

Regional Water Programme



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Report 6

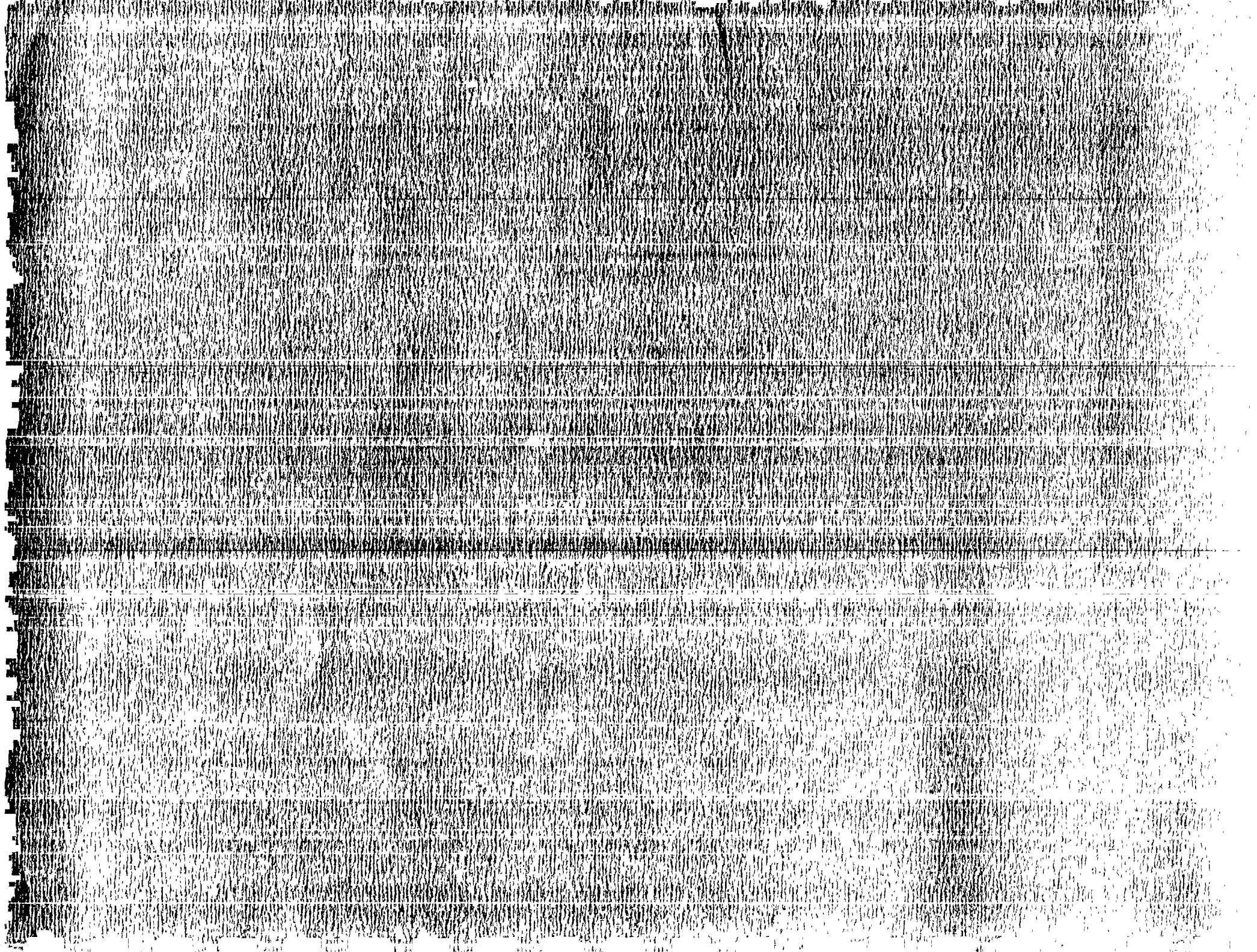
# Summary of the Evaluation

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Prepared by  
CANADIAN INTERNATIONAL DEVELOPMENT CENTRE

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GHANA UPPER REGION WATER PROGRAMME EVALUATION PROJECT

REPORT 6  
EXECUTIVE SUMMARY

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The opinions expressed in this report are those of the authors and do not necessarily reflect the views of CIDA, GWSC, or MFEP.



## GHANA UPPER REGION WATER PROGRAMME EVALUATION PROJECT

The six evaluation reports of the project are as follows:

- |          |   |
|----------|---|
| REPORT 1 | Technological Evaluation of Urban and Rural Water Supply Systems                            |
| REPORT 2 | Part I: Political and Economic Context<br>Part II: Project Expenditures and Economic Issues |
| REPORT 3 | Review of Programme Organization and Management   |
| REPORT 4 | Evaluation of the Education and Participation Components                                    |
| REPORT 5 | Results of a Social Survey of Water Drawers   |
|          | Technical Appendix One: Survey Methodology  |
|          | Technical Appendix Two: Survey Area Maps and Profiles                                       |
|          | Appendix Three: The Anthropology of Water, Health and Hand-pumps                            |
| REPORT 6 | Summary of the Evaluation   |



## LIST OF ABBREVIATIONS

CE	Community Education
CHC	Canadian High Commission
CIDA	Canadian International Development Agency
CPP	The Convention Peoples' Party
CSM	Cerebral Spinal Meningitis
CUSO	Canadian University Students Overseas
FHIG	Family Health in Ghana
GOG	Government of Ghana
GRAAP	Groupe de Recherche et d'Appui pour l'Autoproration Paysanne (Group for Research and Support to Present Self Development)
GWSC	Ghana Water and Sewerage Corporation
ISSER	Institute of Statistical, Social and Economic Research
MFEP	Ministry of Finance and Economic Planning
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NLC	National Liberation Council - First Military Government formed after the overthrow of Nkrumah in 1966
NPP	The Northern Peoples' Party
NRC	National Redemption Council - Second Military Government formed after the overthrow of the Busia government in 1972
ORT	Oral Rehydration Treatment
PCV	Peace Corp Volunteer
PNDC	Provisional National Defense Council - the Military government instituted after the overthrow of Limman's government in 1981
PNP	Peoples' National Party
POP	Plan of Operation
PP	Progress Party
RWSU	Rural Water Supply Unit
SMC	Supreme Military Council - new name of the NRC after a reshuffle
SPSS	Statistical Package for the Social Sciences
URs	Upper Regions
URADEP	Upper Region Agricultural Development Project
URPE	Upper Region Programme Evaluation
VEW	Village Education Worker
VHws	Village Health Workers
WHO	World Health Organization
WS	Water Storage
WSA	Water Storage Area
WUCs	Water Users Committees





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THE UPPER REGION WATER SUPPLY PROGRAMME

For over a decade, the Canadian International Development Agency (CIDA) has been extensively involved in a programme to provide the people of the Upper Regions\* of Ghana with an assured supply of potable water (Figure 1). Prior to CIDA's involvement, most of the Upper Regions' rural population, numbering some 860,000 in 1970, had very limited access to potable water and the traditional supplies

In response to your request for other information, reports, etc., I am sending you under separate cover Reports No. 4, 5 and 6 of our Ghana Upper Region Water Utilization project's evaluation. As well, I am sending you annexes on methodology and evaluation which may prove useful for your library, in addition to Report No. 4 which is an evaluation of the education program. The research project, in fact, took one year in the field to complete for CIDA. I think you will find them quite useful. Please restrict the circulation of these reports to work within your organization pending a CIDA corporate decision on the range of distribution of these documents.

As other reports come to my attention, I shall send them off to you. We have actually begun to make summary reports (two pages) of evaluations done. The intent is in fact to circulate these to organizations such as IRC to improve our exchange of information on projects with feedback to those planning others.

