

WATER AND SANITATION
FOR HEALTH PROJECT

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DEVELOPMENT OF AN
OPERATIONS AND MAINTENANCE STRATEGY
FOR RURAL WATER SUPPLY
IN ZAIRE
PHASE I REPORT

WASH FIELD REPORT NO. 273

MAY 1989

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under WASH Task No. 036

by

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and
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This has been a particularly interesting and rewarding assignment due largely to the good will and support provided to us by a number of individuals and organizations. Operations and maintenance (O&M) is clearly a priority in Zaire and we benefitted greatly from the genuine interest and frank discussions with people during the entire course of our work. Citoyen Sowa, Director of the National Rural Water Service, deserves special thanks for the number of hours he spent with us discussing a wide range of issues. Without his advice and the wealth of information he provided, the objectives of this activity could not have been met. The entire staff of Service National d'Hydraulique Rurale (SNHR) both in the field and in Kinshasa provided support and information willingly. Nicolas Adrien was of particular value for his broad knowledge of rural water supply issues and of the capabilities of the SNHR stations.

The senior staff of Projets de Soins de Santé Primaire en Milieu Rural (SANRU), especially Citoyen Itoko and Citoyen Kasongo, provided us with detailed data and project materials and with their insights into the workings of the Rural Health Zones in the area of rural water supply. Project Manager Frank Baer willingly made time for discussions with us and provided valuable material and technical assistance during the assignment. The participation of Itoko and Baer in the Bas Fleuve field trip was of particular value.

Guy Petit, Christian Ermhouts, and Citoyen Kabagema of Association Internationale de Développement Rural au Zaire (AIDRZ) provided numerous opportunities for exchanging and refining opinions while sharing data, reports, and ideas freely with us. Our experiences with them in Shaba and in Kinshasa will remain as a golden example of collaboration between project staff and outside technical consultants.

The HPN office at USAID provided us with necessary logistical and technical support. Dr. Glenn Post and Chris McDermott provided overall guidance and suggestions on the draft report. Carol Felkel and the ARD office merit special thanks for providing us with portable computers. Rhonda Smith won our respect and admiration by mastering the financial and administrative peculiarities of our host institution while supplying us with documents, contacts, and useful technical suggestions. Her pleasant smile and seemingly inexhaustible patience made Kinshasa a much more enjoyable place to work.

Citoyen Kadima and Citoyenne Kabamba deserve credit for the organization of the round table held by the National Action Committee for Water and Sanitation. They both provided valuable insights into the institutional and policy aspects of building consensus for a national approach to O&M.

The following report reflects the many contributions made by community members, public health staff, SNHR station personnel, local administrators, and traditional authorities during the course of our work here. Everywhere we went, we were struck by the consideration provided us and by the willingness to take time to talk with us at length. We are hopeful that the good will and obvious interest on the part of local users and technical services alike in the long-term operation of rural water systems will result in the development of an effective O&M program.

ACRONYMS

AF	<i>Assistant Financier</i> (Financial Assistant)
AIDRZ	<i>Association Internationale de Développement Rural au Zaïre</i> (International Association for Rural Development)
AT	<i>Assistant Technique</i> (Technical Assistant)
CNAEA	<i>Comité National d'Action de l'Eau et de l'Assainissement</i> (National Committee for Action in Water and Sanitation)
ECZ	<i>Eglise du Christ au Zaïre</i> (Church of Christ of Zaïre)
ENFEA	<i>Equipe National des Formateurs de l'Eau et de l'Assainissement</i> (National Team of Water and Sanitation Trainers)
FBI	<i>Fonds de Bien-Etre Indigène</i> (Local Development Fund)
GOZ	Government of Zaïre
NGO	Non-governmental Organization
PVO	Private Voluntary Organization
O&M	Operations and Maintenance
REGIDESO	<i>Regie de Distribution d'Eau de la Republique du Zaïre</i> (National Urban Water Agency)
RHZ	Rural Health Zone
RWC	Rural Water Coordinator
RWS	Rural Water Supply
RWS/S	Rural Water Supply and Sanitation
SANRU	<i>Projets de Soins de Santé Primaire en Milieu Rural</i> (Basic Rural Health II Project--660-0107)
SNHR	<i>Service National d'Hydraulique Rurale</i> (National Rural Water Service)

TDR *Technicien de Développement Rural*
 (Rural Development Technician)

UNICEF United Nations Children's Fund

USAID U.S. Agency for International Development

VDC Village Development Committee

WASH Water and Sanitation for Health Project

Z zaire (US\$1 \approx 385 zaire in April 1989. It should be noted that the
zaire exchange rate has increased rapidly in recent years making
financial calculations problematic.)

EXECUTIVE SUMMARY

In February 1989, the Water and Sanitation for Health (WASH) Project received a request for assistance from the U.S. Agency for International Development (USAID) Mission to the Republic of Zaire regarding operations and maintenance (O&M) in rural water supply (RWS). This report contains the findings of the first phase of what is projected to be at least a three-phase assignment. The objectives of the first phase of the assignment included the following: (1) to assess O&M procedures and strategies, emphasizing capped springs, gravity-fed piped water systems, and deepwells with handpumps; (2) to make recommendations for O&M strategies; and (3) to develop an operational plan for field testing the O&M recommendations in a subsequent phase of the assignment. On April 2, 1989, a WASH consultant team consisting of a water engineer and a social scientist arrived in Kinshasa, Zaire to carry out Phase I of the assignment. The mission ended with the presentation of this report on May 26, 1989.

The WASH consultant team focused its efforts on the O&M practices and needs of the two major USAID-funded projects in Zaire and worked closely with senior staff and field personnel. Detailed discussions were held with USAID/HPN project officers, Government of Zaire (GOZ) officials, and representatives of non-governmental organizations (NGOs) and international organizations active in the RWS sector. Three field trips were taken during the course of the mission.

The WASH team made substantial contributions to the design of a coherent strategy for handpump O&M at the invitation of the senior staff of USAID Project 0116. The results of this collaboration are included in a document being prepared by the director of the private voluntary organization (PVO) implementing the project.

Recommendations formulated by the WASH team were presented for discussion at a round table organized by the National Action Committee for Water and Sanitation on May 24, 1989. This round table was the first major forum in Zaire for discussion of O&M strategy for rural water supply. After some revisions and additions, all recommendations presented by the WASH team were accepted. The results of this round table will be presented for ministerial approval and will be the foundation of a national approach to operations and maintenance for rural water supply.

FINDINGS

1. There is general agreement among national actors that the user community is responsible for the long-term operations and maintenance costs of rural water supply. A village development committee (VDC) is to manage community activities and resources. The concept of community responsibility, however, has never been fully operationalized.

2. The role and responsibilities of national and local institutions and organizations in supporting village-level O&M (VLOM) remains undefined.
3. To date, the limited resources available have been almost exclusively applied to constructing potable water systems rather than to preparing communities to assume O&M responsibilities.
4. Technical requirements for O&M are generally understood by members of the technical services departments, but have not been detailed, standardized, and evaluated for effectiveness. There has been no systematic attempt to evaluate alternative rural water system designs, hardware, or construction procedures using criteria relevant to O&M.
5. The development of a village-level O&M program requires effective collaboration between local health services, SNHR stations and other technical services providers, and NGOs. The Rural Health Zone is the obvious and preferred local partner for organizations that provide rural water systems.
6. Village development committee members acknowledged difficulties gaining the cooperation of community members in making labor and monetary contributions. The level of difficulty appeared to increase with the frequency of contributions requested. Routine financial contributions seemed to be the most difficult for committees to manage.
7. Community members are much more likely to assume effective responsibility for O&M if they (a) value the service provided, (b) perceive the system as belonging to the community (rather than to the state), and (c) are convinced from the outset that they will be solely responsible for the recurrent costs of operating and maintaining their system.
8. A monetary contribution from the local community prior to construction is a key indicator of the community's willingness to assume local responsibility for O&M.
9. Reliable estimates of O&M costs, including transportation and fees for repair personnel, for RWS systems are not available. The variety of alternative resource mobilization strategies that may be employed to meet O&M financial needs are relatively unknown at the community level. Practical methods of raising and recording funds need to be assessed and communicated to VDC members.
10. At the present time and for the near future, no one service or agency can or should assume exclusive responsibility for village extension in RWS. The capabilities in this area of both the Rural Health Zones and SNHR are evolving. At this stage, attention should be given to strengthening institutional capabilities and coordinating activities and resources.

11. Perhaps the single most critical element of an O&M program for handpumps is the spare parts distribution system. In addition to an integrated system of supply involving national, regional, and local points of distribution, a system of inventory control and financing is required. To the extent possible, private sector entrepreneurs should be encouraged to carry spare parts for handpumps and piped water systems.

RECOMMENDATIONS

1. The choice of RWS systems should take into account technical and socio-cultural factors as well as the capacity of the community to maintain the system.
2. The traditional quantitative evaluation criteria used to evaluate construction yields (such as length of pipe laid, number of boreholes drilled or pumps installed, and number of springs capped) need to be revised to include the efforts made to ensure community participation in construction and O&M.
3. The total value of the RWS system, including all materials, labor, transportation, and other costs, should be estimated and explained to the community prior to construction. The relative value of the contribution by the service responsible for building the system and by the community should be detailed. Project timing and specific responsibilities of each party should be negotiated at this time.
4. Similarly, the community should be aware, well before construction commences, of the estimated O&M costs of the system. The technical service is responsible for communicating this information.
5. A written agreement between the technical service and the community should be drawn up setting forth the responsibilities of each.
6. A standardized monetary payment should be determined and collection prior to construction should be required for all RWS systems. The amount of the payment should be based on technical requirements of the system and on O&M needs rather than construction costs. In the case of capped springs, construction costs may provide the basis for calculating the fee.
7. An inauguration ceremony should be held at the end of construction activities to provide both symbolic and practical recognition of community ownership. A certificate of ownership should be provided to the community at this time. The participation of territorial administration officials should be encouraged.
8. Village development committees should be created and strengthened. The Rural Health Zones have been active and reasonably effective in this area despite serious manpower and especially transport constraints at the health center level. A further step is

recommended to clarify the issue of day-to-day operational responsibility. Specifically, a caretaker, preferably a woman, should be designated for each unit of the system (stand-pipe, pump, spring) to train community members in its correct use and to assure regular O&M.

9. A study of O&M costs for piped water systems and handpumps should be undertaken by SNHR and/or SANRU. This study should be given priority and research should commence as soon as possible. Station personnel, with direction from the central division of studies, should be able to assemble the necessary data for analysis in Kinshasa without external technical assistance. The Sandoa station should be able to contribute to the handpump study.
10. Information on alternative resource mobilization strategies and community practices for raising and managing money should be collected and assessed. The results of this research should be used in training programs aimed at strengthening VDCs and local treasurers. This information is required for the next ENFEA training of trainers session, tentatively scheduled for September 1989. The preparation of materials may require some additional technical assistance which is available locally.
11. The payment required prior to construction as a condition of participation in RWS projects (see recommendation 6) should be used directly for spare parts in the case of piped water and handpump systems. For spring-cappings, this deposit may be used to defray the cost of the capping and as an incentive for personnel (especially for RWCs).
12. All monies collected after the deposit has been paid and the RWS is operational should be tied directly to a well-defined expenditure. Spare parts should be bought with these funds as soon as possible to avoid the risks of currency devaluation due to inflation and to reduce the likelihood of unauthorized use of funds.
13. In light of the difficulty of ensuring routine monitoring of RWS and the high personnel demands this would make, visual training materials for O&M (flip charts, posters, step-by-step repair manuals) should be developed and provided to local VDCs, RWCs, and other extension agents. The development of these materials will require approximately five weeks of short-term technical assistance, beginning, if possible, in July 1989. These materials should be developed in collaboration with ENFEA.
14. Given the complexity of the tasks to be carried out by village development committees, a training program for key members (treasurer, president) should be developed. Methods of fund-raising and principles of community development should be included in the program. The Rural Health Zones and RWS technical services should be responsible for organizing training programs with support from ENFEA.

15. Members of the technical services (SNHR, RWCs and NGOs) operating in the villages should be trained in participatory community development and adult education techniques. ENFEA should be responsible for organizing the training program.
16. The fourth training of trainers workshop, to be organized by SANRU with technical assistance from WASH, should focus on (a) O&M system requirements; (b) community organization for O&M; and (c) community financing options. The visual aids recommended earlier (see recommendation 13) should be integrated into this training program.
17. A structured extension program with well-defined steps and procedures should be developed to assure good community participation before, during, and after construction and to foster long-term maintenance of the system.
18. One or more TDR-level (rural development technician) community development agents should be assigned to key SNHR stations with the long-term objective of at least one agent per station. Agents should be posted to Kabongo (Shaba) and Kinzau-Mwete (Bas Fleuve) immediately. USAID should review logistical and material support needs for these agents.
19. In the case of boreholes with handpumps, at least two full-time extension agents should be assigned to each drill rig. These extension agents should coordinate their activities directly with the technical team and with the local Rural Health Zones. The long-term success of projects providing handpumps is directly linked to the effectiveness of the extension program. USAID should give serious consideration to supporting the transportation and material needs of the extension program as a fundamental part of an overall O&M strategy.
20. To maximize the use of available skills and resources, the division of responsibilities and mechanisms of coordination between Rural Health Zones and SNHR stations should be clarified.
21. Within six months of the inauguration of a system, the technical service should make a follow-up visit to ensure that the system meets technical performance criteria and that O&M activities are understood and implemented by the community.
22. Routine monitoring of RWS systems and the effectiveness of VDCs should be the responsibility of Rural Health Zones. The regular reporting mechanisms of the health centers should include sections on water and sanitation, the state of water supply structures, and the effectiveness of village development committees. The newly-created Division of Water and Sanitation in the Department of Public Health may play a constructive role in designing simple reporting forms for use by Rural Health Zones.

23. Information supplied by health center staff to the Rural Health Zones should be reviewed by the RWC and transmitted to the nearest SNHR station for analysis.
24. National priority should be given to establishing an integrated spare parts system, including inventory control and financial management programs. The rural health infrastructure can play an important role in assuring local access to spare parts. Coordination should be provided by SNHR.
25. Efforts should be made to strengthen the logistic capability of SNHR at the central level to permit effective inventory management and distribution of replacement parts for RWS systems, especially manual pumps. USAID support in this area is critical. Steps should be taken to assure that a central logistic capability is in place by early 1990.
26. The understanding and support of local and regional political and administrative authorities should be acquired to assure the continued operation of the RWS system.
27. If the local community is to assume financial responsibility for O&M costs, no other fee, tax, or charge should be levied on the water system or users.
28. The legal status, powers, and responsibilities of the village development committee should be determined and codified in law.

Chapter 1

INTRODUCTION

1.1 Background to the Report

In February 1989, the Water and Sanitation for Health Project received a request for assistance from the USAID Mission to the Republic of Zaire regarding operations and maintenance in rural water supply. A member of the WASH staff made an initial visit on February 20-24, 1989 to develop the scope of work and funding arrangements and to delineate the primary issues surrounding O&M. The assignment that resulted from this visit is scheduled to include at least three phases: I) assessment of O&M at existing and planned water systems; II) operational tests of selected recommendations to improve O&M and analysis of findings; III) organization of a seminar to present the results to organizations and officials involved in the RWS sector. On April 2, 1989, a consultant team consisting of a water engineer and a social scientist arrived in Kinshasa to carry out Phase I of the assignment.

1.2 Objectives of Phase I

The objectives of the first phase of this assignment included the following:

- Assess O&M procedures and strategies at existing and planned rural water systems with emphasis on the following types of systems: capped springs, gravity-fed piped water systems, and deepwells with handpumps.
- Provide recommendations for O&M strategies that will improve the performance and longevity of rural water systems.
- Present an operational plan for the field testing of O&M recommendations to be carried out in a subsequent phase of the assignment.

Originally, the results of the first phase of the assignment were to be presented at a workshop for National Rural Water Service (SNHR) station chiefs and USAID Project 0107 (SANRU) water and sanitation field personnel. After discussion with the USAID/HPN project officer, the scope of work was revised to include, instead of the workshop, a round table discussion of O&M practices and strategies involving representatives of USAID-funded projects, Government of Zaire technical services, and relevant national and international NGOs and international organizations.

1.3 Round Table on O&M Strategy

The round table discussion, entitled "Toward a Common Approach to Assure the Operation and Maintenance of Rural Water Systems," was organized in collaboration with the National Committee for Action in Water and Sanitation

[Comité National d'Action de l'Eau et de l'Assainissement (CNAEA)] and held on May 24, 1989. The objectives of the round table were as follows:

- To bring together the major actors in RWS to review the need for an operations and maintenance program for rural water systems.
- To develop a shared understanding, based on this discussion, of the common characteristics of an O&M program for capped springs, gravity-fed piped water systems, and deepwells with manual pumps.
- To establish a common approach to O&M that will lead to an integrated program to assure the sustained operation of rural water supply systems.

This round table provided the first major forum in Zaire to discuss O&M strategy for rural water supply. All recommendations presented by the WASH team were accepted, after some revisions and additions. The conclusions of the round table will be presented for ministerial approval and will serve as the foundation of a national approach to operations and maintenance for rural water supply.

1.4 Approach and Methodology

The USAID Mission to Zaire has made a number of important contributions to the development of the RWS/S sector since the early 1980s. Two major USAID-sponsored projects (Project 107, Basic Rural Health II--Water, and Project 116, Shaba Refugee Water Project) are currently involved in building rural water systems, training WS/S technicians, and strengthening GOZ capabilities in the sector. The WASH consultant team focused its efforts on the O&M needs and practices of these projects and worked closely with senior staff and field personnel of SANRU, SNHR, and AIDRZ (the PVO responsible for implementing Project 116). Detailed discussions were held with USAID/HPN project officers, GOZ officials, and representatives of NGOs and international organizations active in the RWS sector.¹ A thorough review of project documents, field reports, and technical studies was conducted.

Three field trips were organized during the course of the mission.² The first field trip was from April 3 - 11. Sites were visited in Kasai Occidental and Bandundu. The second field trip took place in the Bas Fleuve subregion of Bas-Zaire from April 19 - 21. The final and most extensive field trip was from April 26 - May 1 in the Lualaba subregion of Shaba, the area covered by the Shaba Refugee Water Project (660-0116). Topical guides were designed by the WASH consultants to organize discussions and data collection during the field trips.

¹See Appendix A, List of Persons Contacted.

²See Appendix B, Trip Reports.

The WASH team made substantial contributions to the design of a coherent strategy for handpump O&M at the invitation of Project 116 senior staff. The results of this collaboration are included in a document being prepared by the director of the PVO implementing the project.

Chapter 2

RURAL WATER SUPPLY IN ZAIRE

Before independence, the colonial agency with primary responsibility for rural water supply in Zaire was the *Fonds du Bien-Etre Indigène* (FBI). This agency was founded in 1948 with the objective of implementing "any activity that would contribute to the material and moral development of the traditional indigenous society of Belgian Congo," including rural water supply.³ Although the agency existed until 1964, major construction activities in water supply came to an end by 1959. FBI continued to manage the water systems until they were turned over to the newly independent state.

During its 10 years of construction activities in Kasai, Katanga, Kivu, Province Oriental and Equateur (see map 1), FBI capped 1,355 springs, installed 1,634 handpumps, and developed 138 km. of piped water system, thereby serving a total population of 771,372. It also financed 385 spring cappings, 441 handpumps, and 5 small piped water systems. All told, FBI's work resulted in potable water for one-twentieth of the population of Congo.

FBI was only directly responsible for maintenance for the first two years of the system's life, after which time responsibility was turned over to the *circonscription indigènes*. Financing for water system maintenance was assured through the imposition of a *taxe sur l'eau* which was incorporated into the head tax. The communities themselves were apparently never aware that they were maintaining their systems through local taxes.

After FBI was disbanded, there was no organization to install or maintain rural water services. Some scattered efforts, supported by religious and other non-governmental organizations and the GOZ agency, REGIDESO, resulted in a few water supply projects for semi-urban, densely populated areas. From 1960-1980, access to potable water in rural areas declined as FBI installations fell into disrepair and little new activity took place.

In 1978, the Department of Rural Development was created and rural water supply was included among its responsibilities. That same year, in response to crisis situations, two independent Rural Water Brigades were created in Kivu and Bas-Zaire with UNICEF help. A third Brigade was created to take over some important ex-FBI installations in Kasai Oriental.

