptions, sources, periodic fluctuations, etc.);
     - sanitary practices (hygiene, facilities, etc.);
     - preferences for water supply and sanitation (service level, quality, price, etc.)
   - Specific outputs: Real water demand (quantities per unit area, percentages public taps and house connections, actual and planning horizon, etc);
2. Hydrogeological investigations
   - Survey of existing water sources (inventory, establishments of actual yield (long duration pumping tests) and water qualities);
   - Well siting (interpretation of satellite images and aerial photographs, geo-physical investigations);
   - Test drilling (optional and will be decided during the investigation);
   - Specific outputs: proposal for water sources (expected yields, locations);

PROJECT IMPLEMENTATION

1. Mobilization:
   - Recruitment of Technical Assistance Team;
   - Establishment of a DWST in each town;
   - Logistics;
   - Specific outputs: properly established TAT and DWSTs.

Institutional Strengthening

1. Implementing organization:
   - Elaboration of implementing organizations (MLG&RD and DWST):
     - Organization charts;
     - Identification of tasks and responsibilities;
     - Job descriptions;
   - Implementation procedures;
   - Establishment of a financing mechanism for subsidies for sanitation;
2. Training
   - Training Needs Analysis;
   - Elaboration of training plan;
3. Training
   - Development of training materials;
   - Implementation of training plan:
     - project personnel;
     - private sector technicians/artisans;
     - community based cadres;
   - Monitoring, evaluation, and feed-back
4. Counselling and Performance Monitoring

Water supply

1. Topographic surveys
   - Topographic surveys;
   - Specific output: base maps of each town, scale 1:2,000
2. Preliminary design
   - Preliminary design;
   - Cost estimates;
   - Specific output: proposals for water supply improvements in the 4 towns with detailed cost estimates.
3. Detailed design and preparation of tender documents
   - Detailed design of main systems
     - production units;
     - reservoirs;
     - main distribution system;
   - Preparation of tender documents:
     - drilling;
     - supply and installation of electro-mechanical components;
     - civil works (supply and laying of pipes, construction of reservoirs and miscellaneous works);
   - Specific output: tender documents
4. Tendering
   - Evaluation of bids;
   - Contract negotiations and awards;
   - Specific output: contracts with competent contractors
5. Construction
   - Construction of the main systems;
   - Supervision during construction;
   - Contract management;
   - Commissioning
   - Specific output: operational systems

Community Development

1. Assessment of the social structure of the communities
   - Map the social structure of the communities, establish the most appropriate unit areas for WUGs, and identify the community leaders who might take a role in either a WUG or the WUA;
   - Specific output:
     - proposal for unit areas;
     - evaluation of the possibilities for community based management;
2. Development of strategies for community development:
   - Establishment of sequence of activities;
   - Establishment of a catalogue with options containing standard designs, specifications and cost estimates:
     - water supply;
     - sanitation;
   - Design of a hygiene education programme;
   - Field testing of developed materials
   - Specific outputs: field manual containing the project strategy for community development with all planned interventions and supporting materials.

3. Mobilization and organization of the communities
   The implementation will follow a specific project at community level which will pass through a number of activities comprising community mobilization, and development of communal groups (WUAs and WATSAN Committees). A typical set of activities would read as follows:

   a. Mobilization
      - Information of the population;
      - Establishment of WATSAN Committees and WUAs;
      - Specific outputs: WATSAN Committees and WUAs.

   b. Development of WUAs
      - Defining WUA set-up:
        - charter;
        - tasks and responsibilities;
        - job descriptions of key job holders;
      - Recruitment:
        - Election of the WUA "office";
        - Selection and recruitment of WUA personnel;
      - Training:
        - "office" members WUA;
        - WUA personnel;
        - supervision during construction;
      - Organization Development:
        - procedures;
        - contractual arrangements (MLG&RD, WUGs);
        - revenue collection mechanisms;
        - arrangements for complex maintenance and counselling;
      - Commissioning and handing over
      - Specific outputs:
        - functional WUAs;
        - functional water supply systems

   c. Development of WATSAN Committees
      - Preparation of a "Facilities and Management Plan";
      - Improvement of water supply:
        - finalize contract with DA and WUA;
        - final configuration of the water supply systems;
        - collect contribution of the population;
        - organize revenue collection;
      - Assist in hygiene education;
      - Assist in environmental sanitation:
        - communal sanitary facilities;
        - drainage;
        - waste collection and dumping.
      - Specific outputs:
        - functional WATSAN Committees;
        - implemented "Facilities and Management Plans"