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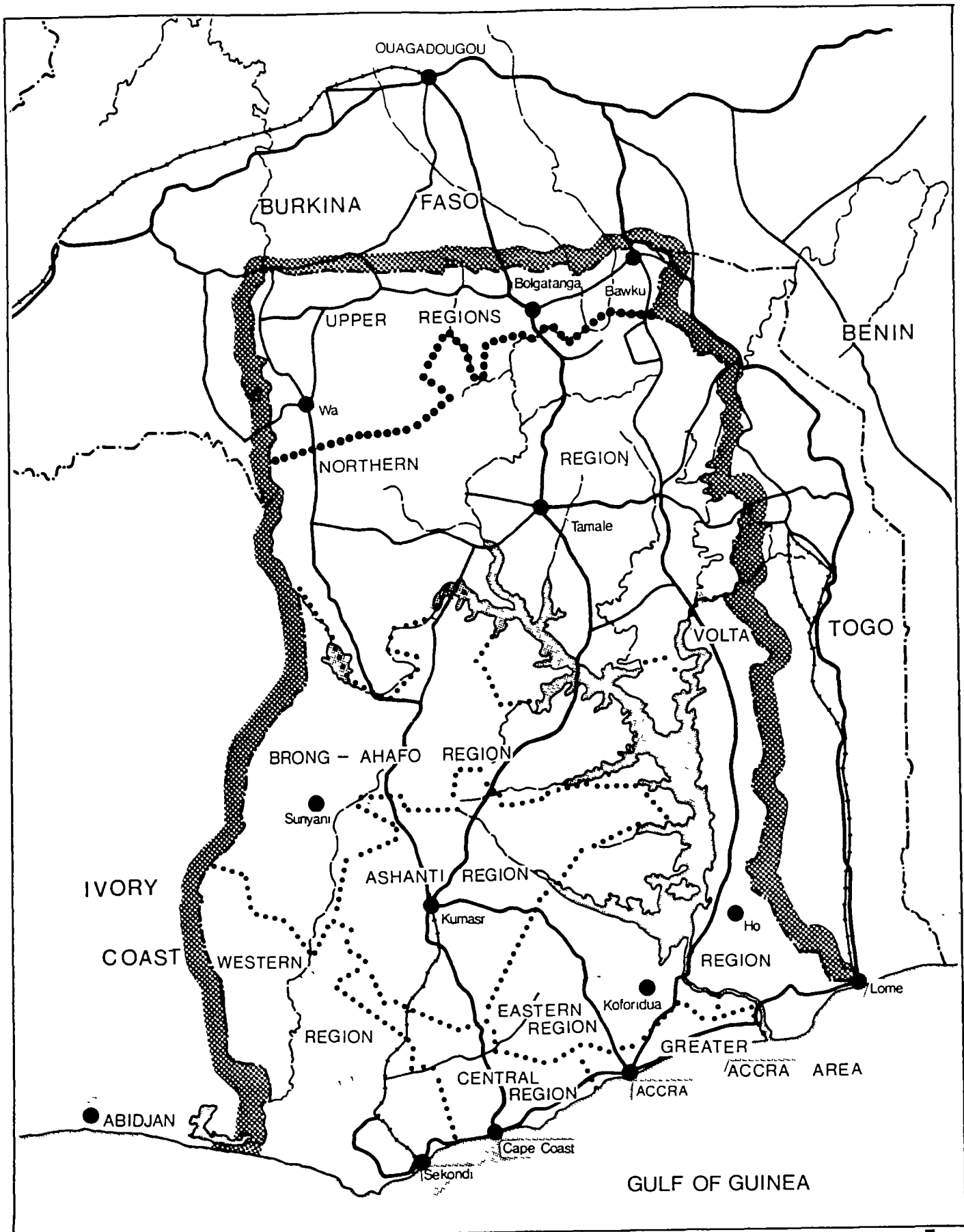


Figure 1 Map of Ghana





development components intended to develop the necessary expertise within the local population to sustain the system beyond its incipient stages. Phase I of WUP ended in 1983 and a second phase is now underway.

A Primary Health Care project, to be implemented simultaneously with WUP, was started in the Upper Regions but subsequently discontinued due to a lack of Government of Ghana support.

The Upper Region Maintenance/Stabilization Project started in early 1983. The project objective was to increase the operational reliability of rural and urban water supplies. This included: the replacement of 1,200 Beatty hand-pumps originally installed in URWSP Phase I; the provision of vehicles, equipment, and spare parts; and the provision of technical assistance.

The implementation of the Upper Region Water Supply Programme spanned a period of considerable political and economic turmoil in Ghana. When the programme was in the planning and early implementation stages (1972 to 1976), Ghana's economy was relatively strong and the northern regions of the country were in a period of political strength. In the late 1970's and into the early 1980's, the economy of Ghana experienced a period of severe decline characterized by hyperinflation and disinvestment, and a serious shortage of foreign exchange which affected the ability of the Government of Ghana to meet its commitment to programme implementation, its ability to maintain the infrastructure that was put in place, and it also affected the role of CIDA which was required to assume a greater share of the financial costs of the programme.

#### THE EVALUATION

In 1983, CIDA commissioned a comprehensive evaluation of the Upper Region Water Supply Programme. Its purpose was to assess the impacts that the Programme has had on the Upper Regions, to investigate the salient programme design and implementation issues, and to help provide a basis for planning future water-related development projects. The evaluation involved an investigation of the effects of rural hand-pumps on drawers of water, an evaluation of the choices of rural and urban water supply technologies, an





evaluation of the education programme, a review of the organizational and management issues related to programme implementation and operation, and a review of project economics. It provides a comprehensive evaluation of the programme as of the end of 1985.

#### OVERALL EVALUATION STATEMENT

The evaluation has concluded that the Ghana Upper Region Water Supply Programme has been a qualified success.

The rural hand-pump project has successfully introduced and maintained 2,500 pumps which are the main source of reliable potable water for some 600,000 - 700,000 people. This has been achieved, however, after failures of early pump designs and only with sustained support by CIDA of the maintenance operation.

At a time when rural water programmes elsewhere are failing faster than new ones can be built, the Upper Region Water Supply Programme has consistently kept 80% or more of the pumps operating at any one time.

Although women were largely excluded from participation in the programme, for example as pump caretakers, their lives have been significantly eased through the provision of a closer source of water, particularly in the dry season.

The programme has helped to provide one of the necessary conditions for improved health and there is some evidence that there have been direct health benefits of reduced guinea worm and possibly, a decline in diarrhoea among young children.

The urban water supply projects are now complete but have not lived up to expectations. The evaluation of their impact upon urban dwellers has not been studied but it is widely acknowledged that there are problems of intermittent supply and inequitable distribution, particularly to peri-urban areas without household connections.

Inappropriate designs, ambiguous management roles, and a critical lack of local resources have adversely affected project implementation and a shortage of operating funds has meant low levels of water production.



After five years of effort, no more than a start has been made in providing education in the rural areas on the utilization of water. Inadequate resources, inappropriate messages, the use of volunteer educators, a questionable emphasis upon latrines in areas of low population density, and a concern to create project-specific water users' committees, rather than expand the mandate of other rural committees, resulted in a thinly stretched and inefficient project. Exposure to the education provided under WUP has been low and has resulted in no discernible changes in domestic hygiene.

Difficulties in the programme can be attributed to the dramatic decline in Ghana's economy during the course of the programme; the large scale of the programme undertaking, and to the pioneering nature of many of the programme elements.

In choosing to stay and expand its programme to compensate for Ghanaian financial and technical deficiencies, CIDA has displayed creditable courage and faith in Ghana at a time when many other aid agencies were reducing their involvement.