The importance of water supply for the population of Zaire was recognized with the establishment of the CNAEA in February 1981. In 1983, the three Brigades were combined to create the nucleus of the National Rural Water Service, again with financial backing from UNICEF. In 1985-1986, the CNAEA prepared a Plan for

³FBI, "Quinze Années d'Activité du Fonds du Bien-Etre Indigène au Congo, Rwanda et Burundi, 1948-1963", p.20.

Rural Water and Sanitation⁴ which defined the context of RWS. WASH was invited to participate in the preparation of this plan.

By 1989, SNHR responsibilities had expanded to include coordinating the activities of fourteen Rural Water Stations (see map 2) with important financial help from USAID project 660-0107. The evolution of rural water supply activities conducted by SNHR is presented in the following table. (See Appendix C for details.)

Table 1. Evolution of SNHR RWS Activities

YEAR	SPRINGS	HANDPUMPS	PIPED WATER SYSTEMS
1985	96	75	7
1986	245	64	8
1987	364	90	10
1988	458	156	1

Apart from SNHR, there are a significant number of NGOs involved in rural water supply activities in Zaïre. Of particular note are AIDRZ, ECZ (SANRU II), Peace Corps, GTER, CDI, the Comité Anti-Bwaki, Solidarité Paysanne, and the Kimbanguistes (see Appendix C). According to 1988 data, these agencies have capped 3,530 springs, installed 1,198 handpumps, and developed 51 piped water systems. (Details by region are included in Appendix C.) The increase in the number of drilling rigs available for RWS from one in 1987 to seven in 1991 makes it possible to install more than 700 handpumps each year. This quantity of pumps requires maintenance, repair, and parts distribution systems at a level of sophistication far exceeding what has existed previously.

A key element of the National Plan is community participation in system design, construction, and operation and maintenance. According to the plan, community participation is to be channelled through local development committees. Committees created to date lack the training and supervisory assistance to perform their roles in O&M.

Few of the agencies providing RWS systems have attempted to create a coherent and viable O&M program. Many of the systems are in danger of falling into ruin, as they did after FBI was disbanded, if these issues are not addressed.

⁴C.N.A.E.A., "Plan de l'Hydraulique et l'Assainissement en Milieu Rural, 1986-1991". Kinshasa, Zaïre. n.d.

Chapter 3

OPERATIONS AND MAINTENANCE REQUIREMENTS

A standardized list of operations and maintenance requirements for capped springs, gravity-fed piped water systems, and deepwell handpumps is provided in the following sections. The requirements in the handpump section are oriented toward the revised Mark II pump that has been adopted as the preferred model for Zaire.

3.1 Spring-Capping

The operations and maintenance requirements of spring-capping systems are quite simple and, if systems are well-constructed, should have few financial consequences. O&M for spring-capping is basically limited to the following activities:

- Maintaining the fence enclosing the capping area;
- Maintaining the "lawn" planted above the capping;
- Assuring the viability of the diversion canal;
- Keeping the drainage canal clear;
- Clearing the path leading from the village to the spring.

Should the structure need a more serious intervention (for a leaking cap wall or due to unexpected diminution of spring yield, for example), a qualified technician would be needed. The village would have to find funds with which to pay the technician and to purchase any imported materials. Villagers would also have to collect local materials and provide manual labor for the repairs.

3.2 Piped Water Systems

A gravity-flow piped water system may be divided into four units, each with its own O&M requirements.

The first unit is the capped spring(s) for which O&M requirements are discussed above.

The second unit is the pipe network leading from the water source to the reservoir, where one is used, and from there to the standpipes. These pipes are normally buried and require little if any routine maintenance. Galvanized metal or PVC pipes may be damaged on occasion (usually the result of not being buried deeply enough or of unauthorized attempts to set up private connections) and a trained repair technician will be needed to either patch or replace the damaged pipe.

The third unit is the reservoir. Routine maintenance involves the following tasks:

- Inspection to ensure that the reservoir is not leaking;
- Checking that all manholes and other openings are secured against contamination;
- Checking that the overflow pipe is not blocked; and
- Draining and cleaning the reservoir as needed, generally not more than once a year.

The fourth unit of a piped water system is the distribution point, generally a public standpipe with one or several taps. In areas with slow-draining clay soil, a drainage pit (*puit perdu*) filled with rocks may be used to prevent the collection of stagnant water. A separate trough for watering animals may also be added. O&M requirements become the most critical, and costly, at this level. Users must be trained to use taps properly; worn and broken taps must be repaired or, more commonly, replaced; drainage pits must be kept filled with rocks and the area around the standpipe kept clean.

An effective O&M program for piped water systems requires the following:

- (1) selection and training of a person to repair and replace pipes and taps;
- (2) some supervision of distribution sites to prevent abuse of taps and maintain the sanitary conditions around the site;
- (3) a mechanism for mobilizing financial resources to pay repair fees and charges and to buy parts and other materials;
- (4) formation of a committee drawn from the local population to manage the water system; and
- (5) prevention by the committee of unauthorized connections.

3.3 Handpumps

Of the three water systems discussed here, handpumps have the most complex O&M requirements. The requirements below are based on the India Mark II (modified), or equivalent, which is becoming the standard in Zaire. On the technical side, there are three levels of intervention:

- 1) The pump caretaker;
- 2) The trained local pump repair technician; and
- 3) The specially equipped regional mechanic.

The pump caretaker operates at the village level under the supervision of the village committee. It is generally recommended that each pump should have a caretaker. The following tasks are to be performed at this level:

- Ensuring the correct use of the pump by all users;
- Greasing the chain on a regular basis;
- Tightening and/or replacing nuts and bolts of the super-structure when required;
- Diagnosing pump performance problems and arranging for visits by pump repair technicians; and
- Assuring that the area around the pump is in hygienic condition and that the drainage canals/pits are maintained.

The trained pump repair technician covers a multi-pump and sometimes a multi-village area. He or she should be able to handle common repairs such as replacing worn cup seals and rubber gaskets, replacing pump rods and couplings, and replacing the chain, axle, or bearings.

The specially equipped and trained regional mechanic services a large area and intervenes only when repairs cannot be handled by the local pump repair technician. He or she will need a vehicle to transport the complete tool kit, the tripod, and the winch so that repairs requiring the lifting of the riser pipe can be performed. The regional mechanic is responsible for the following repairs:

- Replacing a damaged cylinder;
- Re-threading damaged pump rods and couplings; and
- Any other repairs beyond the competence of the repair technician.

The O&M requirements of handpumps clearly have monetary consequences. The spare parts themselves have to be purchased and the repair technician and regional mechanic must be compensated. The transport requirements of the latter two must also be taken into account. It is generally accepted that these costs should be borne by the community.

An effective O&M system for handpumps must address the following factors:

- Assuring the capacities and competence of the village committee in community organization and financial management;
- Organizing a technical and supervisory follow-up system;
- Developing a spare parts and materials distribution system;

- Assuring a viable financial management system at all levels;
and
- Assuring the competence of the technical services to implement the O&M program and to communicate effectively with the communities.

Chapter 4

FINDINGS

4.1 Factors Affecting O&M Strategy

Initial discussions with senior representatives of key organizations in RWS in Zaire suggested a keen awareness of the importance of an O&M program to the long-term success of national efforts to improve access to potable water in rural areas. Indeed, there appears to be general agreement that the development of a coherent approach to O&M should be given high priority. Further discussions revealed some of the factors that have hampered the development of such a program to date.

- No institution or organization has been designated as responsible or has assumed responsibility for long-term operation and maintenance of RWS.
- To date, emphasis has been almost exclusively on the construction of potable water systems. The organizations and institutions active in this area have limited material, financial, and human resources. They have traditionally adopted the attitude that these resources are most productively employed in establishing new water systems.
- O&M technical requirements are generally understood, at least by members of the technical services, but have not been detailed, standardized, and evaluated for their effectiveness. Indeed, there seems to have been no systematic attempt to evaluate alternative rural water system designs, hardware, or construction procedures according to criteria relevant to O&M. For example, no comparative study was found of standpipe taps in terms of relative durability, ease of repair, replacement cost, or availability. Similarly, although a variety of approaches have been taken to spring-capping, the relative merits of the different styles in terms of durability, acceptability to users, or labor required to maintain the capped spring were unknown.
- With the articulation of the principle of community responsibility for O&M,⁵ attention shifted from the system provider to the beneficiary community. The concept of community responsibility, however, was never fully operationalized.

⁵C.N.A.E.A., Plan de l'Hydraulique et l'Assainissement en Milieu Rural, 1986-1991, p. 111-112.

4.2

SANRU II

The Basic Rural Health II Project (660-0107), or SANRU, has made several important contributions to the rural water and sanitation sector in Zaire. The project was initiated in 1981 to improve rural health infrastructure and strengthen primary health care capabilities in 50 Rural Health Zones in Zaire. In 1985, the project was renewed and its mandate broadened to include a major rural water and sanitation component. By the end of 1988, SANRU II had financed the construction of 1,774 capped springs, 18 piped water systems, and 132 wells (including renovation of existing wells). SANRU has also purchased 250 India Mark II pumps, 150 of which are to be installed in the Kabongo area of the region of Shaba in conjunction with a USAID-financed drilling rig operated by SNHR.⁶

4.2.1 The Rural Health Zone and Village Development Committee

A crucial element of the rural health system supported by SANRU II is the zonal health structure. Although estimates differ, it would seem safe to say that approximately 140 of the 306 Rural Health Zones recognized by official decree in 1985 are operational. RHZs vary substantially in area and population, ranging from 60,000 to 150,000 inhabitants. The boundaries of the RHZs do not necessarily correspond to political-administrative jurisdictions but generally correspond to the level of development of health infrastructure (especially the number of hospitals) and the distribution and density of the local population. The RHZ consists of a Reference Hospital, 1-3 reference health centers, and 15-25 health centers. Each health center is to serve a population of 3,000-10,000 inhabitants located in 5-10 villages.⁷ The staff of the health center, generally the head nurse, is to visit each village in the catchment area on a routine basis.

Among the various tasks assigned to the health centers is the creation and training of village development committees (VDC). Committee members are to organize the village population to participate in development activities including primary health care, rural water supply and sanitation. The VDC currently serves as the preferred organizational basis for community participation in SNHR- and SANRU-financed rural water projects. In areas where no local committee has been established, village members are asked to create a committee to manage the proposed water system. These village development committees constitute the foundation of a community-based operations and maintenance system for rural water supply.

⁶SANRU, Rapport Annuel 1988 and communications from SANRU staff.

⁷USAID, Basic Rural Health II Project Paper, 1985, p.10.

4.2.2 The Rural Water Coordinator

Although SANRU has not as yet adopted a comprehensive approach to O&M, it has initiated a number of programs and activities that will permit the development of decentralized O&M capability. An important innovation under SANRU II was the creation of the position of Rural Water Coordinator (RWC) at the level of the Rural Health Zone. The salaries of RWCs are paid from the internal receipts of the RHZ. The objective is to have an RWC in each of the SANRU-assisted health zones. Several health zones located outside of the SANRU project area have adopted this strategy and at present there are 84 Rural Health Zones with an RWC trained by SANRU.⁸ (See Map 3.)

The training program for the rural water coordinators has been divided into three modules. The first module focuses on techniques for spring capping and the basics of community participation. The second module provides training in advanced techniques of community organization and participation, data collection and community studies, sanitation (including construction of the VIP latrine), and health education. The third module will be developed later this year. Over 100 trainees have completed the first module, while 50 trainees have completed the second. The training program is organized by region, with 15 - 20 candidates drawn from one or two regions invited to each session.

4.2.3 The National Water Supply and Sanitation Training Team

The training of rural water coordinators is conducted by members of the National Team of Water and Sanitation Trainers (ENFEA). This institution was initially established to address the training needs of SANRU and has developed into a valuable national training resource. The training team is composed of specialists drawn from a variety of national services. ENFEA trainers have participated in a series of training of trainers workshops organized by SANRU with technical assistance from WASH consultants. These workshops serve both to enhance the training techniques of the participants and to develop materials to be used for subsequent training of RWCs. Three training of trainers workshops have been completed. ENFEA has provided the trainers for the modules described earlier, as well as for training programs for various national and international organizations.

The fourth training of trainers workshop was originally intended to focus on pump installation and construction techniques for rural water systems. After discussion with the current WASH mission, the decision was made to emphasize O&M requirements and strategies rather than installation or construction. The specifics of the program are under consideration by SANRU staff; recommendations related to the fourth workshop are made later in this report.

⁸Data provided by SANRU II staff. Not all RWCs are in SANRU-supported Rural Health Zones.

4.3 The National Rural Water Service

The National Rural Water Service, created in September 1983 under the Department of Agriculture and Rural Development, had its antecedents in the three Rural Water Brigades created with UNICEF funding in 1978 in response to an outbreak of cholera in the north-east (Rutshuru) and a severe drought in the Bas Fleuve subregion of Bas-Zaïre (N'Sioni). The third Brigade was established in Ngandajika to take over the management of an important water system constructed by FBI. Since that time, SNHR has grown to include 13 operational stations spread throughout the country, and plans to expand to 37 stations by 1991. The long term objective is to equip and staff 50 stations. The rate of growth is constrained by the availability of trained technicians, budgetary resources, and investment funds.

In the four-year period from 1985-88, SNHR stations have been responsible for capping 1,163 springs, installing 366 manual pumps and constructing 29 piped water systems. The population served by these rural water systems exceeds 900,000 (see Appendix C). Although this number falls far short of the objective cited by the President of Zaïre of providing potable water to 50 percent of the rural population by 1991, the accomplishments of this young service are commendable.

According to SNHR policy, the management and maintenance of rural water systems is entirely the responsibility of the beneficiary community.⁹ The village development committee is to serve as the organizational basis for community action. Under this division of responsibility, SNHR is to plan and execute the development of rural water systems, as well as provide some basic training to local committee members to assure the maintenance and repair of the system.

SNHR central staff and station personnel are aware of the importance of community participation to the success of their efforts. This interest in participation, however, is often limited in practice to securing needed labor contributions during construction and is rarely carried beyond that point. In other words, participation does not lead to preparation of the community to assume management responsibilities for the water system and carry them out effectively.

4.3.1 SNHR Station Capabilities

SNHR field stations are generally staffed by three cadres and 10 to 15 workers (masons, carpenters, plumbers, and laborers). The cadres consist of the station chief, a technical assistant (AT) and an administrative and financial assistant (AF). There is no one with technical training in community development or *animation*, nor is there a formalized training program for members of village development committees, repair technicians, or system caretakers. None of the stations visited, with the exception of the Sandoa station, had even a rudimentary O&M strategy or program. Community participation was limited to

⁹SNHR. "Aperçu Général des Activités du S.N.H.R.: 1985 à Mai 1988, et Perspectives d'Avenir." n.d., p. 9.

requests that the community provide local materials and assist in constructing some systems. When local contributions were not forthcoming, some stations continued with the projects and either provided the needed materials or labor themselves or hired laborers locally. Not surprisingly, the stations with the least resources in the way of material and transportation had the most positive approach to community participation. The Mweka station, for example, now requires that materials be gathered at the work site before station personnel arrive to begin construction.

4.4 The Shaba Refugee Water Project

The Shaba Refugee Water Project (660-0116) is implemented by AIDRZ, a Zairian PVO, in collaboration with SNHR. The project began in 1985 with the purpose of improving water supply systems in the Lualaba sub-region of Shaba. The original project objectives were to renovate 140 old wells, drill 430 new borehole wells, install 570 handpumps, cap 500 springs, and construct piped water systems depending on feasibility studies. The final outputs of the project have been modified based on information from field studies. The revised objectives include 310 boreholes with handpumps, 500 springs, and 7 piped water systems.

This is the only RWS project in Zaire that has attempted to integrate an O&M program into project design.¹⁰ The project has six full-time extension agents working in coordination with the technical teams. This practice has been quite successful with spring capping, particularly as there is a structured follow-up program. The approach to piped water systems has been modified with experience to include a full-time extension agent during system construction. On April 29-30, a full staff meeting was held at the Sandoa station to review a number of key issues related to the project's O&M strategy for deepwell handpumps. The WASH team was invited to participate in this meeting.

4.5 Peace Corps

The Peace Corps program in RWS/S started in 1984. At present there are 12 Peace Corps volunteers attached to Rural Health Zones as direct counterparts to the RWCs. At present, they are assigned primarily to SANRU-supported zones. Funding has been provided by OXFAM and UNICEF and the program is to be expanded to other zones. The Peace Corps is planning a training session emphasizing O&M for its RWS/S volunteers in early 1990.

¹⁰WASH. "Development of an Operation and Maintenance System for Shaba Refugee Water Supply Project" (Field report no.170). Arlington, Virginia, June 1986.

4.6 Institutional Collaboration

The development of an effective village-level operations and maintenance program will require the effective collaboration of local health services, SNHR stations, other technical services, and NGOs. There are only three structures that operate effectively at the community level or have regular relations at that level: territorial administration, the MPR, and the rural health system. Due to the important linkage between potable water and health, the emphasis of the rural health system on the creation of local development committees, and the creation of the post of Rural Water Coordinator, the Rural Health Zone is the obvious and preferred partner for organizations that provide rural water systems.

Discussions with SANRU and SNHR staff in Kinshasa and with health zone and field station personnel confirm that collaboration already exists at many levels. SANRU, for example, provides the financing for many of the water systems installed by SNHR. In the field, RWCs and station personnel may share information gained from water surveys as well as technical advice. However, there is at present no formal mechanism for collaboration and the result has, in some cases, been duplication of effort, misunderstanding, and decreased productivity.

Collaboration is made difficult by a number of factors. First, a comparison of the two maps localizing RWC and SNHR activities reveals that SNHR catchment areas often include a number of RHZs, some of which may receive SANRU support and have a trained RWC, while others are not included in SANRU activities. The creation of village development committees is very uneven and SNHR stations sometimes find that they must initiate the establishment of a village committee before they can proceed with construction of the water system. More importantly, the lines of authority and financing are not the same, with the RHZ depending on the Department of Public Health and its own internally generated resources and the SNHR station depending on the Department of Rural Development. Finally, in the absence of a coherent O&M program that clearly details the activities, sequencing, and responsibilities of all parties involved, the basis for collaboration remains undefined. All parties have agreed that clarification of the responsibilities and expected contributions of each must be one of the initial steps in developing a common approach to O&M.

4.7 Role of the Community

The broad acceptance by RWS providers of the principle of community responsibility for maintenance of rural water systems is not based on a deep-seated belief in decentralization or a philosophy of community rights. Rather, it is a response to financial and organizational constraints that prohibit the effective operation of these systems by the service-provider or other government service. Rural communities, on the other hand, often see this principle as a form of negative largesse: instead of gifts, the government and donors are handing out responsibilities, often with monetary costs attached, for a service that has historically been provided free of charge.

Community members may place a very high value on potable water and improved accessibility and be willing to pay for this service. However, discussions during the course of the field trips revealed that few communities possess the technical or especially the organizational capacity to manage their water system effectively. Local communities must be assisted in preparing for this responsibility, not simply told that it is theirs to discharge.

4.7.1 The Village Development Committee (VDC)

The VDC is the cornerstone of the village-level operations and maintenance system. As detailed above, O&M requirements differ significantly from one system to the next, but some maintenance is needed if any system is to remain in operation. The demands placed upon a VDC for spring-capping are minimal, and the organizational and technical skills required by committee members are correspondingly less than for a handpump system. The traditional methods of mobilizing labor and other contributions may be adequate to meet the minimal needs of systems using capped springs. However, when substantial labor contributions or regular financial contributions are required, traditional authority and mechanisms are often inadequate.

The village development committees interviewed during field visits generally had some degree of difficulty in obtaining labor and monetary contributions from community members. The level of difficulty appeared to increase with the frequency of requests for contributions. Regular financial contributions seemed to be the most difficult for committees to manage. In some cases, committee members made it clear that they had lost control of the situation. Too often, a clear "us - them" polarity characterized the discussion.

There are a variety of explanations for the difficulties many committees experience. Committee members often lack the skills needed to organize activities or manage money. Many committees are not representative of the population but are instead made up of political appointees, merchants, civil servants, and other educated residents. Women, uneducated farmers, and workers were rarely present at committee meetings, yet they constitute the bulk of the population that is to provide labor or funds for O&M.