2. Water Supply
   - Detailed design of sub-systems (participative design in collaboration with the WUAs/WATSAN Committees;
   - Collection of the contribution of the population;
   - Construction of the sub-systems (local contractors);
   - Operation of the sub-system;
   - Specific outputs: sustainable water supply systems constructed in line with the preferences of the communities;
3. Sanitation
   - Support of the DWST;
   - Promotion of sanitary facilities (for excreta disposal);
   - Promotion of a local construction capacity for sanitary facilities (training and certification of small contractors/artisans);
   - Administering a financing mechanism for subsidies for sanitary facilities;
   - Specific outputs: functioning sanitary facilities at house-hold level
4. Hygiene Education
   - Support of the DWST;
   - Promotion through mass-media;
   - Extension activities at group level
   - Specific outputs:
     - increased demand for safe drinking water;
     - increased demand for sanitary facilities;
     - proper hygienic practices related to water and sanitation.

Appendix 12

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Appendix 13

Photographs of project towns

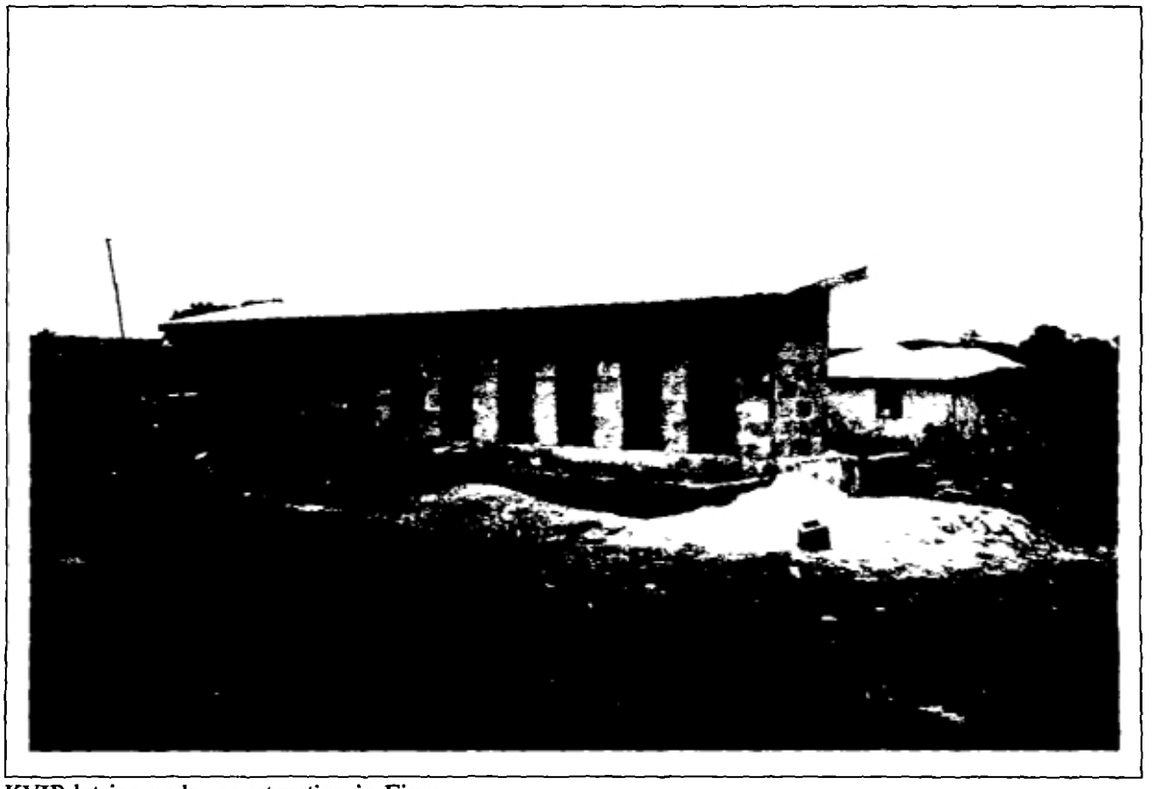
Standpipes for community managed water supply system in Nkoranza

Handpump in Kintampo

Sanitary conditions in Atebubu

Privately owned shallow well in Kintampo

Properly organized KVIP-latrine in Kintampo



KVIP-latrine under construction in Ejura

Steep descent to spring in Kintampo

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