## IMPACTS OF THE PROGRAMME

### Impacts of Hand-Pumps

The URWSP has successfully introduced 2,500 hand-pumps and the Ghana Water and Sewerage Corporation with CIDA assistance, has maintained at least 80% operation at any one time.

It is estimated that the 2,500 hand-pumps installed under the URWSP provided one pump per 400 rural residents of whom about 60% reside within 800 metres. This means that over 600,000 people in the Upper Regions are within 800 metres of a hand-pump.

Source choice is based mainly on relative proximity, especially in the wet season although hand-pumps are the preferred source of water when within a reasonable distance. Where pumps are not accessible, water is drawn from dugouts in river beds or by dams.

Hand-pumps have not increased per capita water consumption. Water consumption from all sources increases in the dry season, but there is no significant difference between villages with pumps and those without.



The major impact of the pump has been to provide a closer source of water, particularly in the dry season, and reduce the energy utilized in transporting water to the compound. On average, those with access to a hand-pump walk about 700m less per collection in the dry season than those without access to a pump. A major inferred impact has been a decrease in energy expended by women in water collection and a reduction in body stress resulting from water transportation. Where pumps are relatively uncrowded and waiting time at the pump is low, the time spent on water collection has also decreased.

Pumps are more heavily used in the dry season when overcrowding at the pump site is seen by collectors as more problematic, particularly in the peak drawing periods during the morning and late afternoon. Of those with access to pumps, almost two-thirds (63%) use them in the wet season and almost three-quarters (72%) in the dry season. On average, a pump is used by 215 drawers per day in the dry season and 142 drawers per day in the wet season.

Every respondent who drew water from a hand-pump reported using it for drinking and cooking; almost all for bathing and washing clothes. Only a minority used hand-pump water for their animals in the wet season although most used it in the dry season for this purpose. On average, about 22 litres per capita is collected each day in the wet season, compared with 25 litres per day during the dry season.

Although males in all areas prefer to bathe in their compound with water brought to the water storage area, more males in areas with access to a pump appear to collect their own bathing water than those without access to a pump.

Reliable and potable water supplies are usually seen as a necessary but non-sufficient condition for the improvement of health, for which other inputs such as nutrition, access to medical infrastructure and health education are also required. However, in the Upper Regions it appears that the hand-pumps alone have improved selected aspects of health.

Families with access to hand-pumps reported a lower rate of diarrhoea among their young children. This finding was also



confirmed by comparing rates of presence of diarrhoea at clinics whose catchment areas include many pumps with one clinic located in an area with no pumps.

Survey respondents from samples with access to pumps also reported significantly lower rates of guinea worm within the last year than those without access to hand-pumps. However they also reported lower historical rates which suggests the lower prevalence may pre-date the pump installation.

A small number of pumps were tested for faecal coliform contamination in both seasons. The water quality of most non-pump sources used for drinking water (principally dugouts) was found to be as good as hand-pump water. This suggests that all traditional water sources in the Upper Regions cannot be assumed to be contaminated. Therefore, the main effect of hand-pumps has been to increase the reliability of the quantity and quality of water, not to provide potable water where it previously did not exist.

#### Impact of the Village Education Programme

From the results of the social survey, other research activities and the evaluation project's own assessment of the educational programme, it is concluded that no more than a start has been made to addressing the educational tasks.

The water utilization education aimed to promote the use of hand-pump water, instill an appreciation of clean water, and improve practices involved in the collection, transport, storage and distribution of water, and other aspects of domestic hygiene. The major medium of water utilization education was through volunteer Village Education Workers (VEWs). Each was expected to utilize a standard set of visuals to give three talks at each of 10 pumps each year. The main findings of the evaluation are:

- . Only a small minority of those with access to the water utilization education report any exposure to it.
- . Some of the intended education messages do not reach the audience. Many people already practice some of the messages while some important information has been omitted.
- . Those with exposure to any health education recall an average of five items immediately afterwards and less than two items some time later.





- . VEWs were effective disseminators of information but not well utilized.
- . Access to education is associated with higher hand-pump use and attachment of value to clean water. However, given the low level of reported exposure to the education, it is unlikely that this is a causal relationship.
- . Access to education is not associated with improved domestic hygiene.
- . Access to education is probably associated with a higher level of pump site development (construction of extended pads and cattle troughs, site maintenance).
- . Involvement by other extension agencies in water education is negligible but could be significant. There was no evidence that any other extension organization had incorporated any water messages or related activities into their programme as a result of community outreach.
- . Pump caretakers could be more effective in the monitoring of pump conditions and fault reporting with better training.
- . The social development aspects of promoting participation and good utilization were largely overshadowed by a (correct) concern to keep the hand-pumps operative.

These results have arisen because of the following factors:

- . The Community Education Programme has existed for only two years in the area of research, though other educational programmes have existed for many years.
- . The education and participation activities were outside the mandate of the Ghanaian counterpart agency.
- . The donor and recipient were inexperienced in providing software support to hardware projects.
- . Inadequate human resources were allocated to these activities, most particularly at the senior levels. CIDA provided only approximately four person-years of advice between 1981-84 with some weeks of consultant input. GWSC as a water supply agency had substantial problems in recruiting appropriate social development staff.
- . The development of the educational content, delivery system and materials did not follow any recognized procedure, and was based more on hunch and preconception than research and experimentation.
- . An unjustified reliance was placed on the untested method of volunteer Village Education Workers.



- . WUP wasted some of its resources on latrines, which offer a relatively low return to health in this context, and are seen by many villagers as unnecessary in their areas of low population density.
- . Villagers were unnecessarily encouraged to form Water Users' Committees to select and supervise a pump caretaker and organize labour for site development. These tasks did not require a continuing committee and most have disappeared.

In summary, inadequate educational resources were dispersed over too many activities with a low pay-off - latrines, volunteer educators, Water Users' Committees - at the price of too little attention paid to messages, materials and effective cooperation with other rural extension agencies.

### Impacts of the Urban Water Supply System

The evaluation of the urban water supply systems in Bolgatanga, Wa, and Bawku was primarily functional in nature and did not examine water consumption or the impacts of urban water supply.

CIDA's role was not to provide a complete water supply infrastructure, but to assist in design and procurement for specific elements in the water system. The Government of Ghana was to provide technical staff, supply local costs, and to implement specific civil works.

The urban water systems have been difficult to implement due to design, management, and economic factors.

Some of these factors include:

- . CIDA sponsored only parts of the urban water supply systems and the successful implementation of the entire system depended on the Government of Ghana meeting its obligations under the Memorandum of Understanding which it has been unable to do.
- . There was a bias towards more sophisticated technologies which have been difficult to implement and maintain - particularly the Degremont water treatment plant in Bolgatanga, the use of automatic control systems, use of stainless steel piping, etc.



- . A serious shortcoming of the urban water supply component of URWSP was in the unclear allocation of responsibility for design, construction, and contract administration. This resulted in individual projects not fully completed; construction of works not carried out to specifications with some serious construction errors; apparently excessive claims by foreign contractors which were eventually settled for much less; the procurement and installation of substandard materials provided by local suppliers under contract to GWSC. All of these have created serious failures of the system.
- . The current imbalance between costs and revenues severely handicaps GWSC's ability to take on development projects and even its ability to operate the infrastructure that is in place. The costs of operating the urban water supply systems in the Upper Regions are eight times greater than urban revenues.
- . Water distribution in the urban areas functions poorly due to intermittent pumping arising from a lack of funds for fuel and an inadequate distribution system.
- . Because of the poor level of urban water service most urban dwellers are forced to use rural water supplies. In Bolgatanga and Wa, these sources are used as supplements, but in Bawku, they are the primary source of supply.