On a more fundamental level, the tasks required of the committee often have no socio-cultural or historical basis in the internal structure of the community. Village communities are not, by tradition, democratic polities where decisions are made by elected representatives and the population routinely complies, even if grudgingly. The committees were created in response to external pressures, not to internal forces seeking democratization of decision-making. Committees were established as delegations or emissaries sent to represent village interests before an external power; they were not created to regulate the internal life of the community.

The VDC is not viewed automatically as a legitimate village institution simply by virtue of its being elected or designated. For the committee to be effective, community members must first acknowledge the importance of the purpose for which it was created. The VDC, when created at the urging of the local health center or RWC, responds to a felt need for better health care. In

the case of RWS, the value of potable water and improved access must be recognized. Next, community members must be convinced that the continued availability of what has now been identified as a collective good depends on their actions rather than on the intervention of an outside authority. Once these two points are accepted, the VDC may be more successful in accomplishing its tasks.

Water system providers rarely give adequate attention to community organization or to the need for community members to develop a perception of the water system as a local public good prior to the construction of the system. Consequently, local labor and material contributions are often less than expected and late in coming. Local people may believe the water system is a gift of the state or of an outside agency or donor and that they are not responsible for it. When the rural water system is viewed as belonging to the state, villagers may think that they should be paid for their labor and that any and all repair costs are legitimately the responsibility of the system provider.¹¹

The implications of this are twofold. First, health education to build awareness of the relationship among clean water, environmental sanitation, and health is an important step in preparing the community for the eventual management of a potable water system. The activities of local health workers, then, are an important component of a comprehensive O&M strategy. Second, the community must be given complete information about the options for improved water supply, the implications and costs of each option, the source of financing for the system, and the requirements that the community must meet before, during, and after construction.

4.7.2 Willingness and Ability to Pay

The willingness and ability of users to pay the cost of service provision is an important issue for all decentralized service systems. User fees have been instituted for virtually every service, somewhere in Africa. The most common sector for the application of user fees and charges is health. Zaire has had a generally positive experience with user fees for health facilities in Rural Health Zones. But will rural residents be willing to pay for potable water, especially in areas where access to water is not a problem?

In the case of the three types of water systems under consideration for this mission, it is safe to assert that ability to pay is not a serious constraint. The recurrent costs of these systems are quite low, especially when averaged over a 12-month or longer period. In most cases, the imposition of regular fees is not necessary; repair costs can be raised as needed using the customary *cotisation* practice. In systems where a stock of replacement parts has already been purchased by the community, collection of money to replace the inventory can be spread over a reasonable period, as needed.

¹¹For examples of the effects of inadequate community preparation on the sense of local ownership and responsibility, see Hall and Malina, WASH Task No. 036, Trip report for Bas-Zaïre, April 1989.

It should be noted that no studies of actual average repair costs have been done for any of the systems under discussion. This is a serious lacuna and should be addressed by the relevant technical services. The assumptions about community ability to pay are based upon repair cost estimates by the WASH team and the results of a socio-economic study conducted by the Extension Division of Project 116 in Sandoa.¹² Handpump systems have the highest per user recurrent operating costs of the systems studied. Estimates of annual costs (calculated to be high on the average) suggest that per family cost would be well under five percent of monthly income. In any case, it would be unlikely that the total annual O&M cost per family would exceed the price of a chicken.

If ability to pay is not a problem for most service users, what about willingness? Based on numerous meetings and discussions with local committees, service users, and technicians, it appears that, in general, users are willing to pay for potable water that is regularly available and easily accessible compared with alternative sources of water. If that is the case, why do local committees experience such difficulty in collecting money? Some reasons have been advanced in earlier sections of this report. Field visits suggest that factors such as perceived inequity in access and in expected contributions and lack of trust in the financial control mechanisms are also important.¹³

Committees are often unaware of alternative resource mobilization strategies. Service providers may fix a sum to be raised without discussing the varying ways this may be done. In most of the communities visited, contributions were uniform across families regardless of family composition, level of service use (and benefits), or income. The full range of options--from collective fields, to user fees, to payment in kind--should be studied and communicated to village committees. Training in basic bookkeeping is also necessary. Village treasurers are generally selected based on respect and trust, and do not always have a deep understanding of the tasks required of them. This is an element of an overall O&M strategy that should not be overlooked.

4.8 System Specific Findings

4.8.1 Spring-Capping

The most common design for spring-capping employs the double dam system to protect the capping foundation from infiltration. The capping itself is protected from above either by a layer of cement (SNHR, SANRU) or by plastic sheeting and clay (Project 116). Most systems also employ a diversion and a drainage canal.

¹²Projet Hydraulique Rurale du Lualaba. "Estimation des Revenues des Ménages Villageois de Lualaba (Méthodologie)." Sandoa, Zaïre. November 1988.

¹³See Hall and Malina, WASH Task No. 036, Trip Report for Bas-Zaïre, April 1988.

The design used by the Mueka station for capping springs employed a spring box or silt chamber with limited capacity, no drainage pipe, and no overflow pipe. Access to the chamber was gained through a plug that was cemented around the edges. The station recommends cleaning the chamber every six months, an operation that would require breaking and replacing the cement seal. No one in the village had been trained to perform this maintenance task. This spring box design appears unnecessary and possibly ineffective. A spring box with drainage and overflow pipes separating the capping pipe from the water delivery pipe would seem to offer more security to the capping. A study needs to be made of the different types of spring cappings in terms of labor required to maintain the capping, durability, and acceptability to users.

All of the agencies responsible for organizing and executing spring-capping generally require some form of community participation. In all cases, the creation of a village committee was required before construction; the following forms of community participation were also generally required:

- providing local materials such as sand, gravel, rocks, clay;
- manual labor during construction; and
- clearing the area around the spring and the path leading from the village to the spring.

A financial contribution for spring-capping is being required in some areas prior to construction. This practice resulted from the advice of the Assistant Peace Corps Director for Water and Sanitation and is to be applied in Rural Health Zones where the RWC is assisted by a Peace Corps volunteer. The Z 2,000 "fee" is to be used in part as an incentive for the RWC, with the rest going to support the costs of the water and sanitation program. When divided among the 50 to 60 families that may be expected to use the water source, the amount requested is quite modest. Nevertheless, the payment of the fee may engender a sense of responsibility for the continued operation of the spring.

The use of a formal protocol or other negotiated agreement stipulating the responsibilities and contributions of all parties was found to be an effective device for mobilizing community support in the Project 1'6 area. A signed protocol has a certain symbolic value and, perhaps more importantly, the process of reaching agreement before construction begins assures that the community receives a clear explanation of the builder's expectations.

A common problem raised by capping teams was the delay in the provision of local materials by the community. This was sometimes resolved by purchasing the materials and transporting them to the villages. When this is done, it sets a negative precedent for other communities and undermines the importance of local participation. Whether the capping teams were large or small, few were willing to slow down construction if the communities did not meet their commitments. Larger teams had a tendency to discourage village participation and to reinforce the belief that the water system was a gift of the government.

Some villages participated fully in the preparation and construction of the spring-capping. Although the number of villages visited during the field trips is too small to draw a firm conclusion, it appeared that villages that had received extensive health education, and especially water use and hygiene education, tended to be more willing to participate in the spring-capping and to maintain the system adequately. The level of understanding and commitment of the village chief and/or development committee was also an important factor in village participation and in the quality of maintenance of the area around the spring.

In villages where follow-up visits were made after construction, O&M activities were clearly better understood and performed. This was the case in the Project 116 area where a well-designed extension program, including evaluation of the maintenance of the spring, was in place. There were no problems in the acceptance and correct use of the spring-capping. In some cases where there was no follow-up program, the spring was no longer being used or maintained. In those villages where community members had followed all steps of the capping, there were fewer problems of acceptance of the structure by the community.

4.8.2 Gravity-fed Piped Water Systems

Piped water systems vary substantially in terms of their capacity and technical characteristics. Operations and maintenance requirements, however, are basically the same: leaking or broken taps must be repaired or replaced, less frequently a pipe will burst and need to be repaired or replaced; the reservoir, if there is one, requires occasional cleaning, and the area around the spring-capping must be maintained. The labor requirements for a large or complex system may be substantial. More importantly, a system for mobilizing financial resources will be required to replace taps and pay for repairs. The operation and maintenance of a piped water system requires a level of organizational and financial management skill that is lacking in most rural communities.

There has been a discernible movement toward requiring more and more meaningful community participation in water projects in recent years. Earlier systems were often built using paid workers, with little or no consideration of community participation in system design, construction, or maintenance. After construction, the system provider would withdraw, more likely than not leaving the user community with little understanding of the configuration of the system or its capacity or maintenance requirements, and no organizational basis for assuring continued operation or financing of needed repairs and maintenance. Predictably, the result has often been system deterioration and the eventual return of most or all community members to non-potable water sources.

In all of the piped water systems visited, a local committee had been (or was to be) formed to manage the water system. Committee members are generally literate and drawn heavily from local civil servants and businessmen. Local religious communities and traditional authorities are generally represented. As noted earlier, women and uneducated farmers and workers are underrepresented on most committees, yet they constitute the vast majority of the users and are called upon to supply the bulk of manual labor for construction and major repairs of the water system.

Many of the committees visited reported difficulties in obtaining the confidence and compliance of community members, especially in regard to financial matters. In a number of cases, the original committee was dissolved after public outcry about alleged financial malfeasance. Although such an occurrence represents a setback for the community and much work and time is required to rebuild confidence and trust, it was observed that the people elected to replace the outgoing committee members tended to take very seriously the need for strict financial management and full communication with the entire community.

It appeared that, in all cases, system providers had failed to inform the community of the cost of the piped water system, the value of the material and labor furnished by the system provider, and the value of community labor, material, and financial contributions. Nor were the estimated costs of routine maintenance and repairs communicated beforehand to community members. The absence of such communication tends to reinforce the view that the system belongs to the service provider rather than to the community. Inadequate preparation of the community prior to construction significantly lessens the likelihood of effective O&M activities once the system is in operation.

The lack of communication between the service responsible for installing the system and the local committee and population before, during, and after construction was an obvious problem in many of the communities visited. In one case, committee members indirectly accused the station of stealing pipe and taps that "belonged" to the community. This and similar misunderstandings could have been avoided if regular meetings had been held to discuss technical, organizational, and other concerns.

Project 116 has attempted to overcome some of these deficiencies in the three villages in which piped water systems are being built. Two full-time *animateurs* have been assigned to help the committees organize construction activities, establish a system to manage each standpipe, and institute appropriate financial management practices.

4.8.3 Handpumps

Project 116 in the Lualaba subregion of western Shaba was the only site visited that was installing handpumps. To the team's knowledge, it is the only major project that has attempted to address O&M issues for manual pumps.

Extension services

Before drilling, the *animateurs* or extension agents made at least five structured visits to each village. Among the activities undertaken during these visits was the signing of a "*Déclaration de prise en charge de puits avec pompes*" ("Declaration Accepting Responsibility for Wells with Pumps"). It was also explained to the communities that they would have to collect Z 90 per household, as a participatory deposit, before the pumps would be opened. This requirement was not always strictly followed, and some pumps were in operation despite incomplete payment of the deposit. However, there seemed to be a general awareness that the village was responsible for O&M.

The policy of locking pumps until the deposit has been collected deserves serious reconsideration. People may require a certain period of time to use a new water source before they develop an appreciation for its merits (primarily access and hygiene). By locking a pump before its merits are fully appreciated, the population is likely to be left with a feeling of being wronged rather than of being deprived of a valued service. Similarly, once people in an area have witnessed the benefits of an improved water supply system, they can reasonably be expected to demonstrate their willingness to participate in construction and O&M of the system by providing a financial deposit prior to construction.

Even though these structured visits were essential to project success in promoting a sense of responsibility for O&M in the villagers, both the agents and the communities suffered from the lack of well-defined O&M mechanisms and a lack of understanding of the reasons for collecting funds. The estimated cost, frequency of replacement, repair fees, and method of obtaining spare parts had not been established and this information was not available to the extension agents to pass along to the community.

There was no program of regular visits by extension agents to villages with handpumps. Due to the heavy demands on the extension service associated with collecting data, monitoring maintenance, working with village committees in towns where systems were under construction, and carrying out the five-visit program of animation in villages where pumps were to be installed, it was not possible to make frequent returns to villages where pumps had already been installed.

The project, aware of these weaknesses, organized a staff meeting to address the problems encountered by the extension animation program. The main issues addressed in the meeting will be discussed in a later section of this report.

Pump repair system

The project has trained 10 local pump repair technicians to perform repairs that do not require the extraction of the riser pipe. The project realized the inadequacy of the training in that, with the base tools provided, the repair technicians could not separate the plunger yoke body from the follower to change the pump bucket (piston rings). The training materials provided by TATA were badly translated installation guides, not repair manuals, and a video showing repairs on the unmodified Mark II pump was not appropriate for the modified version. The training was provided by a technician without the assistance of an experienced trainer and was acknowledged to have weaknesses, particularly at the level of malfunction diagnostics. Administrative and financial issues such as who would have tools and how would the repair technicians be paid for their work and at what rate were not addressed. The project is presently redesigning the repair manual and the training session.

The modified Mark II pump is an attractive pump for village-level operations and maintenance, despite a couple of defects at the level of the underwater pumping mechanism. The only way to replace the piston rings and the upper and lower check valve rubber seatings is to use expensive and potentially destructive pipe wrenches on the brass elements. These pipe wrenches are not provided in the

base tool kits, but only in the district tool kits along with files to repair the damage to the brass parts. The engineer on the WASH team suggested some possible solutions, such as drilling holes through the followers so that they may be blocked with a rod, that are being tested on some pumps.

To date, all maintenance and repairs have been performed by the project. Few repairs have been needed as most of the 120 pumps have been installed in the past year, and about 40 percent are locked up because the communities have not collected the required deposit.

Spare parts

A major obstacle in the establishment of a program for the purchase, distribution, and sale of spare parts is the lack of conclusive information on the usage characteristics of the modified Mark II under the conditions found in the Lualaba subregion. This information is necessary to determine stock levels and to estimate average repair costs to be used by SNHR and the local committees. The need for a sound system for collecting information on pump malfunctions and repairs is clearly indicated.

A pricing and distribution system for spare parts had yet to be established at the time of the field visit. A system employing reference hospitals and health centers was proposed at the staff meeting. It was noted that no major pump parts (such as the cylinder, plunger assembly, etc.) were included in the original order from the manufacturer. Due to the high cost of these items when purchased separately, it was found to be cheaper to order complete pumps which could be dismantled to supply spare parts. Examination of the parts employed in the modified Mark II suggests that considerable savings may be obtained by purchasing some common parts on the local (Kinshasa or Lubumbashi) market.

4.9 Project 116 Handpump O&M Strategy Meeting

Senior project officers and staff at the Sandoa station realized that a critical point in the evolution of the borehole and handpump component of the project had been reached. A full staff meeting was organized on April 29-30, 1989, to establish a handpump O&M strategy in light of experiences in the field. The WASH team was invited to participate. The results of this collaboration are presented in detail in a document under preparation by the AIDRZ director. In this meeting, basic decisions were taken on the following issues.

1. Payment of the deposit and methods of mobilizing funds for repairs.

The deposit is to be exchanged directly for the spare parts start-up kit prior to drilling. It was accepted that drilling would not occur in a village if all preconditions, especially collection of the deposit, had not been met. Given the instability of the currency, the project will recommend but not oblige the villages to have a regular collection of funds. If funds are collected, it is recommended that they be converted rapidly to spare parts. Village committees

will be encouraged to maintain a modest fund to be used for paying transport and fees of the repair technician.

2. Ownership of the pumps.

The pumps are considered to be the property of the community. A certificate of ownership is to be presented to the community in a ceremony once all preconditions (payment of the deposit and purchase of the spare parts kit, in particular) have been met.

3. Composition and costing of the spare parts start-up kit.

The start-up kit consists of the parts most likely to be replaced, a quantity of chain grease, and a wrench (no. 19) for opening the cover of the pump. Initially, it was decided that the cost of the kit should be based on the "real" price of the contents, including transport, handling and replacement factors, based on the prices provided by the manufacturer (see Appendix D). After reviewing the projected cost to the community in light of the actual materials to be included in the kit, it was decided to investigate the possibility of obtaining equivalent parts on the local market. The price of the start-up kit will be re-evaluated taking these factors into consideration.

4. The spare parts distribution system.

A proposal for distributing spare parts through the Rural Health Zone structure is to be presented to RHZ officials. A total of nine reference hospitals and health centers spread throughout the Lualaba subregion are to serve as parts depots and retail sites. Health center and hospital personnel will be responsible for the sale of spare parts, the security of receipts, and control of the stock. The RWC will be requested to provide some supervision of the distribution sites. The Sandoa SNHR station will also maintain all the parts in stock.

5. Inventory and financial control systems for spare parts.

Sandoa station personnel are to visit each parts distribution center every three months to replace parts that have been sold, collect the money from these sales, collect information on pump breakdowns, and post updated price lists. The new price list is to be calculated by SNHR/Kinshasa, taking into consideration changes in replacement costs and exchange rate fluctuations for imported parts. It is proposed that the money collected by the station be kept as operating funds, with an equivalent amount withheld by Kinshasa from the station's operating account and deposited with the supplier to purchase replacement parts for those sold. This would limit risks and costs associated with cash transfers and shorten the period required to replenish stock levels.

6. The levels of maintenance and repair and their cost.

There are three levels of intervention. The first level is the pump caretaker nominated from the village community and responsible for teaching proper operation methods, greasing the chain, and notifying a repair technician when needed. The caretaker is unpaid. The second level is the local pump repair technician, responsible for all basic repairs that do not require removing the riser pipe. Two repair technicians are to be trained for each health center catchment area and are to be paid for their services. The third level is the 'regional' mechanic, specially equipped and with transportation for the heavy equipment. Payment is to be based on actual costs. Given the price of the base tool kits (more than \$200), it was decided not to sell them to villages or repair technicians. Instead, they are to be kept at the health center and checked out to the repair technicians when needed. The district tool kits are to be kept at Sandoa until appropriately supported mechanics are identified and trained.

7. Extension strategy for improving village compliance with financial conditions agreed upon in pump responsibility document.

Rather than requiring Z 90 per household, a fixed amount per pump is to be requested as a deposit from the committee. This deposit will be exchanged immediately for the start-up kit, and will vary according to the real cost of the kit. Agents are to discuss thoroughly with the committee the importance of purchasing spare parts in advance in terms of both value (effect of inflation) and repair time. A regular system of follow-up visits after installation of the pump was also recommended.

8. Training needs for repair technicians, treasurers, and committee presidents.

The content and methodology of the current programs are to be reviewed and amended. Project staff accepted the suggestion of the WASH social scientist that the definition of roles of the president and treasurer be reviewed and that the content of the training program be adapted to the specific duties and tasks of each. A component in diagnostics is to be added to the training program for pump repair technician following the recommendation of the WASH engineer.

9. Monitoring and evaluation responsibilities for water systems.

At the village level, all maintenance activities are to be noted in the revised maintenance book. A routine system for collecting information on pump repair and operation during the visits of health center nurses to villages in the center's catchment area is to be proposed to the Rural Health Zone. This information is to be integrated into the standard reporting system for the

health center and transmitted to the Rural Health Zone for review by the RWC. The data will also be collected and analyzed by SNHR station personnel. The information collected by the health center nurse should include operation and maintenance characteristics for all water systems used in the village.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

The recommendations presented in this chapter are the result of a careful assessment of institutional capabilities and field experiences in O&M in Zaire. At present, no organization has implemented a coherent, systematic program to assure the continued operation and long-term sustainability of RWS systems. As detailed earlier, some attempts to institute O&M components have been made and, more importantly, the key organizations in the RWS sector acknowledge the importance of developing a common O&M strategy. In light of this, the following recommendations are oriented toward the strengthening of institutional capacity and the identification of key elements of an O&M strategy.

5.1 Basic Assumptions

The following assumptions constitute the foundation upon which a common approach to O&M should be built.

- A good water system is one that continues to provide potable water.
- Rural water systems are a local public good.
- The beneficiaries of RWS systems are willing to support the recurrent costs of O&M.
- O&M of rural water systems is a local community responsibility.
- Local popular participation in system design, construction, and operation is essential to assure the continued functioning of a rural water system.
- A monetary contribution from the local community prior to construction is a key indicator of willingness to assume local responsibility for O&M.
- The O&M program must be an integral part of the design of the RWS system.
- The approach adopted for O&M must reflect the specific requirements of the RWS system and the socio-economic characteristics of the local community.

5.2 Rural Water System Design

Rural water systems vary substantially in their technical design and O&M requirements. Some RWS systems require substantial investments. Because of

this, careful consideration should be given to the technical options available in light of the potable water needs and financial and organizational capabilities of the community.

- The choice of RWS systems should take into account technical and socio-cultural factors as well as the capacity of the community to maintain the system.
- The traditional quantitative evaluation criteria used to evaluate construction yields (such as length of pipe laid, number of boreholes drilled or pumps installed, and number of springs capped) need to be revised to include the efforts made to ensure community participation in construction and O&M.

5.3 Community Ownership and Responsibility

Community members are much more likely to assume effective responsibility for O&M if they (a) value the service provided, (b) perceive the system as belonging to the community rather than to the state, and (c) are convinced from the outset that they will be solely responsible for the recurrent costs of operating and maintaining their system. A number of measures may be taken to reinforce a community's sense of ownership and responsibility.

- The total value of the RWS system, including all materials, labor, transportation, and other costs, should be estimated and explained to the community prior to construction. The relative value of the contribution by the service or agency responsible for building the system and the value of the labor, material, and financial contributions by the community should be detailed. Project timing and specific responsibilities of each party should be negotiated at this time.
- Similarly, the community should be aware, well before construction commences, of the estimated O&M costs of the system.
- A written agreement between the technical service and the community should be drawn up setting forth the responsibilities of each.
- A standardized monetary payment should be determined and collection prior to construction should be required for all RWS systems. The amount of the payment should be based on technical requirements of the system and on O&M needs rather than construction costs. Fees may reflect construction costs in the case of capped springs.
- An inauguration ceremony should be held at the end of construction activities to provide both symbolic and practical recognition of community ownership. A certificate of ownership should be provided to the community at this time. The participation of territorial administration officials should be encouraged.

- Village development committees should be created and strengthened. The Rural Health Zones have been active and reasonably effective in this area despite serious manpower and especially transport constraints at the health center level. A further step is recommended to clarify the issue of day-to-day operational responsibility. Specifically, a caretaker, preferably a woman, should be designated for each unit of the system (stand-pipe, pump, spring) to train community members in its correct use and to assure regular O&M.

5.4 Financing Community-Based O&M

Issues of costs, financial strategies and options, and training needs for community members are among the most critical and least understood components of an effective O&M program. Reliable estimates of O&M costs, including transportation and repair fees, for RWS systems are not available. At the community level, the variety of alternative resource mobilization strategies that may be used to meet O&M costs are relatively unknown. Practical methods of raising and recording funds need to be assessed and communicated to VDC members.

- A study of O&M costs for piped water systems and handpumps should be undertaken by SNHR and/or SANRU. This study should be given priority and research should commence as soon as possible. Station personnel, with direction from the central division of studies, should be able to assemble the necessary data for analysis in Kinshasa without external technical assistance. The Sandoa station should be able to contribute to the handpump study.
- Information of alternative resource mobilization strategies and community practices for raising and managing money should be collected and assessed. The results of this research should be used in training programs aimed at strengthening VDCs and local treasurers. This information is required for the next ENFEA training of trainers session, tentatively scheduled for September 1989. The preparation of materials may require some additional technical assistance which is available locally.
- The payment required prior to construction as a condition of participation in RWS projects (see recommendation 6) should be used directly for spare parts in the case of piped water and handpump systems. For spring-cappings, this deposit may be used to defray the cost of the capping and as an incentive for personnel (especially for RWCs).
- All monies collected after the deposit has been paid and the RWS is operational should be tied directly to a well-defined expenditure. Spare parts should be bought with these funds as soon as possible to avoid the risks of currency devaluation due to inflation and to reduce the likelihood of unauthorized use of funds.

5.5 Training

A successful operations and maintenance program depends primarily on the skills of the people involved at all levels rather than on costly or technically sophisticated equipment. A capped spring may be maintained with nothing more than a machete and a hoe, but even these simple tools are useless if community members are not trained in the procedures to follow and the reasoning behind and practical importance of regular O&M.

- In light of the difficulty of ensuring routine monitoring of RWS and the high personnel demands this would make, visual training materials for O&M (flip charts, posters, step-by-step repair manuals) should be developed and provided to local VDCs, RWCs, and other extension agents. The development of these materials will require approximately five weeks of short-term technical assistance, beginning, if possible, in July 1989. These materials should be developed in collaboration with ENFEA.
- Given the complexity of the tasks to be carried out by village development committees, a training program for key members (treasurer, president) should be developed. Methods of fund-raising and principles of community development should be included in the program. The Rural Health Zones and RWS technical services groups should be responsible for organizing training programs with support from ENFEA.
- Members of the technical services (SNHR, RWCs, and NGOs) operating in the villages should be trained in participatory community development and adult education techniques. ENFEA should be responsible for organizing the training program.
- The fourth training of trainers workshop, to be organized by SANRU with technical assistance from WASH, should focus on (a) O&M system requirements, (b) community organization for O&M, and (c) community financing options. The visual aids recommended earlier (see recommendation 13) should be integrated into this training program.

5.6 Extension

At the present time and for the near future, no one service or agency can or should assume exclusive responsibility for village extension in RWS. The capabilities of both the Rural Health Zones and of SNHR in this area are evolving. At this stage, attention should be given to the strengthening of institutional capabilities and the coordination of activities and resources. The personnel requirements for extension can be great. In the case of well-drilling projects alone, five visits per village are required prior to the arrival of the drilling rig. At an average annual rate of 100 wells, the animation component will be required to make 500 community preparation visits.

- A structured extension program with well-defined steps and procedures should be developed to assure good community

participation before, during, and after construction and to foster long-term maintenance of the system.

- One or more TDR-level (rural development technician) community development agents should be assigned to key SNHR stations with the long-term objective of at least one agent per station. Agents should be posted to Kabongo (Shaba) and Kinzau-Mwete (Bas Fleuve) immediately. USAID should review logistical and material support needs for these agents.
- In the case of boreholes with handpumps, at least two full-time extension agents should be assigned to each drill rig. These extension agents should coordinate their activities directly with the technical team and with the local Rural Health Zone. The long-term success of projects providing handpumps is directly linked to the effectiveness of the extension program. USAID should give serious consideration to supporting the transportation and material needs of the extension program as a fundamental component of an overall O&M strategy.
- To maximize the use of available skills and resources, the division of responsibilities and mechanisms of coordination between Rural Health Zones and SNHR stations should be clarified.

5.7 RWS Monitoring and Technical Support

The role of the RWS supplier does not end when construction is completed. The systems installed must be monitored for technical performance and repair capabilities and necessary parts and materials must be available. Monitoring and technical support, however, are not and cannot be the responsibility of the system supplier alone. Externally-financed projects and NGO activities have finite life spans. Provision must be made for long-term monitoring and support.

- Within six months of the inauguration of a system, the technical service should make a follow-up visit to ensure that the system meets technical performance criteria and that O&M activities are understood and implemented by the community.
- Routine monitoring of RWS systems and the effectiveness of VDCs should be the responsibility of the Rural Health Zones. The regular reporting mechanisms of the health centers should include sections on water and sanitation, the state of water supply structures, and the effectiveness of village development committees.
- Information supplied by health center staff to the Rural Health Zones should be reviewed by the RWC and transmitted to the nearest SNHR station for analysis.

5.8 Spare Parts Distribution and Logistics

Perhaps the single most critical element of an O&M program for handpumps is the spare parts distribution system. Spare parts must be available nationally and accessible locally to assure the continued operation of handpumps. In addition to an integrated system of supply involving national, regional, and local points of distribution, a system of inventory control and financing is required. Although a parts distribution system requires careful planning, it is unproductive to create a monopoly on spare parts. To the extent possible, private sector entrepreneurs should be encouraged to carry spare parts for handpumps and piped water systems.

- National priority should be given to establishing an integrated spare parts system, including inventory control and financial management programs. The rural health infrastructure can play an important role in assuring local access to spare parts. Coordination should be provided by SNHR.
- Efforts should be made to strengthen the logistic capability of SNHR at the central level to permit effective inventory management and distribution of replacement parts for RWS systems, especially manual pumps. USAID support in this area is critical. Steps should be taken to assure that a central logistic capability is in place by early 1990.

5.9 Politico-Administrative and Juridical Support

The provision of potable water to the rural population of Zaire is not simply a sectoral concern. Clean and accessible drinking water is a basic human requirement and a precondition for the economic and social development of the country. As such, it must be viewed as a national, regional, and local priority. The full support of the government is required to assure the timely development and continued operation of rural water systems.

- The understanding and support of local and regional political and administrative authorities should be acquired to assure the continued operation of the RWS system.
- If the local community is to assume financial responsibility for O&M costs, no other fee, tax, or charge should be levied on the water system or users.
- The legal status, powers, and responsibilities of the village development committee should be determined and codified in law.

5.10 Future Action

The findings, assumptions, and recommendations included in this report served as the basis for discussion at the round table organized by the National Action Committee for Water and Sanitation on May 24, 1989. The results of these discussions and the proposals for action that emerged are to be presented in a report prepared by CNAEA. The implementation plan for Phase II of this WASH assignment is described in the following chapter.

Chapter 6

PHASE II IMPLEMENTATION PLAN

6.1 Objectives of Phase II

The primary objective of the second phase of this assignment is to test selected recommendations to improve O&M capabilities in Zaire. The test results will be analyzed and integrated into revised O&M programs for capped springs, gravity-fed piped water systems, and boreholes with manual pumps. A secondary objective of Phase II is to provide direct technical assistance to USAID-financed RWS projects to identify deficiencies in and recommend measures to improve O&M programs.

6.2 Rationale

The following observations and conclusions form the rationale for the measures proposed for Phase II and the content of tests.

- O&M programs must be integrated into the overall RWS approach of agencies.
- At present, no agency has established a coherent program for O&M, with the exception of USAID Project 660-0116. The most important implication of this is that Phase II cannot focus on improving existing systems alone, but must work with RWS actors in the development of O&M program capabilities.
- The key ingredients of a rudimentary O&M strategy currently exist through organizations such as SANRU, ENFEA, and SNHR. However, targeted measures are required to strengthen institutional capabilities.

6.3 Proposed Measures to Strengthen O&M Capabilities

- Training of RWCs and SNHR station staff in (a) O&M system requirements, (b) community organization, and (c) community financing options for O&M.
- Developing training programs and materials with WASH assistance during the fourth ENFEA training of trainers workshop.
- Developing visual materials for use by village-level extension agents (animateurs, health center personnel, RWCs). These materials are to be used in training VDC members and villagers in correct O&M procedures. Materials to be left with the VDC and water site caretakers must also be developed.

- Establishing community development capacity in SNHR by assigning one or more TDR-level community development agents to the Kabongo and Bas Fleuve stations. SNHR agents are to develop village *animation* programs in coordination with technical staff and rural health zone RWCs.
- Strengthening logistical capability of SNHR at the central level to permit effective inventory management and distribution of replacement parts for RWS systems, especially manual pumps.

6.4 Testing Methodology

Evaluation of the effectiveness of training materials and visual aids on O&M practices in Sandoa and Kabongo stations in Shaba, the Bas Fleuve, and other appropriate areas of SNHR activity (e.g., Mueka and Misele stations) will be one of the major components of the Phase II testing program. Evaluation will be carried out in coordination with SANRU and SNHR staff.

A different approach to testing is required to improve O&M capabilities for deepwell pump systems. A comprehensive O&M strategy for Project 0116 in Lualaba was developed with the collaboration of the WASH team. This program will be implemented in the near future. The effectiveness of specific program components, e.g., parts distribution system, fee requirements, and VDC member training programs, will be assessed during Phase II.

In the case of the drilling operation currently underway in Kabongo and the one to begin in August 1989 in Bas Fleuve, the WASH mission for Phase II will be to provide direct technical assistance to the SNHR stations and Rural Health Zones operating in these areas. Initially, the WASH team will assist in the development of an integrated program for village-level operations and maintenance. This program will be reviewed at the end of Phase II and measures proposed to improve effectiveness.

6.5 Proposed Timing of Phase II Activities

The timing of the arrival of the WASH team should be scheduled after completion of the fourth ENFEA training of trainers workshop and development of visual aids. Although no dates for these activities have yet been confirmed, it is likely that Phase II will begin in late October or early November 1989. The first part of Phase II will require approximately four weeks of field time and one week of international travel and consultations at WASH headquarters. The evaluation segment of Phase II will require roughly the same amount of time and should occur around May 1990.

REFERENCES

REFERENCES

1. WASH. "Development of an Operation and Maintenance System for Shaba Refugee Water Supply Project" (Field report no. 170). Arlington, Virginia, June 1986.
2. WASH. "Preparation of a National Rural Water Supply and Sanitation Plan in Zaire" (Field report no. 184). Arlington, Virginia, May 1986.
3. WASH. "Plan de Formation pour le Programme d'Alimentation en Eau et d'Assainissement du Projet SANRU II" (Field report no. 160). Arlington, Virginia, November 1985.
4. WASH. "Training of Trainer Workshop and Training Materials Development for the Water and Sanitation Component of SANRU II in Zaire" (Field report no. 177). Arlington, Virginia, April 1986.
5. WASH. "Atelier no. II sur la Formation des Formateurs et Développement de Matériel de Formation pour le Programme d'Alimentation en Eau et d'Assainissement du SANRU II" (Field report no. 198). Arlington, Virginia, October 1986.
6. WASH. "Training of Trainers Workshop III and Training Materials Development for the Water and Sanitation Component of SANRU II" (Field report no. 216). Arlington, Virginia, November 1987.
7. WASH. "Guidelines for Institutional Assessment - Water and Wastewater Institutions" (Technical report no. 37). Arlington, Virginia, February 1988.
8. WASH. "Development of a National Policy for the Maintenance of Rural Water Supply Systems in Solomon Islands" (Field report no. 234). Arlington, Virginia, March 1988.
9. WASH. "Training Guide for Operations and Maintenance Supervisors of Rural Water Systems" (Task no. 332). Arlington, Virginia, July 1988.
10. WASH. "Assessment of the Operations and Maintenance Component of Water Supply Projects" (Technical report no. 35). Arlington, Virginia, June 1986.
11. USAID. "Project Paper for Basic Rural Health II, Project No.660-0107." USAID/Zaire, August 1985.
12. FBI. "Quinze Années d'Activité du Fonds de Bien-Etre Indigène au Congo, Rwanda et Burundi, 1948-1963." Gand Belgium: Presses des Etablissements Snoeck-Ducaju et Fils, n.d.
13. CNAEA. "Plan de l'Hydraulique et l'Assainissement en Milieu Rural, 1986-1991." Kinshasa, Zaire, n.d.

14. CNAEA. "Plan Quinquennal 1986-1990 de Développement du Secteur Eau et Assainissement." Kinshasa, Zaire, n.d.
15. CNAEA. "Etude Sectorielle Eau et Assainissement. Mai 1989" (2 vols.). Kinshasa, Zaire, n.d.
16. SNHR. "Apperçu Général des Activités du S.N.H.R. : 1985 à mai 1988 et Perspective d'Avenir." Kinshasa, Zaire, n.d.
17. USAID. "Project Paper for the Shaba Refugee Water Supply Project, No. 660-116." USAID/Zaire, September 1984.
18. Project 660-0116. Annual Report 1986. Kinshasa, Zaire.
19. Project 660-0116. Annual Report 1988. Kinshasa, Zaire.
20. Project 660-0116. "Estimation des Revenues des Ménages Villageois de Lualaba (Méthodologie)." Sandoa, Zaire. November 1988.
21. J.I.C.A. "Rapport sur l'Etude du Plan de Base pour le Projet de Développement des Eaux Souterraines de la Région du Bas-Zaire en République du Zaire." Agence Japonaise de Coopération International, March 1988.
22. Arlosoroff, Saul, et al. "Community Water Supply: The Handpump Option." The World Bank, Washington, D.C., 1987.
23. USAID. "Shaba Refugee Roads (Evaluated Jointly with the Health and Water Projects) 660-0115." USAID/Zaire, September 1986.

APPENDIX A

LIST OF PERSONS CONTACTED

LIST OF PERSONS CONTACTED

USAID/Kinshasa

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Chris McDermott	Project Officer
Rhonda Smith	Project Officer

USAID/Lubumbashi

Beth Moracco	HPN Project Monitor
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Cit. Lwanuna	Chef de Division, Suivi et Evaluation
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SNHR/Kinshasa

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Nicolas Adrien	USAID Technical Advisor
Cit. Badibanga	Supervision
Cit. Luvemba Kangu	Supervision
Cit. Lombo	Etudes et Supervision
Cit. Masumbuko	Planification/Evaluation
Guy Goyens	Cooperation Belge, Technical Advisor

SANRU/Kinshasa

Dr. Franklin Baer	Project Manager
Cit. Kasongo Ntambwe	Chef de Division des Infrastructure
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Cit. Itoko Y'oluki	Coordinateur de Formation - Eau et Assainissement

Peace Corps/Kinshasa

Dr. Harold Randall	APCD/Water Supply and Sanitation
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Cit. Mbala Kimpiatu
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Chef de Station
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Assistant Administratif et Financier

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Cit. Ifanga Y'olema

Chef de Station
Assistant Administratif et Financier
Assistant Technique
Secrétaire Comptable

SNHR/N'sioni

Cit. Kazadi Maleka
Cit. Tshidimba Muambay

Assistant Technique
Technicien

SNHR/Sandoa (USAID Project 116)

Cit. Mudahama Terera
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Cit. Luyindula
Cit. Nkongolo Nginau
Cit. Manyingu Kasongo
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Cit. Kazake Muteba
Maurice DeBachere
Alain Pirnay

Chef de Station, Chef de Projet
Assistant Administratif et Financier
Assistant Technique
Chef sondeur
Animateur
Animateur
Animateur
Conseiller au Chef de Projet (AIDRZ)
Maitre Sondeur (AIDRZ)

Zone de Santé/Bulape

Cit. Kwete
Dr. Tshibango
Cit. Kongo

Infirmier Titulaire/Kakenge
Médecin Chef de Zone
Administrateur

Zone de Santé/Mushenge

Dr. Shamwol
Cit. Minga Matuna
Nimy Lukengo

Médecin Chef de Zone Interimaire
Coordonnateur d'Eau et Assainissement (CEA)
Grand Chef Coutumier des Baluba

Zone de Santé/Kinkonzi

Dr. Konde
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Médecin Chef de Zone
PCV - Adjoint CEA

Zone de Santé/Kangu

Dr. Paul James
Dr. Vuidi Mbadu
Cit. Umbadi Lusala

Médecin Chef de Zone
Médecin, Hôpital de Ref.
CEA

Zone de Santé/Seke-Banza (at Kinzau-Mvuete)

Dr. Nsoni-Za-Mauko
Cit. Pindi Mawulo

Médecin Chef de Zone
CEA

Village Development Committees

Capped Springs

Ndenga Monga II
Kambala
Sakaji

Piped Water Systems

Misele
Mbata Siala
Maduda
N'Sioni
Kinzau-Mvuete
Kasaji
Musumba

Handpumps

Tshimbayeke
Tshimbalanga
Sakwonda
Kafumbata

APPENDIX B

TRIP REPORTS

TRIP REPORT

WASH TASK NO. 036 Robert Hall, Alan Malina

Dates of travel: April 3 - 11, 1989

Region visited : Mueka Zone, Kasai Occidental; Bandundu

Participants : Robert Hall, Alan Malina, Nicolas Adrien (Technical Advisor to SNHR), Cit. Badibanga (SNHR)

<u>Date</u>	<u>Site Visited</u>	<u>Activity</u>
4/3	Misele	Brief visit with Misele SNHR personnel; travel Kikwit. Overnight Kikwit.
4/4	Idiofa	Brief visit with DPP Idiofa; left Badibanga to Mapangu; investigate sites for future SNHR station; travel; overnight Mapangu.
4/5	Mueka	Travel; overnight Mueka.
4/6	Kakenge	Meetings with SNHR station personnel; review activities of Kakenge Health Center staff, with emphasis on O&M. Overnight Kakenge
4/7	Kakenge	Formal meeting with SNHR personnel; visit capped Ndanga-Monga II springs and Development Committees in two Kalamba villages (Ndanga-Monga II and Kalamba); visit Mueka capped spring in Kakenge center. Return to Mueka.
4/8	Bulapé	Visit Bulapé and Mushenge Health Zones; meet with Mushenge Water and Sanitation Coordinator (CEA); audience Ilebo with Chief of Baluba in Mushenge. Overnight Ilebo.
4/9	Idiofa	Travel. Overnight Idiofa.
4/10	Idiofa	Meet with Health Zone personnel; Commissaire de Kikwit Zone; DPP in Idiofa; meeting with Proj. 102 staff.
4/11	Kikwit	Meet with Water Development Committee in Misele. Misele Review plans for piped water system with SNHR Kinshasa station staff.