## PROGRAMME DESIGN ISSUES

The Upper Region Water Supply Programme has now been actively underway in one form or another for more than a decade. The programme has broken new ground for aid efforts, not only for CIDA, but the international community as a whole.

Throughout the programme a great deal has been learned about the special problems and opportunities which are associated with large scale programmes which encompass an array of internally linked projects.

### Issues in the Design of Rural Water Projects

There is no doubt that hand-pumps were an appropriate choice in this area of dispersed settlements and accessible aquifers. Perhaps the most obvious but yet complex conclusion of the evaluation is that pumps alone do not constitute a viable project element. Where an innovation, pumps require that new social, organizational and technical infrastructures be created at the village level and within host government organizations.

Minimal village participation in all aspects of the programme has reduced its effectiveness. In future programmes, village participation must be commenced prior to drilling and should encompass borehole location, pump selection, cost recovery, pump maintenance and repair, and the choice of educational and related activities.

Pump users can and should pay for the pumps. They should contribute towards both the capital and operating costs with their first payment preceding pump installation. The level of cost recovery should be enough to recover actual costs where possible but not represent more than 5% of user income.

Two questionable selections of hand-pumps have been made. Both the original Beatty and the Moyno are quite suitable for a single family but the Beatty was not strong enough to meet the demands of a small community and the Moyno suffers from low yield, a high work requirement and a poor ergonomic design that makes it inappropriate for women and children.





In the future, more serious consideration should be given to the use of newer (although non-Canadian) pumps such as the India Mark II, which are easier and less costly to maintain. The preliminary results of the UNDP Hand-Pump Test Programme indicate that these are durable and reliable.

A heavy dependence upon GWSC and foreign manufacture has made the project vulnerable to the institutional inadequacies of GWSC and post-CIDA shortages of foreign exchange. Water projects would be stronger if they promoted cooperation between the private and public sectors, and promoted the local repair and manufacture of, firstly, selected pump parts and, eventually, complete pumps.

Data on rainfall, aquifer recharge and the breakdown rates of different components of pumps have been neglected but are essential for effective management of the system.

Self sufficiency in the maintenance of the rural hand-pump system requires sufficient revenues from the rural tariff and requires sufficient foreign exchange for the purchase of spare parts and replacements. The management of rural revenues is an essential yet difficult task because of the temptation to use these revenues to subsidize money losing urban operations, the erosion of purchasing power of local currency in a capital replacement fund, and the difficulty in obtaining access to scarce foreign exchange.

### Issues in the Design of Education Projects

A number of basic design errors have curtailed the return on the inputs to the education programme.

These include the inadequate exploration of:

- . the water-related health problems of the regions;
- . local beliefs about the transmission, symptoms, treatment and prevention of these problems;
- . means of teaching about these problems;
- . locally implementable behaviors to address these problems;
- . different ways of dissemination of information.



Questionable design decisions were made about:

- . the content of messages of the programme which chose to address a large number of aspects of water utilization with an uncertain relationship to improved health;
- . working with volunteer educators, rather than with the 500 or so extension agents within the existing rural development agencies;
- . the emphasis upon latrines in rural areas of low population density where a majority could probably see no advantage in their use, where they were perceived to have a high opportunity cost, where previous programmes of latrine construction had resulted in such low standards of usage as to become a health hazard, and where the sanitation facilities of the urban and peri-urban areas are grossly inadequate;
- . the emphasis upon Water Users' Committees to select and supervise pump caretakers and organize labour for site development when existing village health or development committees or village elders could have done these tasks;
- . the form and content of presentation aids, posters and calendars which utilize culturally inappropriate symbols, insufficient facial detail and some of which are more appropriate for urban literates rather than the illiterate majority.

#### Issues in the Design of Urban Systems

The urban water supply systems present far more unresolved problems than the rural project. There was poor coordination in supplying materials and frequent shortages of fuel and spare parts. Often, the overly complex technology is not functioning properly. There are examples of poor design caused by economic limitations, inadequate data analysis and poor planning.

Simpler, "old fashioned" technologies would often have been more appropriate and should be investigated in more detail. The decision to proceed with the Degremont water treatment plant in Bolgatanga, to use stainless steel piping instead of ductile iron, and to use automatic meters, monitoring devices and control equipment reflected a bias towards more sophisticated technical solutions. This may have seemed reasonable in the late sixties and early seventies when Ghana



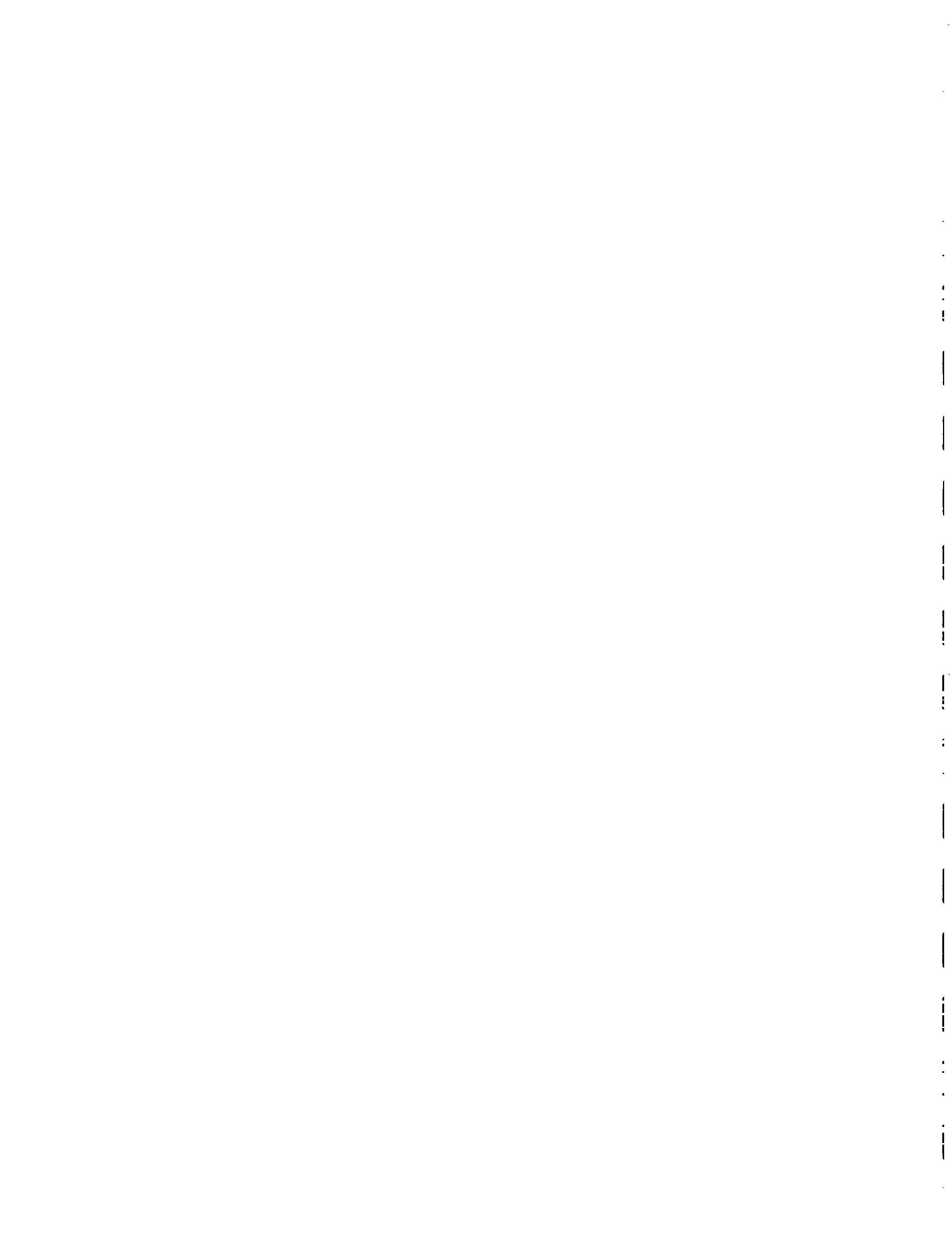
was exhibiting positive economic development trends. Today, after a significant decline in the economy, these choices seem far less appropriate and have proven to be difficult to operate and maintain.

Prior to designing mechanized water supply systems, the practical operating specifications must be defined. A new plant, pumping station, or other major installations should be designed based on clear and practical specifications which encompass:

- . design capacity;
- . expected operating schedules;
- . anticipated interruptions of operation;
- . existing maintenance procedures and practices which should be extended to the new system;
- . expected performance under various operating conditions;
- . maintainability of the technology; and
- . choosing material, equipment, and construction practices with which there is local experience.

Mechanized technologies should be designed with the possible negative contingencies in mind. Sometimes this is easier said than done. When the urban projects in the Upper Region were being designed, the endemic fuel and foreign exchange shortages which Ghana now faces were not considered as a plausible "worst case." Based on this experience, it is clear that much more attention must be paid to the problem of low and intermittent operation even at the expense of capital cost and design/operating efficiency. There is no point having an elegant engineering solution to the wrong problem.

The distinction between rural and urban areas is not clear and needs to be carefully understood for new projects. Although CIDA and GWSC have invested substantial sums in urban water supplies, many people in the large urban areas continue to use rural water. In future, urban areas should be supplemented as much as possible by hand-pumps and mechanized systems should be introduced only where scale and fuel supplies permit. It also recommended that the threshold population for investment in mechanization be raised from 1,500 people to at least 5,000 people.



The urban tariffs must reflect the actual cost of water production. GWSC is currently in a position where it loses money for every litre pumped and suffers from such a shortage of funds that it often cannot purchase enough fuel to maintain even very low levels of water production.

The experience of the URWSP underscores the need for clear and realistic programme goals. The programme goals and objectives were not specific enough to provide clear guidance for detailed programme and project design. This arose from the evolutionary nature of the programme with its final form not envisioned in detail by CIDA and GWSC during the initial planning.

There is a need for a system perspective. As with all programmes, the Upper Region Water Supply Programme was composed of an array of individual project elements. Programme design requires that the entire system be defined and the interaction and interdependence of all implementation, operational and technical components be established. Where the economic environment and levels of technical capability are satisfactory, these interdependencies are not so important. Where there is substantial uncertainty about the ability of the host institution to meet its project objectives and responsibilities the interdependencies can become critical. For example, in the case of Bolgatanga, the Government of Ghana, through GWSC, has been unable to meet its 1973 obligation of improving the urban distribution system. Even when the urban water supply components of the URWSP are finally completed, the inability of the system to distribute water effectively and equitably will undermine the achievement of better water supply.

The programme and its project elements must be implementable. Although this conclusion is an obvious one, the experience of Ghana underscores the fact that when economic and political contexts change, an apparently sensible and appropriate technology can become cumbersome, complex and much less appropriate. A thorough preprogramme assessment of context must answer these questions:

- Is this technology congruent with existing practice and experience? How is it different? What new ideas does it introduce? How best can they be introduced? Will this cause problems after the implementation phase is complete?





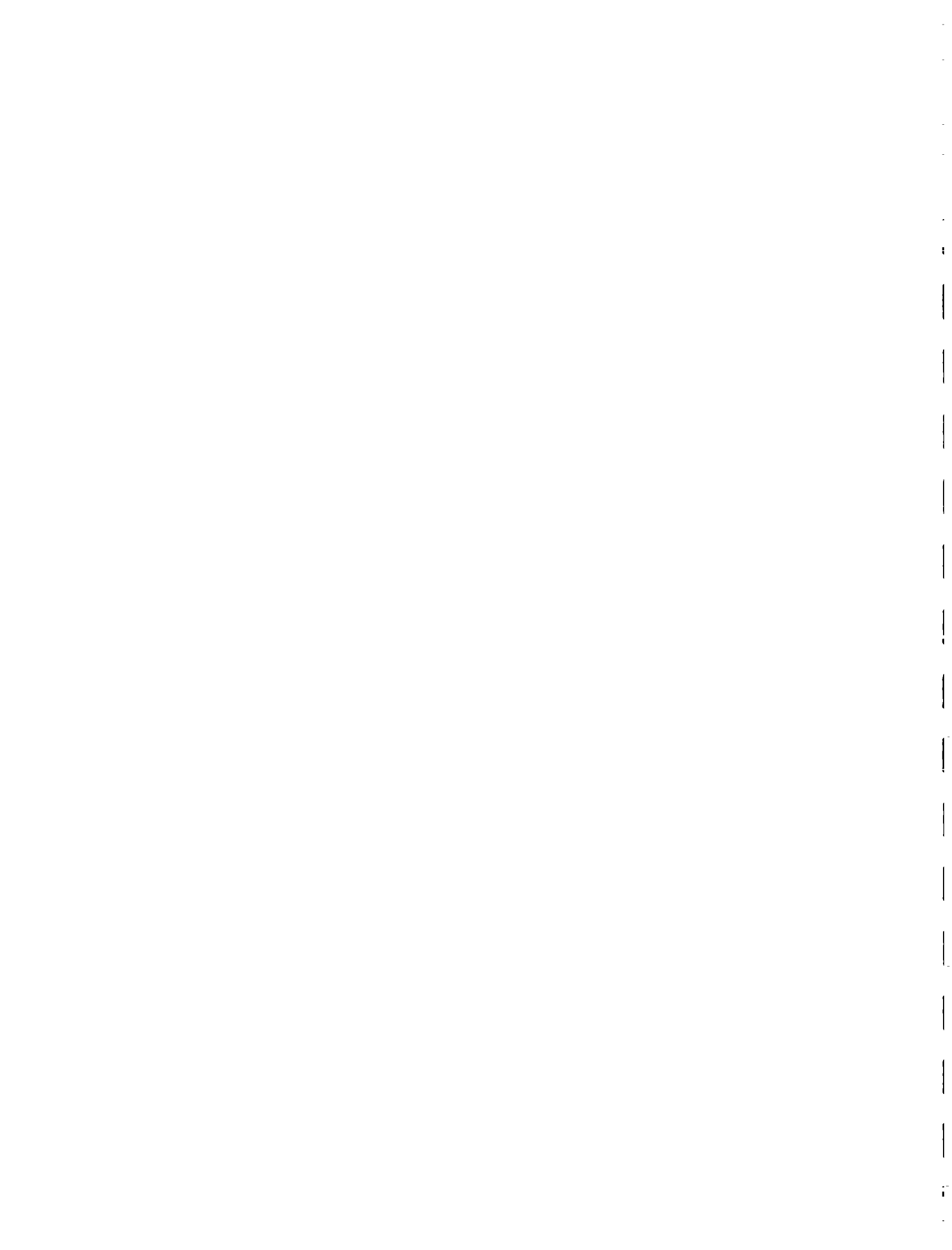
- . What technical and personnel resources will be available to implement and operate the project? If insufficient, how can they be developed?
- . Is the institutional capacity sufficient to implement and maintain the system? Is its mandate appropriate? Can the institution be strengthened sufficiently to support the proposed technology? What other agencies are involved and how will they be coordinated?
- . Is the host government committed to the programme and can they live up to their agreed responsibilities?

The technology must be maintainable. This is another obvious conclusion and one that has been recognized by the Government of Ghana and CIDA. However, the installation of diesel-dependent water supply systems in the small urban locations continued the unrealistic assumptions about the level of operating support and availability of fuel.