Observations

This field trip began exactly 25 hours after the arrival of the WASH team, Sunday, April 2. The purpose of the trip was to allow the USAID PSC assigned to SNHR to (1) visit the recently established station in the Mueka area and (2) to visit the SNHR station at Misele in the Bandundu region. The timing and duration of the trip required serious reorientation of the WASH team workplan. The trip covered approximately 9 full days and 2,500 kms. A topical guide was prepared in route by the WASH team for use during village site visits.

Mueka SNHR station

The Mueka station opened in May 1988 and presently has a staff of 3 cadres, a secretary-treasurer and 10 field workers. To date, they have capped 20 springs which demonstrates considerable initiative given the lack of materials and transportation resources. Lack of resources also obliges station personnel to request substantial material and labor contributions from villagers. In one case, village women transported rocks over 14 kms from the quarry site to the spring. Other contributions expected of village residents include: food and lodging for workers when needed, clearing of area around work site, gathering of necessary local materials (sand, gravel and rock) for construction, providing labor during construction. No financial contribution has been requested.

Some villages have been slow in providing requested materials; some have even refused to participate, especially at the outset. Now station staff affirm that local people come to them to request services and participation is more easily forthcoming as the benefits of capped springs are becoming known in other villages. The Technical Assistant and Station Chief stated that their policy is not to work in a village unless and until local materials are collected, thereby requiring demonstration of willingness to participate.

The station has had contacts with medical personnel from the two SANRU Zones de Santé, Bulapé and Mushenge, that are in the station's area of action. So far collaboration has been minimal, avowedly due to the station's lack of a vehicle. The station has received the loan of 20 sacks of cement from SANRU and has expressed interest in coordinating water site surveying with the local Water and Sanitation Coordinators (CEA).

The station has no clear position on O&M responsibilities nor on the best approach to follow in preparing villages to assume such responsibilities. So far, maintenance has been performed by SNHR staff, sometimes with local participation. SNHR personnel were very receptive to ideas about village level operation and maintenance but were unsure of how to go about it.

The most obvious area for improvement is in the quality of communication between the station and local people. The importance of this became evident during the meeting with the local organization charged with responsibility for the capped spring (Comité de Développement). Village women claimed they had seen white worms and even a toad come through the pipe of the capped spring. The Station Chief and Technical Assistant (TA) totally rejected the claims and provided highly technical explanations that failed to sway the women. The point to be extracted from this exchange is the failure to communicate rather than who was

right or wrong. There were certain indications that the spring was not being used heavily and no maintenance had been carried out on the path leading to the spring or on the diversion or drainage canals.

No criticism of the personnel of the station is intended or indeed merited at this point. The station and the staff are both quite young. The level of competence of the staff is acceptable. The Technical Assistant was particularly impressive. Mr. Adrien's personal attention and careful consideration of the opinions and requests of station personnel observably boosted morale and encouraged open discussion. His suggestions to improve procedures and on technical issues were to the point and well received.

One technical point emerged that should be addressed to the SNHR Direction. It was noted that the design used by the Mueka station for capping springs employed a spring box or silt chamber with limited capacity, no drainage pipe and no overflow pipe. Access to the chamber was gained through a plug that was cemented around the edges. The TA recommends cleaning the chamber every six months. This operation would require breaking and replacing the cement seal. No one in the village had been trained to perform this maintenance task. The design appears unnecessary and possibly ineffective.

Health Zones and Centers

Discussions were held with personnel from the Zones of Bulapé and Mushenge and with the Health Center staff at Kakenge. The CEA for the Bulapé zone is a Peace Corps Volunteer and was not available at the time of our visit. She has visited the SNHR station and has met with Health Centers in her area. Health Center staff, notably the Head Nurse (Infirmière Titulaire), are to visit each village in their area to provide health education, form village development committees and provide basic medical services. A clean water and hygiene component exists with visual aids developed for the purpose. The efficacy of the lessons was demonstrated in one village when the village chief recounted, with no prompting, the lesson step by step as his explanation of why clean water was important. Such materials are easily understood by the villagers and offer an important tool for communicating basic O&M practices for water supply systems.

The Bulapé Health Zone has appointed a person to work with the PCV but has not been able to put him on full salary as of the time of our visit. CEAs are to be paid from the receipts generated by the Health Zone and therefore must compete with other priorities for limited funds. Given the size of the health zones in the this region, some form of motorized transportation seems warranted. However, other health zone personnel with more technical training and status may question the allocation of a motorcycle and operating costs for a modestly trained CEA.

The CEA in the Mushenge zone is a nurse, working on water supply and sanitation part-time. He has received the first two modules of the SANRU training. He started work in March of 1988 and received a motorcycle supplied by SANRU in July. Nevertheless, he reported having conducted water surveys in only six villages and has identified four springs to be capped. The SNHR station has sent a report to the Zone de Santé identifying an additional 16 springs and

provided cost estimates. This report was forwarded to SANRU for consideration for funding. Despite the importance attached to potable water and to the role of the CEA attested to by the Médecin Chef p.i., the CEA obviously lacks proper supervision and motivation. The Zone has requested a PCV for support.

Misele SNHR Station

In comparison to the accomplishments of the new station at Mueka, the Misele station appears almost quiescent. The station was established in 1984 and a number of springs have been capped in the area. Since 1986 the station has been developing plans to install a motorized piped water system for the town of Misele. Popular participation has not been forthcoming, possibly due to the lack of a coherent animation program and adequate explanation of the responsibilities, benefits and costs of such a system to the local population.

A Water Committee was established in mid-March of 1989, following a visit effectuated by Mr. Nicolas Adrien, the USAID Technical Advisor assigned to SNHR. According to committee members, it was Mr. Adrien's explanation of the responsibilities of both parties, the community and the station, that led to the creation of the committee. Once again, his presence appeared to be a key factor in resolving differences that had arisen with the station. It would appear that the committee has not been kept informed of the status of the water system nor of some of the technical considerations. The committee may be faulted for not raising their concerns directly with station personnel. Furthermore, the leadership of the committee appears to be made up of the leading business interests of Misele (the president is also the president of the local ANEZA branch) and is not representative of the local population.

The station chief at Misele has a somewhat paternalistic attitude towards providing WS systems to the population. He started work in this field with FBI (the Belgian Fonds du Bien-Etre Indigène) and was the first chief of the N'Sioni drought emergency station. In both cases little or no community participation was required. The results can be seen in the lack of responsibility the communities feel for the WS system, from construction to continued O&M of the systems. This points to the need for a well defined village approach, with personnel trained in this approach.

Conclusions

The following points emerged from the review of the events of the field trip.

- Some training in basic community development methods is essential for SNHR station personnel. Communication and adult education skills should be emphasized.
- A coherent O&M program, including specific activities and responsibilities needs to be developed by SNHR staff, ideally in collaboration with the health zone coordinators (CEA) and communicated to community members.

- Two or three people, including at least one woman, should be nominated by the local committee to participate during the entire construction period. They should receive clear explanations of the operation and maintenance characteristics of the system at that time. Their effective integration into the endeavor will enable them to dispel concerns of other villagers about the water supply system.
- The use of a written contract or protocol that specifies the responsibilities of all parties should be encouraged. Attention should be given to materials to be supplied, labor requirements, financial contributions, and specific responsibilities related to operations and maintenance.
- Current SNHR/Mueka policy of requiring evidence of village participation before proceeding with construction is to be encouraged. The possibility of requiring a modest financial contribution should be considered. This amount could be used in part to motivate Coordinators and applied against operating expenses.
- The agency responsible for the water supply system, SNHR or CEA, should be responsible for conducting at least one visit after approximately six months of operation to evaluate the technical aspects of the system and to review committee members and others in the village in O&M procedures.
- A uniform and comprehensive system for monitoring rural water systems should be established. The development of a form to be maintained in the village for recording O&M activities should be considered. WASH may be of assistance here.
- Capped springs require little technical maintenance and virtually none that would require the intervention of the SNHR station short of replacement of the system. However, regular maintenance is necessary to assure the integrity of the system and the quality of the water provided. The use of visual O&M materials -- flip-charts, posters, and pictorial manuals -- would make an important difference in the ability of the community to assure village level O&M. The development of such materials and their testing and revision should be considered as a Phase II activity.

PERSONS CONTACTED

SNHR/Mueka

Cit. Mbala Kimpiatu	Chef de Station
Cit. Balaga Kapooyi	Assistant Technique
Cit. Ebwy Lanko Mpe-Nde	Assistant Administratif et Financier

SNHR/Misele

Cit. Lobati Assombo
Cit. Lumbila Fwamba
Cit. Nyembe Mutombo
Cit. Ifanga Y'olema

Chef de Station
Assistant Administratif et Financier
Assistant Technique
Secrétaire Comptable

Zone de Santé/Bulape

Cit. Kwete
Dr. Tshibango
Cit. Konge

Infirmier Titulaire/Kakenge
Médecin Chef de Zone
Administrateur

Zone de Santé/Mushenge

Dr. Shamwol
Cit. Minga Matuna
Nimy Lukengo

Médecin Chef de Zone Interimaire
Coord. Eau et Assainissement
Chef Coutumier Baluba

Local Development Committees

Ndenga Monga II
Kambala

TRIP REPORT

WASH TASK NO. 036 Robert Hall, Alan Malina

Dates of travel: 19-21 April 1989
Region visited : Bas-Zaïre
Participants : Robert Hall, Alan Malina with Frank Baer and Cit.Itoko (SANRU), and Nicolas Adrien (SNHR/USAID).

<u>DATE</u>	<u>SITE VISITED</u>	<u>ACTIVITY</u>
4/19	Tshela	Flew on MAF to Boma, then drove to Tshela, with Frank Baer and Cit.Itoko. Joined up with Nicolas Adrien and SNHR/N'sioni staff.
4/20	Mbata Siala	Accompanied by AT from the SNHR station, Maduda visited piped water systems at Mbata Siala, Kinkonze Maduda, and N'sioni. Discussed O&M with water N'sioni committees. Reviewed technical plans of Kinkonze system. Met with MCZ and CEA to discuss WS/S and O&M. Reviewed WS and O&M issues with station personnel.
4/21	Kinzau Mvuete	Visited piped water system and discussed O&M with water committee. Flew back to Kinshasa on MAF.

OBSERVATIONS

This trip was organized to visit the activities of the Bas Zaïre SNHR station, to observe the coordination between SNHR/SANRU and to see at first hand O&M activities in rural WS. Separate research instruments were prepared by the WASH team to serve as topical guides for interviews (a) with local water committees, (b) Zone de Santé Water and Sanitation Coordinators (CEA), and (c) SNHR station personnel.

The N'Sioni station was established in 1980 in response to severe drought conditions. Funding was provided by UNICEF and a number of important piped water systems were undertaken. As one of the three original Brigade hydraulique, the N'Sioni station was obliged to develop its own modus operandi under crisis conditions. Popular participation was not an objective or even a conscious component of the approach taken to the development of rural potable water systems in this region.

The Brigade Hydraulique became an SNHR station on the creation of the service in 1983. It has become evident that the procedures adopted for dealing with emergencies are quite different from those required for long term development

activities. The main task facing the N'sioni station is to make this transition as quickly and as effectively as possible. The tenacity of past experiences and historic realities are reflected in the problems encountered during our site visits.

In three of the four piped water systems visited, there appeared to be a general willingness to pay for O&M. However, in no case was there an effective system in place to calculate costs and organize the financial collection process. A number of factors entered into the ability of the local water committee to collect funds. Trust, specifically trust in the committee and those people responsible for handling the funds, appeared to be a critical factor affecting popular willingness to make financial contributions.

Equity, the sense that all people contribute and benefit equally, was also important. In the case of Kinzao-Mvwete and N'sioni the equity issue was of particular salience. The Kinzao-Mvwete system is approximately 75% completed. The local water committee was informed in our presence that the proposed system will not be able to service the entire population given the yield of the spring. Some neighborhoods will be served by hand pumps, according to station personnel. The committee acknowledged that unequal access to potable water from public standpipes would seriously threaten the present system of labor contribution during construction and could have serious repercussions for the system once it was in operation.

The possibility of willful destruction of standpipes by residents of neighborhoods not served by the system was voiced. Obviously, the O&M requirements and costs are quite different for a gravity flow piped water system and a system of dispersed boreholes with manual pumps, with interesting implications for the cost recovery and management systems to be put in place.

The situation in N'sioni is similar to the extent that the present system does not deliver water to the entire population expected to contribute financially to its operation and maintenance. The reasons for this are many, primary of which is the lack of a functioning reservoir to provide adequate pressure and volume to service all existing standpipes. The system currently operates, when it operates, by pumping water from the spring catchment tank directly through the system. Only 7 of 11 public standpipes receive water, at considerable stress to the pump and motor. Those people not served by the present system are unwilling to pay. Although their lack of participation is quite understandable, their example acts to discourage others from paying even though they receive water.

Nevertheless, local community members provided both subjective and objective verification of willingness to pay for water. Non-random, chance encounters with villagers confirmed that they would pay a "reasonable" amount if a sound system of financial management was set up and if water was actually provided. The committee also displayed an apparently sincere commitment to establish a workable system. The President of the water committee underscored the point that the entire population must have access to water for financial recovery to be effective. Objective evidence of willingness to pay was provided by accounts of community members buying water from private open wells in the village. Since this water would probably not be potable it would seem that access is its

important attribute. In other words, local people are willing to pay for non-potable water that they receive upon payment but are not willing to pay for water that they may not receive or that is not easily accessible. The problem is of course compounded by the difference in attitude toward a "public" and a "private" good.

The failure to accept local responsibility for a "public" good was most evident in the case of Maduda. It should be noted that Maduda is the collectivity seat and therefore has its own politico-administrative character. The Maduda water committee leadership appeared unwilling to accept community responsibility for the water system and openly stated that the population could not contribute financially. It was evident that the leadership, heavily dominated by local political and administrative authorities, hoped to acquire a "free" service by placing financial and operational responsibilities for the system on the SNHR station, the donor community and any and all other sources of outside aid. As the election season approached, it would seem that local leaders wanted to make a "gift" of the new water system and were unwilling to bring the potentially unpleasant topic of local financial contributions before the public. In all fairness, it was clear from the meeting that the committee had little if any idea of what they were supposed to do, i.e. their role and responsibilities, or how they could do it.

The discussions with village committees were always informative and often contained some level of acrimony. The latter was often directed, fairly or not, at the station. Regardless of the reality of the accusations, it is clear that the quality of communication between the station and local communities must be improved if the latter are to assume primary O&M responsibility for their water supply systems.

Mr. Adrien's presence proved to be of great value in calming tensions and eliciting clarity from often obscure accounts. His patient and methodical manner allowed substantial progress to be made in focussing the attention of station personnel on problems and priorities as well as on measures to be taken in the future. His comments also contributed to a heightened awareness of the responsibilities and actions to be taken by local water committees.

Discussions were held with the Médecins Chef of the Kinkonze and the Seke-Banza Zones de Santé and their respective CEAs. The Kinkonze zone receives support from SANRU, while the Seke-Banza zone does not. The Kinkonze CEA, assisted by a PCV, have capped 11 springs since June 1988. The community is required to provide all local materials and labor for the construction. The quality and timeliness of participation has varied substantially among villages. However, as more successful experiences are accumulating local communities are actively requesting assistance. After advice from the Peace Corps APCD for Water and Sanitation, a financial contribution of 2,000 Zaires has been requested from the village by the CEA. The contribution, to be paid before construction begins, is equally divided between the CEA, as an incentive, and the WS/S program in the Zone de Santé. The financial requirement has been accepted in the one village to which it has been applied to date and the PCV does not anticipate any major problems in securing the amount from other communities.

Conclusions

The following points were raised for consideration by the WASH team during the course of their routine Team Planning Meeting on April 22.

1. In no case was the local population/water supply users informed of local responsibilities or costs of O&M prior to installation.
2. At the time of our visit, there appeared to be no organized attempt to discuss O&M procedures and costs with local water committees.
3. There was a lack of precise information/knowledge on O&M costs by all concerned. No monitoring system has been established to assess system performance, operations and maintenance activities effectuated, repairs performed or cost of repairs. The attitude of station personnel seemed to be that all interest and responsibility for the water system ended with construction, after which time "the community" assumed total responsibility.
4. Due in part to the lack of information on O&M costs, the message about the importance of and methods for collecting funds was not well transmitted between the WS provider and the Committees, or between the Committees and the communities. Local water committees seemed unable to convince community members to contribute financially. Factors underlying this reticence include trust, equity and access. The lack of a clear sense of community ownership compounded the problem.
5. There is a very definite need for training in community organization and financial management practices for Water Committees. Alternative resource mobilization practices and strategies need to be evaluated. The development of training materials in this area should be an issue for consideration in Phase II of this WASH assignment.
6. Before local water committee members can be trained, it will be necessary to organize TOTs for CEAs, PCVs and SNHR in community development and adult education techniques and organizational approaches to participation and finance. A special effort for SNHR personnel would seem to be desirable given the importance of piped water systems in the Bas Fleuve subregion. This type of WS system requires an especially intensive program of *animation* and follow-up to assure that the local community is organizationally prepared to assume O&M responsibilities.
7. There is a lack of sense of ownership by the community linked to the lack of preparation for ownership by the WS provider, and the ambiguous division of authority and responsibility by the WS provider. None of the formal mechanisms used to further a sense of ownership and meaningful participation have been used, viz. convention d'entraide, protocol, certificat de propriété. The fact that the remise-reprise ceremony had not been held was raised in Mbata Siala and Maduda. These documents and ceremonies have an important symbolic value and also serve the heuristic function of clarifying roles, responsibilities and expectations during the course of the project.

8. There seemed to be inadequate coordination between SNHR and the Zone de Santé CEAs. This may be due to the changing role and responsibilities of SNHR, and the lack of a precise, coherent approach to WS and O&M issues.

9. The utility of didactic materials for community members, water committees and local animation agents was strongly endorsed by the local agents and committee members. As in the case of Kasai Occidental, emphasis should be placed on the development of visual materials, photos or drawings demonstrating O&M practices, financing and accounting practices, health and clean water, etc.

10. The requirement of a financial contribution prior to construction initiated by the PCV and the CEA in Kinkonze should be carefully studied. The amount required, when divided among the number of households served, is easily within the financial capacity of the population yet may reinforce the value attached to the WS system while serving to motivate the CEA and to defray some of the minor costs of the WS/S program at the Zone de Santé.