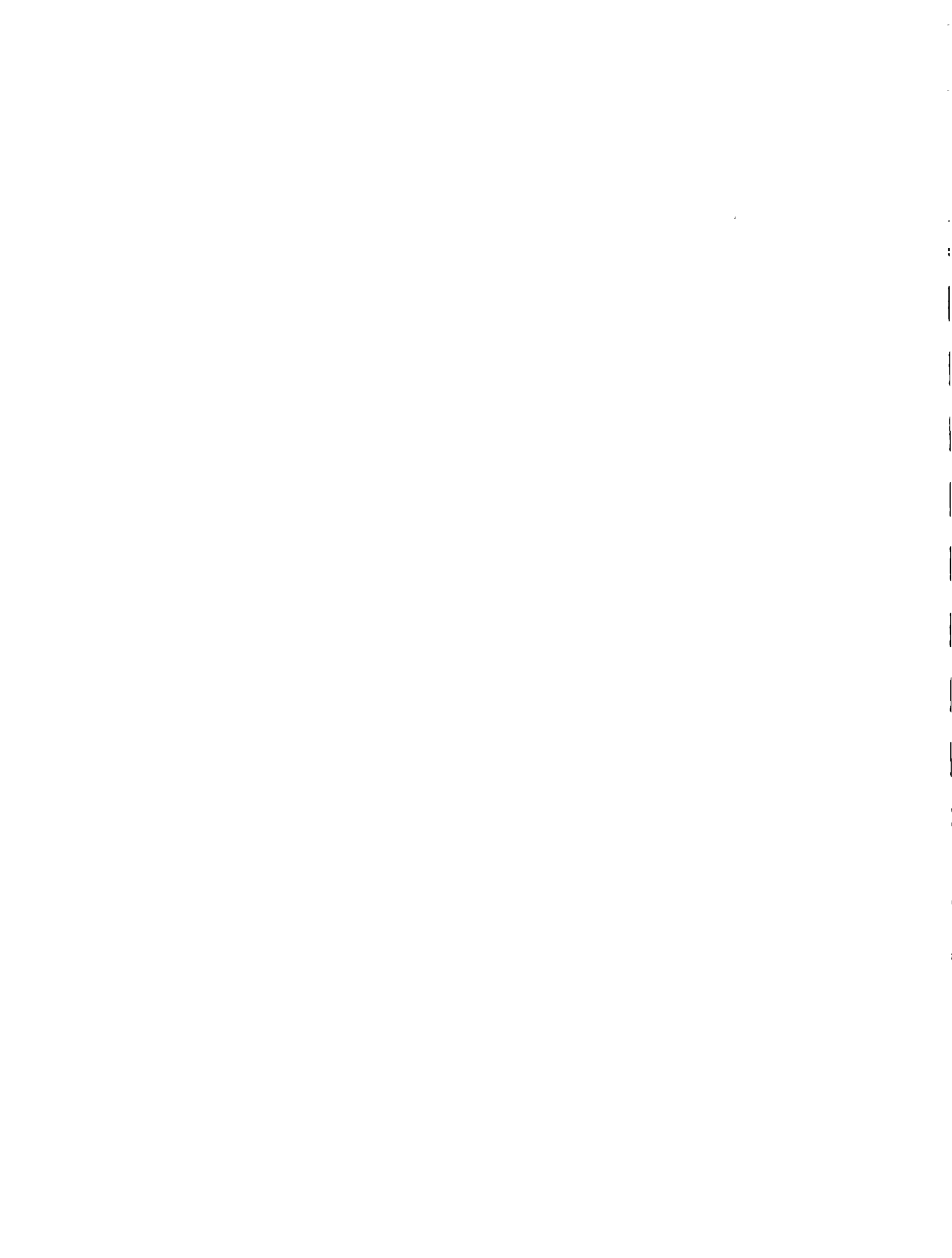
It is recommended that the maintainability of technological systems continue to be clearly incorporated into the selection decision. The following questions must be answered:

- . What spares must be imported and will sufficient foreign exchange be made available?
- . What spares can be fabricated locally?
- . Is sufficient fuel and/or electric power available to operate the system and support infrastructure?
- . How do the expected fuel and power supply characteristics affect operating cost and efficiencies?

The institutional support capabilities must be clearly assessed. Before selecting the appropriate mix of project elements and technology, it is essential to understand the ability of the host institution to provide the financial and human resources necessary to support the implementation and operation of each project element. In the case of URWSP, the support capabilities were not accurately assessed at the time of programme design. This was not due to negligence but rather to the incorrect assumption that future economic conditions in Ghana would not be substantially worse than they were in the early 1970s when the programme was being designed. This implicit assumption turned out to be incorrect, placing CIDA in a difficult



dilemma. It could either expand the programme to include more project elements or terminate its involvement with the almost certain knowledge that the programme underway would never be completed and its investment would make no substantial contribution to the development of the Upper Regions.

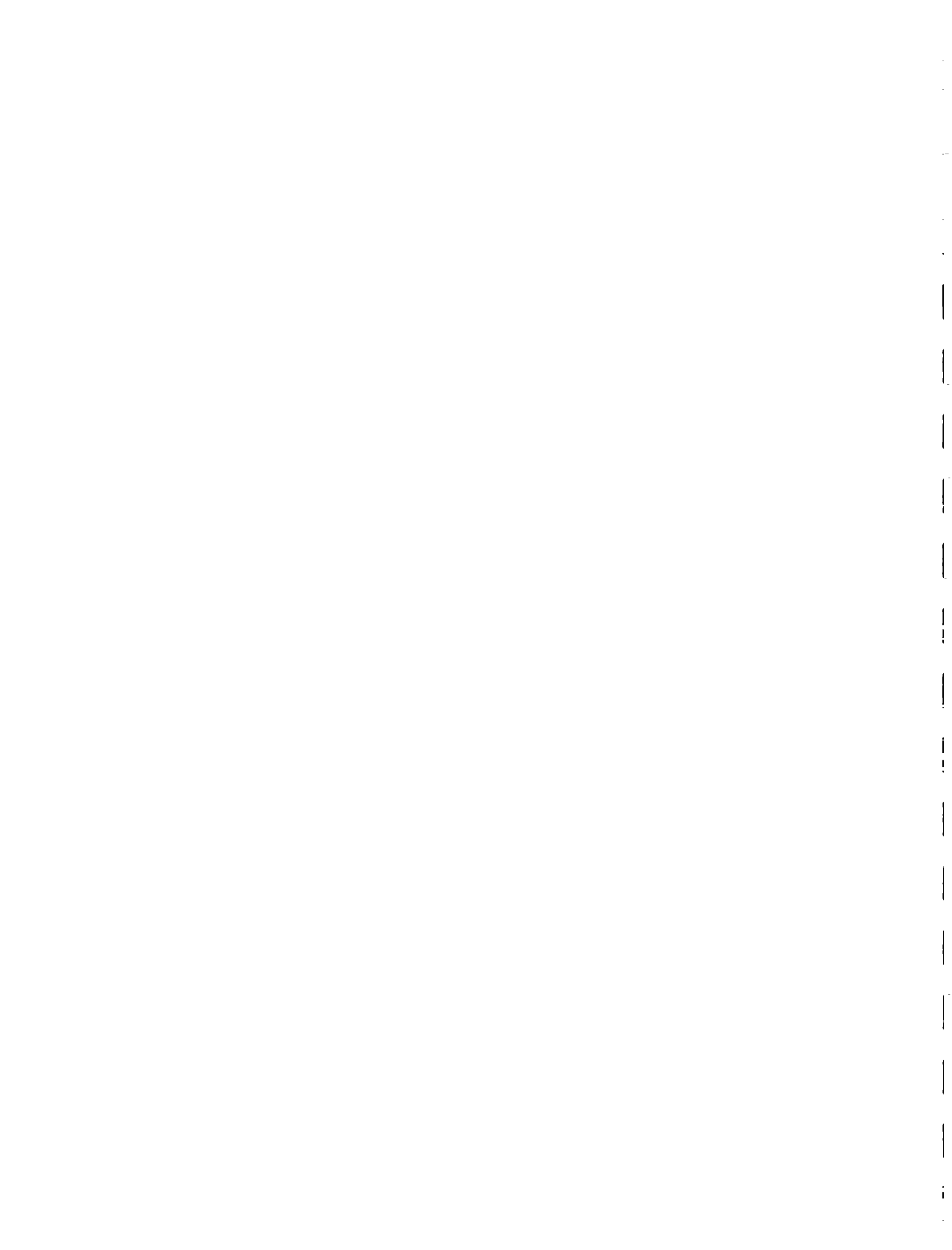


## RECOMMENDATIONS ON FUTURE INITIATIVES FOR THE PROGRAMME

Recommendations for CIDA's future role in the Upper Region Water Supply Programme are as follows:

### The Rural Water System

1. The number of rural hand-pumps in the Upper Regions should not be increased at this time. Although it would be desirable to have more hand-pumps installed in the Upper Regions, the proportion of rural people with access to hand-pumps is significant and the level of service is adequate for the areas covered. Until GWSC builds up its financial and technical resources to support the pumps now under its jurisdiction, a new borehole drilling and hand-pump installation project sponsored by CIDA would be premature.
2. Consideration should be given to the provision of an Administrative Advisor under Phase II of the Water Utilization Project. Administrative systems and procedures, especially those related to cost control, inventory, and revenue must be strengthened if GWSC is to successfully operate the urban and rural water supplies.
3. Alternative methods for maintaining the hand-pumps in the longer term should be investigated. Possible options include: continued GWSC responsibility; moving the rural hand-pump programme to another government ministry; privatization, or a combination.
4. An appropriate and effective method of preserving the purchasing power of hand-pump tariff revenues which accrue to the hand-pump capital replacement fund must be found. Some possibilities include: an inflation adjusted fund; foreign exchange deposits; purchase of foreign exchange credits from CIDA.



5. A longer term goal of the programme should be the local manufacture of hand-pumps or components. This may not be possible with the Canadian pump designs and therefore the focus should be on simpler pumps.
6. CIDA should support continued emphasis on technical training for maintenance personnel.
7. In the short term, CIDA should continue to provide foreign exchange support for hand-pump spare parts and related equipment. However, this should be tied to: assurances that rural revenues are not used to subsidize urban operations; successful operation of a capital replacement fund; and the reduction of unnecessary expenses.

#### Water Utilization Education

1. The responsibility for water and health education should be transferred from GWSC to an agency(ies) with a mandate to promote health and an appropriate organizational capability.
2. New means of village extension using existing extension agencies within government and non-government organizations should be employed.
3. The village education workers should be disbanded.
4. Better pump caretaker training methods need to be developed.
5. Begin a process of curriculum design and development of learning materials that aims to maximize the health benefit of water; utilizes a problem-based approach; and is sensitive to local culture and context.





### The Urban Systems

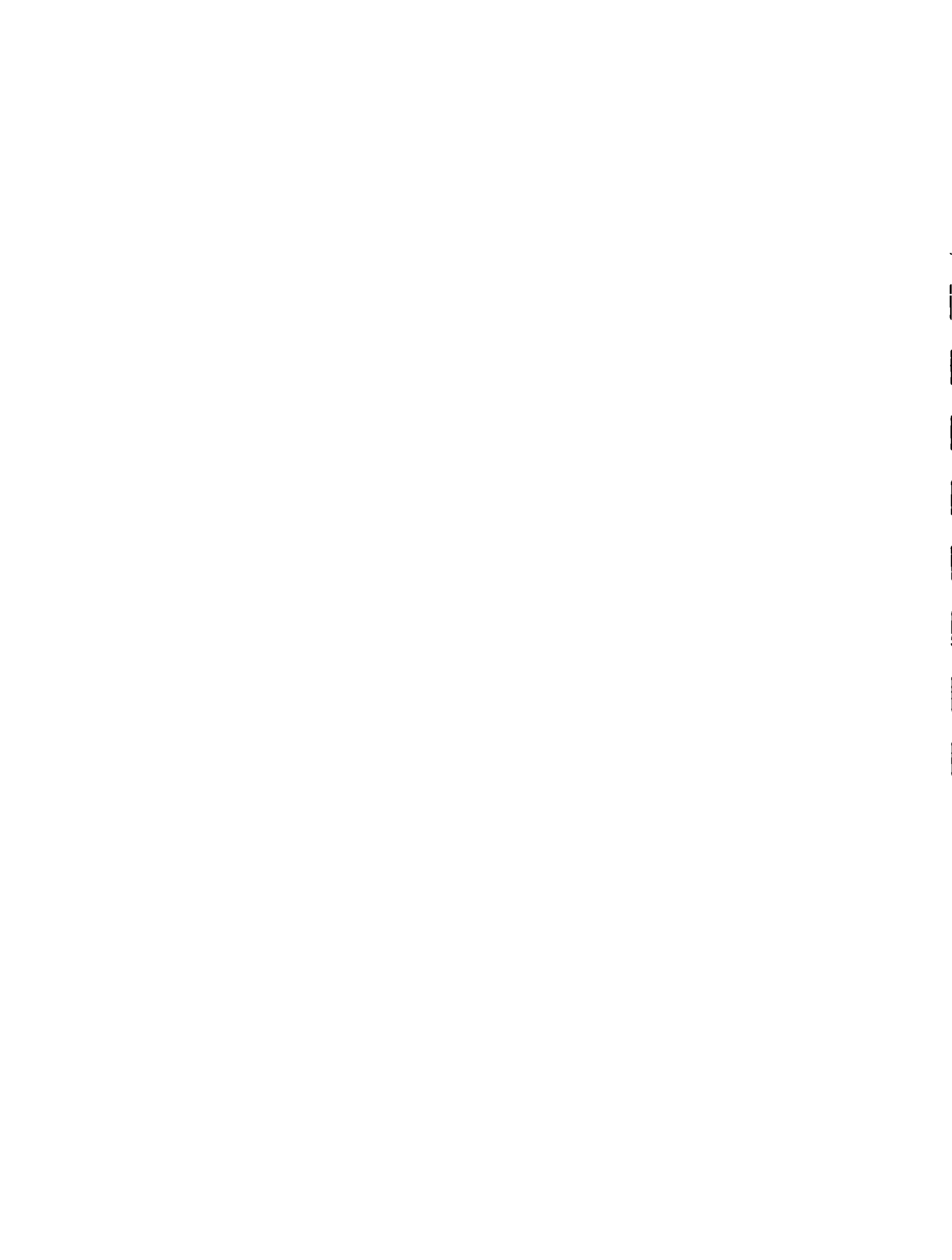
1. A hydrogeological study of the Wa area should be undertaken as soon as possible to assess the ground water limitations of the south well field and to investigate appropriate ground water management initiatives.
2. No new urban water supply projects should be considered until the present systems are completed and brought into working order.
3. CIDA should continue to support specific foreign exchange requirements for equipment but only for a limited period.
4. CIDA should continue to support training of operations and maintenance personnel for the urban systems and workshop.
5. CIDA should strongly support the increase in urban water tariffs, without which GWSC will be unable to recover even its direct costs of operations.

### General Recommendations

1. GWSC and CIDA must work toward the goal of self-sufficiency.

After a substantial investment in the development of a water infrastructure and institution building with GWSC, CIDA should not indefinitely subsidize the supply of rural and urban water in the Regions. At the same time it should not completely withdraw its support until the system is viable.