PERSONS CONTACTED

SNHR/N'sioni

Cit. Kazadi Maleka	Assistant Technique
Cit. Tshidimba Muamba	Technicien

Zone de Santé/Kinkonzi

Dr. Konde	Médecin Chef de Zone
Kelley Thomin	PCV - Adj.CEA

Zone de Santé/Kangu

Dr. Paul James	Médecin Chef de Zone
Dr. Vuidi Mbadu	Médecin, Hopital de Ref.
Cit. Umbadi Lusala	CEA

Zone de Santé/Seke-Banza (at Kinzau-Mvueté)

Dr. Nsoni-Za-Mauko	Médecin Chef de Zone
Cit. Pindi Mawolo	CEA

Piped Water CVDs

Mbata Siala
Maduda
N'Sioni
Kinzau-Mvueté

TRIP REPORT

WASH TASK NO. 036 Robert Hall, Alan Malina

Dates of travel : 26 April - 1 May 1989
Region visited : Shaba, Lualaba sub-region.
Participants : Robert Hall, Alan Malina with Guy Petit and
Cit. Kabagema (AIDRZ) and Beth Moracco (SHADO)

<u>DATE</u>	<u>SITE VISITED</u>	<u>ACTIVITY</u>
4/26	Lubumbashi	Flew on Air Zaire to Lubumbashi with Petit and Kabagema; met by Beth Moracco, discussed flight plans and research for Lualaba area.
4/27	Kasaji	Flew on ITAB to Kasaji. Met with 116 Project personnel. Visited springs capped for piped water system. Hall, Kabagema and Moracco stayed Sakwonda overnight in Kasaji; met with local committees, Kafumbata animateur and visited pump villages. Malina and Tsimbayeke Petit drove to Sandoa visiting pump villages on Tshimbalanga the way.
4/28	Sandoa	Malina met with 116 project personnel at Sandoa to discuss the approach adopted by the project to pumps including village meetings, repairmen training, parts distributor, and O&M cost Sakaji estimates. Also visited a spring cap village.
	Musumba	Hall, Kabagema and Moracco flew to Kapanga to visit the piped water project at Musumba. Discussed with Committee construction participation problems as well as O&M costs and organization. Flew down to Sandoa.
4/29	Sandoa	Project-wide staff meeting to finalize O&M strategy, including animation, drilling schedule, maintenance fund needs, start up parts kit, etc.
4/30	Sandoa	Continued meeting. Then flew to Lubumbashi.
5/1	Kinshasa	Flew to Kinshasa on Scibe.

OBSERVATIONS

The primary objective of this field trip was to assess the experiences of the Shaba Refugee Water Supply Project (Project 116) in regard to the approach taken for assuring O&M for capped springs, piped water systems and especially for manual pump systems. This objective was accomplished with the full and commendably open participation of AIDRZ (the PVO responsible for implementing the project) staff, Project and station personnel. A variety of WS systems were visited, often lengthy meetings were held with local water committee members, interviews were conducted with Project staff and documentation was provided upon request.

Project 116 is in many respects a model undertaking. It is arguably the best documented water project in Zaire and is the only well-drilling operation with an integrated animation component. The project has either met or exceeded its established objectives in terms of numbers of WS systems completed to date. The animation program for spring capping and the monitoring system established for this type of WS system is commendable. The program established for pumps and piped water systems has experienced problems, some serious, and is being redesigned. All models should be expected to have flaws; the point is to acknowledge them once revealed, and alter the model accordingly.

The WASH team was given every opportunity to assess the strengths and weaknesses of the project's approach to O&M. At the invitation of the AIDRZ director and Project staff, the WASH team participated in the development of an integrated O&M system for the Lualaba project area. The results of this collaboration are presented in detail in a document under preparation by the AIDRZ director. Specific elements of the revised system will be selected for evaluation as experiments in the second phase of the WASH mission.

Manual Pump systems

In Tshibayeka, in which two pumps had been installed and were operating by July 1988, there was an apparently well integrated committee. After much questioning it was found that the village was unhappy with the pumps as they produced a reddish water. Village members also claimed the yield of the pumps had diminished. From the condition of the site and the reports of the villagers, the pump water was not used for drinking (a neighboring village's capped spring was used for drinking). One of the two pumps needed serious maintenance, but was apparently so little used that its repair was not perceived as a priority. The funds collected for the deposit (caution) (Z 3,400 for two pumps) did not meet the amount agreed upon by the Project and the community in the "Déclaration de prise en charge de puits avec pompes" yet the pumps were not locked up, as was the case in other villages that had failed to provide the deposit. The water committee has met only twice since its creation and has not addressed any of the recent pump problems.

Project personnel had not visited the village to monitor pump operation or maintenance. Local concern over water quality could have been dispelled by providing an explanation of the cause of the reddening of the water (oxydation of the iron in the water) and demonstrating that the water would run clear after

a few buckets had been pumped. The committee had no clear understanding of O&M activities or costs.

In Tshimbalanga, there were four pumps with a committee organized around each one. The committee of the commercial center pump was well organized, had collected the correct amount for the deposit (Z 6,800), and had continued collecting funds on a monthly basis to arrive at a total of Z 25,790 of which about Z 2,200 had been spent on office supplies (notebooks, pens, etc.) for the committee. The treasurer kept a rigorous accounting of all incoming and outgoing funds. The pump was used a lot, a living fence was planted around it for crowd control. The nearest other water source was a polluted pond 4 km. away, and the community valued the convenience and cleanliness of the pump water. The committee had little idea of the real costs and mechanisms of O&M, but were clearly willing to assume responsibility.

Three of the five pumps in the "twin villages" of Sakwanda and Kafumbata were chained and locked. Local residents explained that the deposit had not been paid. Discussions with community members and representatives of the water committee suggested that the committee needs more supervision. Leadership in particular was weak and committee members were seemingly unaware of alternative methods of encouraging payment of contributions for the deposit. The village chief who is also the honorary committee president acknowledged that villagers are unhappy with the project for having locked the pumps. Their displeasure does not seem to have been translated into willingness to contribute. Follow-up animation visits would seem to be called for.

The policy of locking pumps until the deposit has been collected merits (and later received) serious reconsideration. People may require a certain period of using a new water source before they develop an appreciation for the merits of the water supply system (primarily access and hygiene). By locking a pump before its merits are fully appreciated, the population is likely to be left with a feeling of being wronged rather than of being deprived of a valued service. Similarly, once the population of a subregion has witnessed the benefits of an improved water supply system, they can reasonably be expected to demonstrate their willingness to participate in construction and O&M of the system by providing a financial deposit prior to construction of the WS system. This issue was discussed in depth at a project meeting April 29.

Mr. Petit and Cit. Kabagema of AIDRZ (the PVO responsible for implementing USAID Project 116), collaborated fully with the WASH team in addressing the O&M issues for their project, particularly in regard to pumps. The timing of the WASH visit was quite felicitous in that Project 116 had clearly arrived at a point where some basic decisions on O&M strategy and project planning were called for. In this regard, after many interviews with project personnel to discuss various aspects of the project, the WASH team was invited to participate in a full staff meeting to establish an O&M strategy in light of experiences in the field. In this meeting basic decisions were taken on the following issues:

- payment of the deposit and methods of mobilizing funds for repairs
- ownership of the pumps

- composition and costing of the spare parts start-up kit
- the spare parts distribution system
- inventory and financial control systems for spare parts
- the levels of maintenance and repair and their cost
- animation strategy for improving village compliance with financial conditions agreed upon in pump responsibility document
- training needs for repairmen, treasurers and committee presidents
- monitoring and evaluation responsibilities for water systems

Piped water systems

The findings in the piped water villages did not differ much from those in Bas Zaire. A much bigger effort had been put into village preparation in this project, and the communities were much better prepared to take over O&M. There was still a major weakness in understanding the cost of O&M (the collection of funds for no specific purpose), but the project was learning from its experiences particularly regarding helping the committee organize the community for construction activities, and assigning caretakers (even women) to each standpipe.

It should be noted that the local water committees in Kasaji and the new committee in Musumba appear to be quite sensitive to the need for instituting an appropriate financial management system. In both cases, the committees have decided to simplify cost recovery/collection by fixing the fee at Z 100 to be made in one payment rather than collecting Z 30 per month as they were initially advised.

The issue of equity in participation was raised and resolved in an impressive manner in Kasaji. Villagers communicated their unwillingness to provide manual labor during construction of the system unless all able adults participated. Previous experience had shown that certain categories tended to absent themselves from manual labor, notably merchants, civil servants and educated people. The villagers' view was that those who drink the water should work for it. The matter was raised with the Commissaire Sous-Régionale who not only accepted the villagers' reasoning but announced that everyone, regardless of station, would be expected to participate unless they were physically unable to do so. Committee members affirmed that the Commissaire himself participated in digging and that other members of the local "elite" have followed suit. The military detachment was singled out for their efforts in aiding the construction.

The Project has assigned an animation agent to reside in each of the towns where a piped water system is under construction. Given the greater complexity of

community responsibilities in labor mobilization and finance, this would seem to be a practice to recommend.

Spring capping

The first spring capped in the Project was at Sakaji in March 1986. The site visit showed a good capping, with apparently all village maintenance steps accomplished by the villagers (clear path, cleared run off and drainage canals, fence around the cut lawn protecting the spring). The committee was well integrated in the community, with active participation of women. The station has had an important and well defined follow up strategy for springs, which seems to have helped the village organize itself for the O&M of the spring capping.

PERSONS CONTACTED

SNHR/Sandoa (USAID Project 116)

Cit. Mudahama Terera	Chef de Station, Chef de Projet
Cit. Muzembe He-Bantshi	Assistant Administratif et Financier
Cit. Nkongolo Nginou	Chef sondeur
Cit. Manyingu Kasongo	Animateur
Cit. Hungisa Wa Hungisa	Animateur
Cit. Kazake Muteba	Animateur
Maurice De Bachere	Conseiller Technique au Chef de Projet(AIDRZ)
Alain Pirnay	Maitre Sondeur (AIDRZ)

Water Committees

Pumps

Tshimbayeke
Tshimbalanga
Sakwonda
Kafumbata

Piped Water

Kasaji ville
Lueu-Tshanika
Musumba

Capped Springs

Sakaji

APPENDIX C

TABLES

EVOLUTION DES OUVRAGES D'EAU POTABLE + PREVISIONS

Tab. 1 : NOMBRE D'OUVRAGES PAR TYPE PAR REGION (en milieu rural)

a) S N H R

REGIONS	S O U R C E S				P U I T S				A D D U C T I O N S			
	1985	1986	1987	1988	85	86	87	88	85	86	87	88
BANDUNDU	4	17	23	48	-	-	-	5	-	-	-	-
BAS-ZAIRE	7	2	12	16	5	5	1	1	1	2	-	-
EQUATEUR	-	-	3	10	2	7	36	31	-	-	-	-
HAUT-ZAIRE	5	-	11	18	9	-	10	16	-	-	-	-
KASAI ORIENTAL	74	88	162	171	59	52	43	37	5	1	1	1
KASAI OCCIDENTAL	-	-	-	20	-	-	-	-	-	-	-	-
MANIEMA	-	-	-	-	-	-	-	-	-	-	-	-
SUD-KIVU	6	20	1	4	-	-	-	7	-	1	3	-
NORD-KIVU	-	5	12	38	-	-	-	4	1	4	5	-
SHABA	-	113	140	133	-	-	1	55	-	-	1	-

b) S N H R + Autres intervenants (ONG) : cumul

REGIONS	Sources jusque 1988	Puits jusque 1988	Adductions jusque 1988
BANDUNDU	599	5	-
BAS-ZAIRE	90	19	5
EQUATEUR	13	416	-
HAUT-ZAIRE	1478	148	-
KASAI ORIENTAL	553	191	9
KASAI OCCIDENTAL	75	-	-
MANIEMA	-	-	-
SUD-KIVU	31	7	4
NORD-KIVU	55	4	10
SHABA	636	408	23

TABLE 2 -

S.N.H.R.
 TABLEAU SYNTHESE DE REALISATION DES OUVRAGES
 ET POPULATIONS DESSERVIES :
 1 9 8 5 - 1 9 8 8

REGIONS	SOURCES AMENAGEES	POMPES INSTALLEES	ADDUCTIONS REALISEES	POPULATIONS DESSERVIES
<u>BANDUNDU</u>				
- KAHEMBA	8	-	-	6.596
- MISELE	84	5	-	108.084
<u>BAS-ZAIRE</u>				
- N'SIONI	37	12	3	42.127
<u>EQUATEUR</u>				
- BIKORO	13	76	-	57.502
<u>HAUT-ZAIRE</u>				
- BUNIA	34	35	-	34.457
<u>KASAI-OCC.</u>				
- MWEKA	20	-	-	14.633
<u>KASAI-ORIENTAL</u>				
- LUPUTA	268	15	1	120.015
- LUSAMBO	74	-	1	66.691
- NGANDAJIKA	153	176	6	199.135
<u>MANIEMA</u>				
- KASONGO	-	-	-	-
<u>NORD - KIVU</u>				
- MASISI/KI-				
ROTSHE	3	-	8	52.612
- RUTSHURU	52	4	5	63.304
<u>SHABA</u>				
- KONGOLO	-	-	-	-
- SANDOA	386	56	1	115.631
<u>SUD - KIVU</u>				
- BARAKA	31	7	4	44.462
T O T A L :	1.163	386	29	925.249

Tableau 3 : ORGANISMES QUI TRAVAILLENT EN AEP ET REALISATION

ORGANISMES	SOURCES	PUITS (Pompes)	ADDUCTIONS
SNHR	1.119	382	29
ONG			
. Centre de Développement Communautaire (CDC)	4	4	-
. Groupe Technique d'Encadrement Régio- nal (CTER) (Haut-Zaïre, Equateur, Bas-Zaïre, Kasaï Oriental)	1.479	168	1
. Bureau pour le Développement Diocésain (Bas-Zaïre, Kasaï Oriental)	58	4	5
. Programme Agro-Social de Mayanda (PASHA) (Bas-Zaïre)	8	-	-
. Bureau des Oeuvres Médicales Catholi- ques (Kasaï Occidental)	38	-	-
. OXFAM (Kasaï Occidental)	8	-	-
. Institut Supérieur de Développement Rural (Kasaï Occidental, Equateur)	8	-	-
. Promotion de la Femme Rurale (Kasaï Occidental)	7	-	-
. Commission pour le Développement (Haut-Zaïre)	40	103	-
. DEPROVIE - TOUFOR et CEATA (Shaba)	-	324	-
. AIDRZ	250	28	22
. Association pour le Développement Intégral (Equateur)	-	36	-
. C.D.I. - BWAMANDA	-	304	-
. Lions - Club / EQUATEUR	9	-	-
. Division Régionale du Département Social et Développement Kimbanguiste	507	-	-

Tableau 4. : POPULATION DESSERVIE EN 10⁶

REGIONS	POPULATION DESSERVIE & PREVISIONS							
	1987	1988	1989	1990	1995	2000	2005	2010
BANDUNDU	0,24	0,36	0,54	0,6	1,0	1,5	2,5	3,7
BAS-ZAIRE	0,10	0,15	0,22	0,3	0,4	0,7	1,1	1,8
EQUATEUR	0,43	0,45	0,47	0,5	0,9	1,3	2,1	3,4
HAUT-ZAIRE	0,45	0,5	0,55	0,6	1,1	1,6	2,7	3,4
KASAI ORIENTAL	0,10	0,15	0,22	0,3	0,4	0,8	1,2	1,8
KASAI OCCIDENTAL	0,10	0,17	0,27	0,3	0,4	0,4	1,2	1,8
MANIEMA	0,07	0,08	0,09	0,1	0,3	0,4	0,6	1,0
SUD-KIVU	0,29	0,33	0,37	0,4	0,7	1,1	1,8	2,9
NORD-KIVU	0,36	0,41	0,46	0,5	0,4	0,7	1,2	1,9
SHABA	0,40	0,43	0,47	0,5	0,8	1,2	2,0	3,1
T O T A L	3,1	3,37	3,65	3,9	6,4	10,1	16,4	25,6

BOKOTA TWANGAKA
 Chef de Service de la
 Coordination Régionale
 CNAEA

APPENDIX D

HANDPUMP TECHNICAL ANALYSIS

SPARE PARTS AND TOOLS CALCULATIONS FOR THE PROJECT 116 O&M MEETING

The dollar costs of the tools and spare parts are based on the TATA bill of 8/10/87 for furnishing 240 India Mk.II pumps and spare part including shipping and insurance CIF Matadi. .

- (1) The first column of figures is the dollar price payed to Tata.
- (2) The second column is the price in Zaires (at Z450 = \$1).
- (3) The third column includes a 1.35 factor for transportation to Sandoa.
- (4) The fourth column has a 1.25 for storage and distribution fees for the Station.
- (5) The final column includes a 1.7 factor requested by local merchants to reorder (figure according to Guy Petit of AIDRZ).

TOOLS	(1) \$	(2) x450=Z	(3) x1.35 Sandoa	(4) x1.25 Fees	(5) x1,70 Replace
District workshop kit	365	164,250	221,740	277,175	471,200
Coupling spanner(clef 19)	34	15,300	20,655	25,820	43,900
Connecting rod holding vice (etau pour tige)	64	28,800	38,880	48,600	82,620
Connecting rod lifter (elevateur)	13	5,850	7,900	9,875	16,790
Chain coupling support tool entretoise)	13	5,850	7,900	9,875	16,790

The tools included in the base tool kit for the local pump repairmen include the coupling spanner, the connecting rod holding vice, connecting rod holding vice and the chain coupling supporting tool. The total purchase cost of these four tools is \$124. Missing from the kit is another spanner (17 x 19) to be able to tighten the nuts and bolts and to be able to replace the chain. Also missing is the axle punch to replace the bearings and the axle. The total cost in local currency for a complete base tool kit is more than Z 60,000 (more than Z 170,000 in replacement cost) which is way beyond the means of the repairmen or the committee. From observation of the tools themselves, it would seem that many of them could be made locally for a much more reasonable price.

The replacement cost calculation were done in a similar way for the spare parts already received from TATA. As can be seen from the replacement cost calculations for simple parts such as nuts and bolts, the price of importing these parts is higher than can be bought in the local hardware store. Thus, particularly for the start-up kit, it seems a little excessive to ask for the replacement price for what is physically very little, and available cheaper in-country.

PARTS	\$	x450=Z	x1.35	x1.25	x1,70
Segment de refoulement	3.15	1,420	1,917	2,400	4,080
Joint soupape superieure(petite)	0.60	270	365	460	780
Joint soupape inferieure(grande)	0.60	270	365	460	780
"O" ring	0.60	270	365	460	780
Boulon axe de chaine	0.85	380	515	645	1,100
Ecrou nyloc	0.85	380	515	645	1,100
Chaine de transmission	15.10	6,800	9,180	11,500	19,550
Roulement	9.05	4,100	5,535	6,920	11,765
Axe de levier	15.10	6,800	9,180	11,500	19,550
Ecrou M12 x 1.75	0.20	90	125	155	265
Rondelle 4 mm	0.40	180	250	310	530
Boulon M12 x 1.75 x 40	0.60	270	365	460	780
Boulon de couvercle	0.50	225	305	380	650
Joint en cuir	1.15	520	705	880	1,500
Accouplement hexagonal	1.90	855	1,160	1,450	2,465

KIT DE DEMARRAGE

The parts below were judged to be the most useful in a start-up kit (most likely to be used first)

PARTS	\$	x450=Z	x1.35	x1.25	x1,70
Segment de refoulement x2	6.30	2,840	3,834	4,800	8,160
Joint soupape superieure(petite)	0.60	270	365	460	780
Joint soupape inferieure(grande)	0.60	270	365	460	780
"O" ring	0.60	270	365	460	780
Boulon axe de chaine	0.85	380	515	645	1,100
Ecrou nyloc	0.85	380	515	645	1,100
Ecrou M12 x 1.75 x4	0.80	360	500	620	1,060
Boulon M12 x 1.75 x 40 x2	1.20	540	730	920	1,560
Rondelle 4 mm x2	0.80	360	500	620	1,060
Boulon de couvercle	0.50	225	305	380	650
TOTAL	13.10	5,895	7,995	10,010	17,030

The following replacement parts of the India Mk.II pump have not been ordered. Guy Petit of AIDRZ (project 116) explained that the parts ordered individually were more expensive than a complete pump. It had been decided to order extra pumps on the next pump order for these parts.

- | | |
|--------------------------------|-------------------------------------|
| 1. Cylinder Body | 7. Follower |
| 2. Upper Reducer Cap (coupler) | 8. Push Rod and Lock Nut |
| 3. Lower Reducer Cap (coupler) | 9. Check Valve Body |
| 4. Plunger Yoke Body | 10. Rubber Seat Retainer |
| 5. Upper Valve Guide | 11. Check Valve Guide |
| 6. Spacer | 12. Conical Seating for Check Valve |

MEMORANDUM

Date: May 23, 1989

From: Alan Malina, WASH consultant.
To: Chris McDermott, Project Officer

Subject: Joint U.S. and local production of the Mark II pump.