In the long run, the development process is not served by ongoing aid to operations. If recurrent costs of operating and maintaining the water supply infrastructure in the Upper Regions were to require continued direct aid, then the whole water programme must be considered too great a burden in the existing local economic and administrative context.



To date, CIDA's laudable desire to protect its investment through subsidy from development funds in both cedis and dollars has protected GWSC from bringing its recurrent costs and revenues into balance. Under present expenditure and revenue trends, GWSC operations in Upper Regions will continue to require increasing direct aid. This is simply unacceptable. The first and most important step in achieving self-sufficiency is the planned reduction of CIDA's contribution to operating expenses in the next three to five years.

2. The focus of the next three to five years should be on consolidation and assimilation of the rural technologies, improvements in the water education programme, and maintenance of the existing urban infrastructure.

The Upper Region Water Programme should now focus on the goal and objectives outlined in Figure 2. The overall goal has been, and must remain, the improvement of health of residents of the Upper Regions of Ghana through the provision of potable water supplies and through the provision of education on the water-health relationship. However, the programme objectives must now support action which will create the conditions for a progressive reduction of CIDA's direct support while ensuring continued operation and maintenance of both the rural and urban water supply infrastructure and while ensuring progress on the education of rural people on the relationship between water and health.

3. The new GWSC Assistance Project is logical and necessary but should be tied to GWSC action.

Although general economic conditions in Ghana seem to be improving it is doubtful whether foreign exchange for replacement of equipment and spares for the Upper Region projects will be available over the next 5 years in sufficient quantity to maintain operations. The support to be provided by CIDA under the GWSC Assistance Project is essential to the ongoing rural and urban operations in the Upper Regions.



The recommendations made regarding the linkage of rural and urban tariffs, the institution of a separate capital replacement fund for hand-pumps, the continued commitment towards preventative maintenance, and the reduction of unnecessary costs are essential to adequate longer term operations in the Upper Regions. Progress towards these objectives should be part of GWSC's obligations under the GWSC Assistance project. The essential fact is that CIDA will not be able to protect its investment and simultaneously withdraw from this programme without changes being made at GWSC. Without these changes, it is certain that another major injection of support similar to the Maintenance/Stabilization Project will be required within 5 years.



RECOMMENDED UPPER REGION WATER PROGRAMME INITIATIVES: 1986 - 1988

	INDICATORS	ISSUES	OUTPUTS	INPUTS		KEY MANAGEMENT TASKS
				CANADIAN	GHANAIAN	
<p>GOAL</p> <p>Improve the health of the residents of the Upper Regions</p>	<ul style="list-style-type: none"> <li>a significant decline in water related diseases</li> </ul>	<ul style="list-style-type: none"> <li>how much can water alone improve health?</li> <li>why should CIDA invest in pumps if health does not improve?</li> <li>what other health promoting inputs can be provided by other agencies?</li> </ul>				<ul style="list-style-type: none"> <li>monitoring and evaluation of health indicators</li> </ul>
<p>OBJECTIVE 1</p> <p>Maintain a high and reliable level of hand-pump operation.</p>	<p>BY THE END OF 1988:</p> <ul style="list-style-type: none"> <li>85% of pumps operating at all times</li> <li>pumps repaired within ten days of reporting fault</li> <li>sufficient supply of spares at all times</li> <li>number of dry or shorting wells</li> <li>90% of caretakers can identify the most common faults for their respective pump</li> <li>100% of pump mechanics can repair pumps</li> </ul>	<ul style="list-style-type: none"> <li>is the aquifer adequate in the long term?</li> <li>what is the availability of foreign exchange and credits for the hand-pump system?</li> <li>can GWSC provide adequate incentives to staff?</li> <li>what role can the informal sector play in pump repair?</li> <li>what is the limit to village level surveillance, maintenance and repair of pumps?</li> </ul>	<ul style="list-style-type: none"> <li>hand-pump maintenance and repair capacity</li> <li>tariff/revenue collection</li> <li>capital replacement fund</li> <li>delivery of parts and spares</li> </ul>	<ul style="list-style-type: none"> <li>short term capital replacement fund</li> <li>professional and technical services                             <ul style="list-style-type: none"> <li>training</li> <li>administrative advisor</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>increasing share of capital replacement burden</li> <li>strengthening of staff resources through training and management</li> <li>organizational base for water and health education programme</li> <li>counterpart staff</li> <li>inter-agency cooperation and commitment to water-health education programme</li> </ul>	<ul style="list-style-type: none"> <li>monitoring of static water levels</li> <li>monitoring of pump maintenance</li> <li>hand-pump tariff collection and management of tariff revenues</li> <li>management of spare-part stores</li> <li>vehicle maintenance</li> <li>monitor progress towards self-sufficiency</li> </ul>
<p>OBJECTIVE 2</p> <p>Maximize health benefits from the improved water supply.</p>	<p>BY THE END OF 1988:</p> <ul style="list-style-type: none"> <li>30% of all mothers know the major health-water relationships</li> <li>25% of all mothers practice the major health promoting behaviours</li> </ul>	<ul style="list-style-type: none"> <li>where should the water and health education programme be located?</li> <li>how to organize inter-agency cooperation?</li> <li>how will water and health education resources be allocated and controlled among different agencies?</li> <li>what are the major health-water relationships and health promoting behaviours: which are the easiest to implement?</li> </ul>	<ul style="list-style-type: none"> <li>research into water and health problems</li> <li>water and health education materials</li> <li>training of extension agents in the use of education materials</li> <li>dissemination of educational materials</li> </ul>	<ul style="list-style-type: none"> <li>professional and technical services</li> <li>equipment and supplies</li> </ul>	<ul style="list-style-type: none"> <li>commitment to continue health education</li> <li>logistical support</li> <li>organizational framework</li> <li>logistical support</li> <li>staff</li> </ul>	<ul style="list-style-type: none"> <li>identify best organizational format</li> <li>coordination of health education</li> </ul>
<p>OBJECTIVE 3</p> <p>Maintain operation of the urban water supply systems.</p>	<p>BY THE END OF 1988:</p> <ul style="list-style-type: none"> <li>completion of all urban projects started under the programme</li> <li>urban tariffs raised to cover costs of operation</li> <li>an acceptable level of water production in all communities with mechanized systems</li> </ul>	<ul style="list-style-type: none"> <li>will rainfall at VEA be sufficient?</li> <li>groundwater management strategy for the Wa south well field?</li> <li>will sufficient funds be available for the purchase of fuel and for other operating costs?</li> <li>will piped systems in the small urban communities provide adequate water?</li> <li>are the water distribution systems adequate?</li> <li>should hand-pumps be used instead of mechanized systems in the smaller communities?</li> </ul>	<ul style="list-style-type: none"> <li>an adequate and reliable quantity of water pumped</li> <li>a financially self-sufficient water supply</li> <li>an urban capital replacement fund</li> <li>delivery of parts and spares</li> </ul>	<ul style="list-style-type: none"> <li>short term capital replacement fund</li> <li>short term professional and technical services                             <ul style="list-style-type: none"> <li>training</li> <li>administration</li> <li>mechanical</li> <li>workshop</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>increasing share of capital replacement burden</li> <li>increase in tariff</li> <li>short term operating subsidy until revenues exceed costs</li> <li>measures to increase efficiency of human resources</li> </ul>	<ul style="list-style-type: none"> <li>raise urban tariffs immediately</li> <li>ensure that rural tariffs are not used to subsidize urban costs</li> <li>ensure that fuel is available</li> <li>management of surface and groundwater sources</li> <li>management of stores</li> <li>maintenance of stationary and mobile equipment</li> <li>training</li> <li>reduction of redundancies</li> </ul>