Ref.: A) Malina Meeting notes of 24 April 1989 (attached)
B) McDermott memo of May 8, 1989
C) Dempster quotation of no. 263 of May 8, 1989
D) WASH Task 036 Field Report

One of the major issues in any handpump projects, apart from the viability of the pump, is the availability of spare parts. This is particularly crucial in Zaire where the currency has a tendency to devalue regularly, and thus few suppliers are willing to stock significant quantities of spare parts.

The Mark II pump has been shown to be a robust pump (over a million functioning in India). It is relatively easy to maintain with a three level repair system (ref D). Many of the spare parts could be either available locally (nuts and bolts) or within the technical capabilities of local industries (such as welding the tripod together, preparing the connecting rods, etc) if correctly equipped (hot galvanizing). Other parts would have to be imported, such as the ball bearings and the stainless steel handle axle.

One of the main advantages of having a joint U.S.-local production of the Mark II is the likelihood that more of the spare parts for this pump will be available locally. As drilling activities increase, the market for pumps may grow to the point where it might be economically interesting to manufacture the pump totally in-country. It is likely that other donors would be more willing to purchase a pump that is, at least partially, manufactured in Zaire.

As regards the Dempster quotation (ref C):

1. The cost of the pump seems about equivalent to the one available from TATA. That is about \$ 520 for the modified pump.
2. There is a major discrepancy in the pricing of the District Workshop Tool Kit - \$ 2,000 from Dempster, \$ 370 from TATA.
3. The bid seems to answer, on page 6 of the quotation, some of the issues raised in Ref.B :
 - By subcontracting some of the work to UTEMA/Zaire, Dempster will apparently give its guarantee to the pump (to be confirmed). Though what the guarantee would mean once the pump is installed in the village is not clear.
 - UTEMA/Zaire has apparently agreed to hot dip galvanize all parts manufactured in Zaire (again to be confirmed).
 - spare parts will be stocked in country based on funding (what funding?)

4. The financial advantages of subcontracting some of the work in Zaire does not seem clear from the bid, except savings in shipping.

It would seem necessary in the near future to have SNHR compare the TATA pump side by side with the Dempster pump to see what parts are interchangeable between the two. At this point in borehole/handpump development in Zaire standardizing to the Mark II pump is probably a good idea, but there appear to be a number of significant differences between the two versions of the pump, and there are already more than 500 TATA mark II pumps in country.

It may be interesting for SNHR to obtain alternative local bids on many of the common spare parts - nuts, bolts, washers, 'O'ring, etc. It may even be possible for a certain number to be made in country - cup leathers, chain with coupling.

The Dempster proposal needs some more clarification, particularly on the Zaire side of the operation to evaluate the real possibilities and advantages of local participation in pump production. Utema-Travhydro has good reputation locally. They are the main suppliers of REGIDESO and SNHR in PVC pipe, and seem interested in expanding their business in water supply to include handpumps. Their facilities (apart from the lack of hot dip galvanizing) seemed adequate, and personnel seemed competent enough to be able to take care of the assembly and some manufacture of the pump (ref A).

POSSIBILITIES OF JOINT PRODUCTION OF MK II PUMP

American Producer: - Dempster

Zairian Factory: - Utema-Travhydro

The Utema-Travhydro facilities were visited on Monday 24 April 1989. The group consisted of David Suey, representative of Dempster/US, Eric Lambion, Admin. Director of Travhydro, Cit. Luzayidila, Chef de Service Technico-Commercial Utema-Travhydro, Chris McDermott, Project Officer, Nicolas Adrien, USAID advisor to SNHR, Cit. Lombo, representative of SNHR, Georges Gendarme, USAID engineer in PDO and Alan Malina, WASH Consultant.

The main activities of the facility were:

- production of about 1000 MT p.a. of welding rods
- production of PVC piping (main customers -- REGIDESO, SNHR)
- assembly (including making of tin sheet parts) of about 2000 air conditioners p.a.
- production of steel piping
- metallic construction (truck beds, roof beams, etc.)
- machine shop

There was apparently a good level of quality control (welding rods were certified by VERITAS).

Travhydro is apparently interested in participating in some way with Dempster in Mk. II production. (Partly because their main PVC piping customers are the country's major water suppliers -- REGIDESO, SNHR). The following points can be highlighted from the discussion.

- Assembly of the pump at Travhydro would present no problem.
- All below water parts (cylinder, piston, etc.) would be provided by Dempster.
- Connecting rods and rising pipes would be provided by Travhydro (lacking galvanising facilities?).
- Above ground, Travhydro would make only the three-legged pedestal, the rest would come from Dempster.
- Travhydro is apparently willing to stock spare parts -- 2 factories (Kin, L'shi) and 20-30 official distributors up-country for Utema (where?).
- Travhydro claims training capacity in Kin. for pump repair, but would present bit for up-country training.

All the above points were tentative and would need confirmation (and some form of guarantee) at further meetings.

memorandum

DATE: May 8, 1989

REPLY TO
ATTN OF: ^C Chris McDermott, BPN

SUBJECT: Results on Meeting to discuss joint U.S. and local firms co-production of handpumps and spare parts

TO: See Distribution

Date and Place of Meeting: 26 April 1989, USAID Conference room

Participants: Mr. Davis Suey, Dempster Inc.
Mr. Eric Lambion, UTEMA-Travhydro
Cit. Luzayidila, Ing. UTEMA-Travhydro
Dr. Glenn Post, BPN
Mr. Nicolas Adrien, SNHR (USAID)
Cit. Lombo, SNHR
Mr. George Gendarne, ENG/PDO
Mr. Paul Lacerte, CMO
Mr. Richard Dreiman, CIP
Mr. Chris McDermott, BPN

BACKGROUND:

In mid-October of 1988, the Director of USAID requested that the feasibility of local production of the UNICEF-approved Mark II handpump and replacement parts -- the pump used in the 107 and 116 projects -- be investigated. Upon investigation it was discovered that UTEMA-Travhydro (UT), a local firm with part ownership by Belgian nationals, was the local agent for Dempster, Inc., a U.S. manufacturer of the Mark II pump.

From the beginning, the complexity and rigorous quality requirements of producing durable handpumps were assumed to require contractual participation of a U.S. firm that would stand by the product - with or without local contribution to its production/assembly. The review of the local firm and discussions with UT and Dempster have done nothing to alter that view.

In November, reps of USAID met with Cit. Luzayidila and a Mr. Van der Straeten, Dempster's representative in Belgium, who had responded to our initial inquiries to Dempster about local production. At that time, USAID explained our objectives and requested that Dempster/UT prepare an initial

response outlining a plan for co-production. After several telexes between USAID and Van der Straeten, telexes began coming from Dempster USA which indicated they did not have a good understanding of what USAID was looking for nor did they have any knowledge of UTEMA-Travhydro's capability to be a partner in co-production. At the suggestion of Dempster USA, it was agreed that a representative should visit Zaire and meet all the interested parties. Mr. David Suey, Executive VP of Dempster, visited here April 23-26 to gain a clearer understanding of USAID's interests and to assess UT's capability of producing components of the Dempster Mark II pump. His visit and findings, then, led to the meeting reported below.

OBJECTIVES OF THE MEETING:

The objective of the meeting was to clearly identify Dempster/UT's interest in co-production of the Mark II and spare parts: production plans, quality control, delivery schedule and prices.

DISCUSSION:

The initial presentation by Mr. Suey called for production of the components from the tripod up at their Nebraska plant and shipment to UTEMA's factory for welding and installation of the platform and joining parts (bolts, connecting rods, guidance plate). However, Mr. Suey noted that while welding the parts together at UTEMA presented no problem, they were unable to find a local firm capable of hot galvanizing a finished pump. Mr. Suey estimated (privately) that in the U.S. installation of hot galvanization would cost on the order of \$100,000.

He estimated the CIF price \$500 per unit (plus ancillary parts) based on an initial order of 400 pumps (currently planned).

The major issue discussed by the participants was the method of galvanization, which protects the equipment from rust. The issue is critical because:

- galvanization must be done after all welding;
- hot galvanization does not flake easily and was a requirement on our previous specifications for handpumps;
- UT was unable to identify a local source for hot galvanization.

After long discussion on this issue, it was the general consensus that hot galvanization - after welding will be required on USAID's commodity specifications. On the question of price, Mr. Suey estimated that the FOB price of the same pump, produced at the Dempster facility would be \$400 per unit. Mr. Lacerte estimated that shipping and handling would be no more than \$50 per unit -- possibly less. UT expressed surprise at that figure, they had estimated considerably more for shipping. Mr. Lacerte and Mr. Dreiman stuck to their estimates. Mr. Lacerte also asked Dempster on their

warranty and guaranty policies, and if their standard policies would apply to a pump co-produced with UT in Zaire. Mr. Suey explained that they stand by their pumps, but would not state categorically that he could offer the same assurance of satisfaction under those conditions.

The question of spare parts production was raised. One option is to import spare parts from Dempster and an other is to have local production of relatively simple, high-mortality parts. UT expressed interest in producing these parts over the long run, once a sufficient number of Mark II pumps have been installed long enough to generate a demand for parts. UT also said that it would stock sufficient parts for the pumps, but they would not necessarily buy them from Dempster. Rather, they would procure parts from their sources in Europe, South Africa, or Asia. Opinion was divided on the issue: CMO holding that only genuine Dempster parts should be accepted, while others contending that having local availability and production were more important than the Dempster seal of approval. No firm conclusion could be reached, although Mr. Suey claimed to having no objections if UT began production of certain replacement parts.

DECISIONS TAKEN:

M. Lambion from UT said that he will investigate further the availability of hot galvanization for the pump - hot galvanization is available locally but only for small items (maximum size a water pail) and report back to USAID and Dempster USA within three weeks.

The general consensus was that hot galvanization after welding was essential to assuring the longevity of the pump and could not be compromised. Mr. McDermott stated USAID would -- following its own generalized decision-making process be deciding on a procurement process. He explained that this would mean either a) a CBD notice and call for bids or b) should conditions be favorable, a single source/proprietary waiver. Depending on the outcome of this decision, the timetable for procurement would be determined. McDermott noted that USAID would inform the participants of its decision and requested Dempster and UT to forward any additional information that would be helpful in making the procurement decisions.

DISTRIBUTION:

Participants

D. Chandler, DIR

J. Goodwin, D/DIR



DEMPSTER INDUSTRIES INC.

PO Box 848 Beatrice, Nebraska 68310 Phone (402) 223-4026
Telex 701447 Toll-Free Number 1-800-777-0212

May 8, 1989

Mr. Chris McDermott
Health Officer
USAID/ZAIRE
Avenue des Aviateurs
Kinshasa, Zaire

Dear Mr. McDermott:

If any of the enclosed does not agree with our discussions, please advise as soon as possible.

Hope this cooperative effort accomplishes USAID efforts for future service of the Mark II Hand Pumps in Zaire.

Thanks again for your courtesy extended to me on my visit to Zaire.

Sincerely,

David P. Suey
Executive Vice President

DPS:je
cc:S.A. Utema Travhydro
Rue Montoyer 47
B-104 Brussels, Belgium
Attn: Mr. C. Van Der Straeten
cc:Val Meyer
cc:Dean Kilgore
cc:Joyce Ehmke

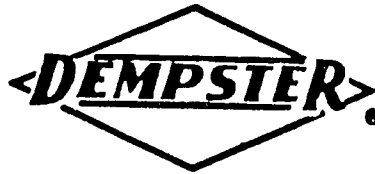
Enclosures

QUOTATION

NO. 263

F.O.B. Beatrice, NE - USA

Terms: Letter of Credit



DEMPSTER INDUSTRIES INC.
Factory & General Offices
711 South 6th Street PO Box 848
Beatrice, Nebraska 68310

To:

WATS LINE 800-228-3013
In Nebraska, call (402) 223-4026
Telex 701447

Chris McDermott
Health Officer
USAID/ZAIRE
Avenue des Aviateurs
Kinshasa, Zaire

Sheet No.: 1 of 6

Dated: May 8, 1989

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
1.	400	Mark II Modified Hand Pumps For: 30 Meter Depth	\$ 408.49	\$163,396.00	NET	\$163,396.
2.	400	2-1/2" Brass Lined Open Top Cylinder with Extractable Check Valve & Plunger	108.15	43,260.00	NET	43,260
3.	4000	12MM x 3 Meter Long Galvanized Steel Rod Threaded & Coupled With 12MM Coupling & Locknut	10.50	42,000.00	NET	42,000
4.	800	Extra 12MM x 3 Meter Galvanized Steel Rod Threaded & Coupled With 12MM Coupling & Locknut	10.50	8,400.00	NET	8,400.
<u>TOOLS:</u>						
5.	50 SETS	District Workshop Tool Kit - Standard - to include the following: #510-00151 900MM (36") Pipe Wrench #510-00122 300MM (12") Adj. Spanner #510-00123 17MM x 19MM Open End Spanner #510-00127 Hacksaw Blades (10 per package) #510-00126 Hacksaw Blades (Steel-Iron) (10 per Package) #510-00125 Hacksaw - 10"- 12" Adj. Frame (254MM-305MM) #510-00128 10" Flat File w/Handle - Fine (254MM)	1940.63	97,031.50	NET	97,031.

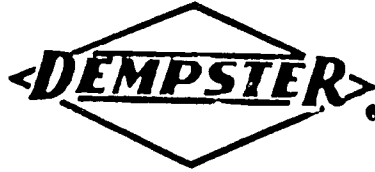
ALL TERMS QUOTED HEREIN ARE FOR ACCEPTANCE WITHIN 30 DAYS AND ARE SUBJECT TO REVISION WITH MARKET CHANGES, AND CREDIT APPROVAL PRIOR TO ACCEPTANCE OF THIS PROPOSAL AT OUR OFFICE. DELIVERIES ARE CONDITIONAL UPON CAUSES BEYOND OUR CONTROL. SALES OR MANUFACTURING TAX AND WHEN ASSESSED, WILL BE ADDED TO INVOICE.

QUOTATION

NO. 263

F.O.B. Beatrice NE - USA

Terms: Letter of Credit



DEMPSTER INDUSTRIES INC.
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 In Nebraska, call (402) 223-4026
 Telex 701447

Chris McDermott
 Health Officer
 USAID/ZAIRE
 Avenue des Aviateurs
 Kinshasa, Zaire

Sheet No.: 2 of 6

Dated: May 8, 1989

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
		#510-00129 (250MM) Half Round File - Fine				
		#510-00132 Tap Set w/Handle M17 x 1.75 Threads				
		#510-00152 Stock & Die - 2-1/2" B.S. Threads W/Spare Die				
		#510-00131 Dies & Handle for Conn. Rod				
		#510-00133 100MM Screwdriver				
		#510-00134 300MM Screwdriver				
		#510-00135 16 oz. Ball Peen Hammer				
		#510-00142 230MM Non-Metallic Level				
		#510-00137 Wire Brush 10" L x 30MM				
		#510-00148 Brissels (254MM x 30MM) Sand Paper #220 Girt (Fine) 230MM x 280MM (50Sheets/pkg.)				
		#510-00138 Cold Chisel 150MM x 13MM				
		#510-00143 Tape Measure - 2 Meter				
		#510-00141 Oil Can Pressure Pump Type				
		#510-00140 Grease Gun for 14-1/2" Cartridge (368MM)				
		#510-00139 Bench Vice - 2-1/2" Pipe				
6.	50 Sets	Special Tool Kit - to include the following: 19MM Coupling Spanner	\$ 188.76	\$ 9,438.00	NET	\$ 9,438.0

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QUOTATION

NO. 263

F.O.B. Beatrice, NE - USA

Terms: Letter of Credit



DEMPSTER INDUSTRIES INC.
 Factory & General Offices
 711 South 8th Street PO Box 840
 Beatrice, Nebraska 68310

WATS LINE 800-228-3013
 In Nebraska, call (402) 223-4026
 Telex 701447

Sheet No.: 3 of 6

Dated: May 8, 1989

Chris McDermott
 Health Officer
 USAID/ZAIRE
 Avenue des Aviateura
 Kinshasa, Zaire

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
		#380-2-4099 Axle Punch #380-2-4100 Connecting Rod Holding Vice #380-2-4098 Connecting Rod Lifter Chain Coupling Supporting Tool				
		<u>SPARE PARTS:</u>				
7.	1600	M12 x 1.75 x 40MM Hex Bolts #900-00786	.35	560.00	NET	560.00
8.	3200	M12 x 1.75 Hex Nuts #900-05215	.17	544.00	NET	544.00
9.	600	4MM Thick Washer - #900-10204	.07	42.00	NET	42.00
10.	800	M10 x 1.5 x 40MM High Tensile Hex Bolt #900-00787	.30	240.00	NET	240.00
11.	400	Nyloc Nut M10 x 1.5 #900-05216	.20	80.00	NET	80.00
12.	400	Stainless Steel Handle Axle #380-3-4331	21.35	8,540.00	NET	8,540.00
13.	800	Bearing - #901-00211	6.00	4,800.00	NET	4,800.00
14.	400	Chain With Coupling #380-2-4093	18.07	7,228.00	NET	7,228.00
15.	400	Bolt for Front Cover #900-00785	.36	144.00	NET	144.00

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 711 South 8th Street PO Box 848
 Beatrice, Nebraska 68310

WATS LINE 800-228-3013
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 Telex 701447

Sheet No.: 4 of 6

Dated: May 8, 1989

Chris McDermott
 Health Officer
 USAID/ZAIRE
 Avenue des Aviateurs
 Kinshasa, Zaire

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
16.	2000	2-1/2" Cup Leathers #380-3-3066	\$ 1.97	\$ 3,940.00	NET	\$ 3,940.00
17.	800	Rubber Seat for Plunger #380-3-3049	.36	288.00	NET	288.00
18.	800	Rubber Seat for Check #380-3-3049	.36	280.00	NET	288.00
19.	400	#380-3-3373 Stainless Steel Cylinder Connecting Rod	10.50	4,200.00	NET	4,200.00
20.	400	#900-05224 M12 x 1.75 S.S. Jam Nut	1.50	600.00	NET	600.00
21.	300	#380-3-3356 12MM Hex Coupling	1.42	426.00	NET	426.00
22.	150	#380-2-3016 Poppet Assembly	4.35	652.50	NET	652.50
23.	300	#380-3-3366 Plunger Follower	5.44	1,632.00	NET	1,632.00
24.	750	#380-3-3372 2-1/2" Cylinder Cap Gasket	.63	472.50	NET	472.50
25.	300	#380-3-3062 Upper Valve Guide	1.82	546.00	NET	546.00
26.	150	#380-2-3059 Check Spool Poppet Assembly	10.05	1,507.50	NET	1,507.50
27.	400	#907-03148 O Ring	.70	280.00	NET	280.00

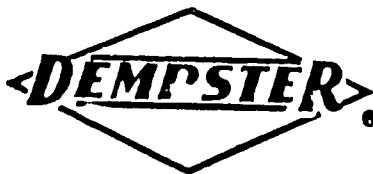
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F.O.B. Beatrice, NE - USA

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DEMPSTER INDUSTRIES INC.
 Factory & General Offices
 711 South 8th Street PO Box 848
 Beatrice, Nebraska 68310

To:

WATS LINE 800-228-3013
 In Nebraska, call (402) 223-4028
 Telex 701447

Chris McDermott
 Health Officer
 USAID/ZAIRE
 Avenue des Aviateurs
 Kinshasa, Zaire

Sheet No.: 5 of 6

Dated: May 8, 1989

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
		TOTAL NET COST				\$400,536.00
		ABOUT HANDLING, INLAND FREIGHT, OCEAN FREIGHT & DOCUMENTATION FEES				28,826.30
		ABOUT INSURANCE PREMIUM				2,950.00
		ABOUT C.I.F. MATADI, ZAIRE				\$432,312.30
		APPROX. GROSS WT - 92,300# (41,867 Kilograms)				

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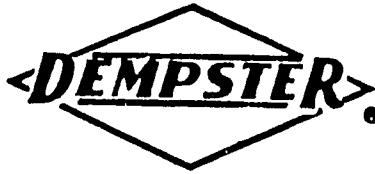
60

QUOTATION

NO. 263

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DEMPSTER INDUSTRIES INC.
 Factory & General Offices
 711 South 6th Street PO Box 848
 Beatrice, Nebraska 68310

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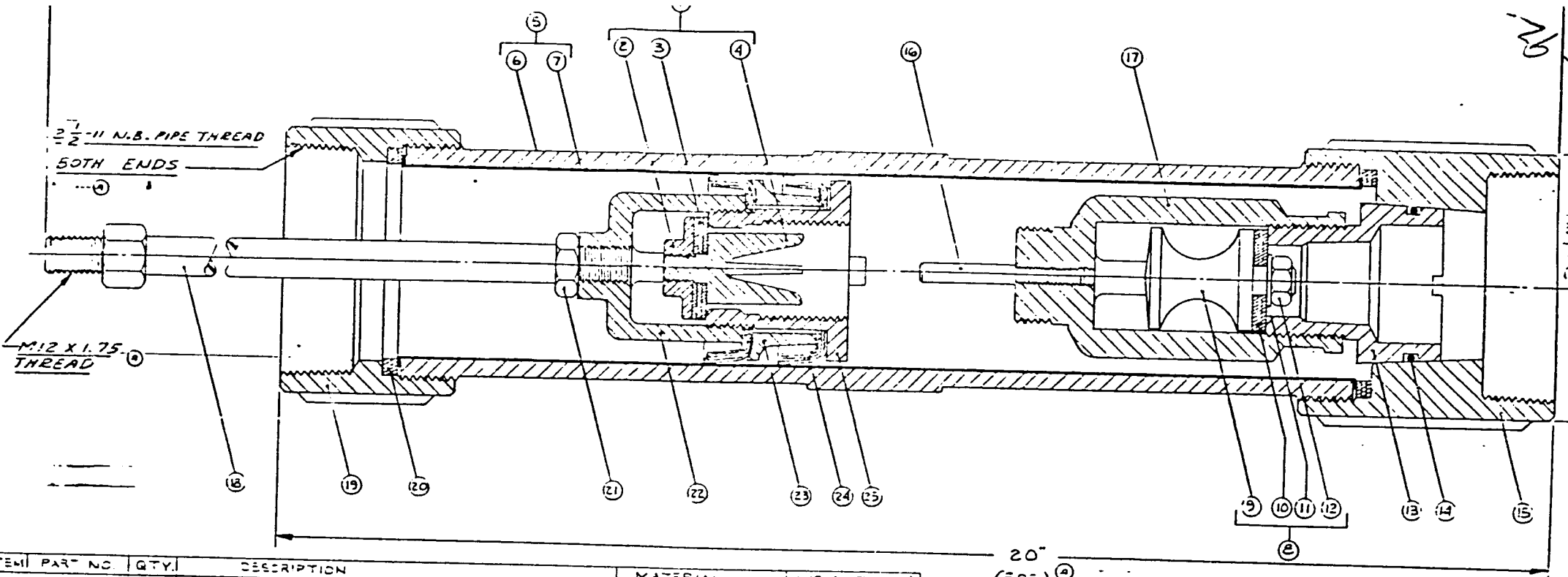
Sheet No.: 6 of 6

Dated: May 8, 1989

To:

Chris McDermott
 Health Officer
 USAID/ZAIRE
 Avenue des Aviateurs
 Kinshasa, Zaire

Item	Quantity	DESCRIPTION	Unit Price	Total List	Discount	Net Price
		<p>NOTE: (1) Reference - Meeting on Wednesday April 26, 1989 with USAID/Zaire, UTEMA/Kinshasa, Zaire and Dempster Industries. We have agreed to subcontract the pedestal assembly - which includes the top flange, three (3) legs, collar and pipe, and guide rod bushing and plate assembly to be produced by UTEMA/Zaire and we will reimburse them as subcontractors. They have agreed to provide hot dip galvanizing for parts manufactured in Kinshasa. Utema has also agreed to supply necessary hardware (nuts, bolts, and washers) and to stock required spare parts based on funding.</p> <p>(2) There should be a considerable freight reduction in cost if pedestal assemblies are manufactured in Zaire.</p> <p>(3) Quantity was not determine at the meeting on tool kits, you will find we have quoted on 50 sets.</p> <p>cc:Mr. C. Van Der Straeten cc:Val Meyer cc:Dean Kilgore cc:Joyce Ehmke</p> <p>DEMPSTER INDUSTRIES INC. <i>David P. Suey</i> David P. Suey, Executive Vice President</p>				



ITEM	PART NO.	QTY.	DESCRIPTION	MATERIAL	WEIGHT (KG)
1	380-2-3016	1	POPPET ASS'Y - INCLUDES ITEMS 2, 3 & 4	ASSEMBLY	
2	380-3-3046	1	POPPET BUTTON	BRASS	
3	380-3-3049	1	POPPET RUBBER	NITRILE RUBBER	
4	380-3-3062	1	WINGED POPPET	BRASS	
5	380-2-3053	1	CYLINDER BARREL ASS'Y - INCLUDES ITEMS 6 & 7	ASSEMBLY	
6	380-3-3112	1	CYLINDER BARREL	CAST IRON	
7	380-3-3113	1	CYLINDER LINER	BRASS	
8	380-3-3059	1	SPOOL POPPET ASS'Y - INCLUDES ITEMS 9, 10, 11 & 12	ASSEMBLY	
9	380-3-3205	1	SPOOL POPPET	BRASS	
10	380-3-3049	1	POPPET RUBBER	NITRILE RUBBER	
11	900-10067	1	WASHER	BRASS	
12	900-85049	1	NUT	BRASS	
13	380-3-3369	1	SPOOL CHECK FOLLOWER	BRASS	
14	907-0348	1	O-RING	NITRILE RUBBER	
15	380-3-3370	1	BOTTOM CAP	CAST IRON	
16	380-3-3367	1	PUSH PIN	STAINLESS STEEL	
17	380-3-3368	1	SPOOL CHECK CAGE	BRASS	
18	380-3-3373	1	STUD ROD	BRASS	
19	380-3-3371	1	TOP CAP	STAINLESS STEEL	
20	380-3-3372	2	CAP GASKET	CAST IRON	
21	900-05224	1	NUT	LEATHER	
22	380-3-3362	1	PLUNGER CAGE	STAINLESS STEEL	
23	380-3-3065	1	CUP RING	BRASS	
24	380-3-3066	2	CUP LEATHER	BRASS	
25	380-3-3366	1	FOLLOWER	LEATHER	
				BRASS	

20" (508) ⓐ

INCHES (MILLIMETERS) ⓐ

DEMPSTER INDUSTRIES INC. BEATRICE, NEBRASKA

REVISIONS	BY	CHK. NO.	AUTHORIZED	DATE	PART NAME 2 1/2" OPEN TOP CYLIND. WITH EXTRACTABLE CHECK VALVE
A					MATERIAL
B					ASSEMBLY
C					SCALE
D					PART NO.

APPENDIX E

ROUND TABLE DOCUMENTS



1981-1990

REPUBLIQUE DU ZAIRE
COMITE NATIONAL D'ACTION
DE L'EAU ET DE L'ASSAINISSEMENT
SECRETARIAT EXECUTIF

Votre Réf. :

Kinshasa, le 19 mai 1989.-

Notre Réf. : CNAEA/SE/223/ML/ML/89.-

Citoyens/Messieurs,

Concerne : TABLE RONDE SUR LA MAINTENANCE
DES OUVRAGES DE L'HYDRAULIQUE
RURALE.-

Il sera organisé, le mercredi 24 mai 1989, une
Table Ronde sur la Maintenance des Ouvrages de l'Hydraulique
Rurale.

A cet effet, il vous est demandé de vous faire
représenter à ladite Table Ronde dont l'heure d'ouverture
est prévue à 09H00', dans la salle de réunions située au
rez-de-chaussée de l'Immeuble REGIDESO-AC - Croisement
des avenues Huileries et Boulevard du 30 Juin. Vous trou-
verez, en annexe, le programme de déroulement de travaux.

Veillez agréer, Citoyens/Messieurs,
l'expression de mes salutations distinguées.

KADINA KUMBA

Secrétaire Général Permanent.-

TABLE RONDE SUR LA MAINTENANCE DES OUVRAGES
DE L'HYDRAULIQUE RURALE.-

Lieu : FOYER DU BATIMENT REGIDESO

Date : Mercredi 24 mai 1989

PROGRAMME DES TRAVAUX

- 8H00 : Arrivée des participants
- 8H50 : Arrivée du Citoyen TSHIONGO TSHIBINKUEULA wa TUMBA, Secrétaire Exécutif du Comité National d'Action de l'Eau et de l'Assainissement Président Délégué Général de la REGIDESO.
- . Zaïroise
 - . Mot d'introduction par Citoyen KADIMA MUAMBA , Secrétaire Général Permanent du Comité National d'Action de l'Eau et de l'Assainissement
 - . Discours d'ouverture par Citoyen TSHIONGO TSHIBINKUEULA wa TUMBA Secrétaire Exécutif du CNAEA
 - . Pause - Présentation des participants
- 10H00 : Démarrage des travaux
- Evolution du secteur de l'AEP
 - Intervenants du secteur
 - Eléments d'un système de fonctionnement et entretien
- 11H30 : Pause-café
- 11H45' : Reprise des travaux :
- Discussion sur les hypothèses de base et résumé des accords
 - Discussion sur les recommandations
- 13H15 : Pause
- 14H30' : Reprise des travaux :
- Suite des discussions sur les recommandations
 - Adoption du rapport final
- 15H45' : Pause — café
- 16H00 : Suite des travaux
- 17H30' - Arrivée du Secrétaire Exécutif
- Zaïroise
 - Clôture des travaux
 - Cocktail

**COMITE NATIONAL
D'ACTION
DE L'EAU ET L'ASSAINISSEMENT
SECRETARIAT EXECUTIF**

**TABLE RONDE
VERS UNE APPROCHE COMMUNE
POUR ASSURER LE FONCTIONNEMENT ET L'ENTRETIEN
DES OUVRAGES D'APPROVISIONNEMENT EN EAU POTABLE
EN MILIEU RURAL**

Document de base

MAI 1989

Organisée par le C.N.A.E.A. avec le concours de WASH

TABLE RONDE: VERS UNE APPROCHE COMMUNE

INTRODUCTION

L'importance de l'approvisionnement en eau potable de la population du Zaïre a été reconnue avec la création du Comité National d'Action de l'Eau et l'Assainissement le 14 février 1981. Pour mieux répondre aux besoins du monde rural, le Service National de l'Hydraulique Rurale a été institué en septembre 1983. En 1985-1986, le C.N.A.E.A. a élaboré le Plan National de l'Hydraulique et l'Assainissement en Monde Rural, 1986-1991. Ce plan détermine le cadre dans lequel les activités d'approvisionnement en eau potable devraient se poursuivre. Le Projet d'Eau et d'Assainissement pour la Santé, W.A.S.H., a apporté son concours à l'élaboration de ce plan, à la formation des formateurs pour l'E.N.F.E.A., au développement du matériel de formation en eau et assainissement et des guides de formation pour l'aménagement des sources, la construction de citernes.

A la demande du S.N.H.R. et avec le soutien de l'U.S.A.I.D., cette mission W.A.S.H. a été organisée pour étudier les pratiques et les besoins en fonctionnement et entretien des systèmes d'approvisionnement en eau potable en milieu rural. L'attention est mise surtout sur les sources aménagées, les adductions par gravité, et les forages avec pompes manuelles. L'objectif global de cette étude est de formuler des recommandations qui mèneraient à la meilleure survie des ouvrages à long terme. Ces recommandations seront testées au cours d'une deuxième phase. La mission aboutira avec l'organisation d'un séminaire pour présenter les résultats des expériences vécues sur le terrain.

L'évolution de l'hydraulique rurale au Zaïre.

Depuis la création du S.N.H.R. en 1983, le rythme des réalisations en approvisionnement en eau potable en milieu rural s'est fortement accéléré. D'autres organismes et O.N.G. tels que UNICEF, E.C.Z. (SANRU II), A.I.D.R.Z., le Comité Anti-bwaki au Kivu et le C.D.I. en Equateur ont aussi contribué à cette accélération. Un élément clef du Plan National est la participation communautaire à la construction, à l'exploitation, et à l'entretien des installations. La participation de la communauté, selon ce document, doit être canalisée par un comité de développement. Ce comité, à présent, manque de définition et d'encadrement.

Les compétences techniques existent et les moyens matériels sont de plus en plus disponibles pour la réalisation des ouvrages hydriques. Le nombre de foreuses dont disposera le secteur rural (une en 1987 à sept en 1990) pourrait permettre l'installation de plus de 700 pompes manuelles par an. Cette quantité de pompes exige l'organisation d'un système d'entretien, de réparation et de distribution de pièces de rechange bien plus sophistiqué qu'auparavant.

Le regard doit être tourné maintenant de la simple réalisation vers les mesures nécessaires pour assurer la survie de ces ouvrages.

HYPOTHESES DE BASE

- * Un système d'approvisionnement en eau potable est réussi lorsqu'il fournit une bonne eau à long terme.
- * Ce système appartient à la communauté bénéficiaire.
- * Les utilisateurs du système sont prêts à payer pour son fonctionnement et son entretien.
- * La responsabilité du fonctionnement et de l'entretien du système d'approvisionnement en eau potable revient à la communauté.
- * La participation communautaire dans la planification, la construction et la gestion est essentiel à la survie de l'ouvrage.
- * Un indicateur clef de la volonté de la population d'assurer l'entretien du système est une contribution financière préalable à la construction.
- * Le programme de fonctionnement et entretien doit faire parti intégrante de tout projet d'approvisionnement en eau potable à partir de sa conception.
- * L'élaboration d'un programme de fonctionnement et entretien doit prendre en compte les besoins spécifiques du système et les caractéristiques socio-économiques de la population desservie.

COMPOSANTES D'UN PROGRAMME DE FONCTIONNEMENT ET ENTRETIEN

Tous programmes de fonctionnement et entretien des systèmes d'alimentation en eau potable devraient partager un certain nombre d'éléments.

Les Eléments

Animation
Financement
Capacité institutionnelle
Ressources humaines-Formation
Répartition des responsabilités
Ravitaillement en pièces de rechange et matériel
Suivi technique et soutien administratif

Ces éléments agissent à plusieurs niveaux d'intervention.

Les Niveaux

Utilisateur
Responsable des unités du système
Comité de Développement
Réparateur
Service Technique

RECOMMANDATIONS

L'ouvrage

1. Le choix du système d'approvisionnement en eau potable devrait tenir compte de la capacité de la communauté à le prendre en charge.

La communauté

2. La définition des responsabilités mutuelles entre le service technique et la communauté bénéficiaire devrait être faite par écrit (convention d'entraide).
3. La communauté devrait être consciente des coûts estimés de l'entretien et du fonctionnement du système d'approvisionnement en eau potable bien avant le commencement de la construction.
4. Une caution financière devrait être exigée et elle serait déposée par les membres de la communauté comme action préalable à la construction. Pour les adductions et les pompes manuelles la caution serait échangée directement contre des pièces de rechange. Dans le cas des sources aménagées, la caution serait utilisée pour défrayer une partie du coût de captage.
5. Après la remise de la caution, tous fonds recueillis par le comité devraient être liés directement à une dépense bien précise. La conversion de ces fonds en pièces de rechange devrait s'effectuer le plus tôt possible pour diminuer les risques de baisse de valeur dus à l'inflation et pour éviter les fuites.
6. Une cérémonie d'inauguration devrait avoir lieu à la fin de la construction pour assurer la prise en charge du système par la communauté. La remise d'un certificat de propriété serait à recommander.
7. Un responsable, de préférence une femme, devrait être désigné pour chaque unité du système (borne-fontaine, pompe, source) pour assurer son fonctionnement correct et son entretien.
8. Le statut juridique et les droits du comité devraient être étudiés pour que le comité puisse connaître ses possibilités d'action.

Formation

9. Vu la difficulté d'un suivi régulier, il serait important de développer un matériel didactique visuel (boîte à images, poster, manuel des étapes d'entretien) à déposer dans les villages, les Centres de Santé et chez les agents d'animation des services pertinents.
10. Vu la complexité des tâches exigées du Comité de Développement, un programme de formation pour les membres clés (trésorier, président) s'avérerait nécessaire. Ce programme devrait s'adresser aux différentes méthodes de mobilisation des ressources financières et aux principes du développement communautaire.

Les services techniques

11. Les services techniques intervenants dans les villages devraient bénéficier d'une formation en développement communautaire participatif et en éducation des adultes.
12. Les critères d'évaluation du rendement technique (nombre d'ouvrages réalisés) devraient être revus en fonction des étapes à suivre pour assurer la participation communautaire.

Le suivi

13. Le suivi régulier de l'état des systèmes d'approvisionnement en eau potable et des Comités de Développement devrait être la responsabilité des Zones de Santé. Une composante sur l'eau et l'assainissement, l'état des ouvrages d'eau potable, et l'efficacité du Comité devrait faire partie intégrante du rapport périodique du Centre de Santé.
14. La compréhension et l'appui des autorités politique et administratives devraient être obtenus pour assurer la survie des ouvrages à long terme.
15. Dans les six mois qui suivent l'inauguration, le service technique devrait être tenu à effectuer une visite de suivi pour assurer que le système répond toujours aux critères techniques, que les activités de fonctionnement et entretien sont exécutées par la communauté, et pour le recyclage des responsables communautaires.

L'animation

16. Un programme structuré d'animation avec des étapes bien définies serait essentiel pour assurer la bonne participation communautaire avant, pendant et après la construction du système, et pour la prise en charge de l'ouvrage par la population.
17. Vu l'importance de la participation communautaire à la survie des ouvrages, il serait utile d'attacher directement à chaque station SNHR un spécialiste en développement communautaire.
18. Dans le cas particulier des forages avec pompes manuelles, pour chaque foreuse il devrait y avoir au moins deux animateurs à plein temps responsable de la préparation des communautés bénéficiaires. Ces animateurs devraient coordonner leurs activités directement avec l'équipe technique.

Les pièces de rechange

19. Un système de ravitaillement en pièces de rechange, de gestion de stock et un circuit financier et d'inventaire, devraient être prévu avant de se lancer dans un programme de forage et pompe manuelle.

RAPPORT FINAL DE LA TABLE RONDE SUR LA MAINTENANCE DES OUVRAGES
DE L'HYDRAULIQUE RURALE

Le Comité National d'Action de l'Eau et de l'Assainissement " CNAEA ", appuyé par l'équipe de WASH, a organisé ce mercredi 24 mai 1989, sous la présidence du Citoyen TSHIONGO TSHIBINKUBULA wa TUMBA, Secrétaire Exécutif du CNAEA et Président Délégué Général de la REGIDESO, une Table Ronde sur la Maintenance des Ouvrages de l'Hydraulique Rurale.

Les séances de travail ont eu lieu dans la salle de conférence de l'Administration Centrale de la REGIDESO et ont connu une participation active des représentants de Services et Organismes intéressés au Secteur de l'Eau Potable dont la liste se trouve en annexe.

Dans son mot d'ouverture, le Secrétaire Exécutif a salué la présence dans la salle du Représentant Résident du PNUD ainsi que celle des représentants d'autres organismes internationaux et souhaité plein succès aux travaux de la Table Ronde. Pour orienter ces travaux, le Secrétaire Exécutif a souligné la bienvenue de l'initiative et regretté l'absence des consommateurs de l'eau aux discussions étant donné qu'ils sont les premiers bénéficiaires de services fournis.

Pris par d'autres occupations, le Secrétaire Exécutif du CNAEA et Monsieur le Représentant Résident du PNUD se sont excusés et les discussions et débats ont continué sous la présidence déléguée du Citoyen KADIMA MUAMBA, Secrétaire Général Permanent du CNAEA.

Les participants ont passé en revue l'évolution de l'hydraulique rurale au Zaïre, les hypothèses de base pour une bonne maintenance des ouvrages ainsi que les composantes d'un programme de fonctionnement et entretien.

Après un échange des vues très animé, les participants ont arrêté les résolutions suivantes :

L'Ouvrage

1. Le choix du système d'AEP doit tenir compte de la capacité et de la volonté de la communauté à le prendre en charge.

La Communauté.

2. La définition des responsabilités mutuelles entre le service technique et la communauté bénéficiaire doit être faite par écrit (convention d'engagement mutuel et public).
- 3a. La communauté doit être consciente des coûts estimés de l'entretien et du fonctionnement du système d'AEP bien avant l'exécution des travaux.
- 3b. La communauté doit être encadrée par un Comité de Développement comprenant des représentants choisis par elle et en son sein.
4. Une contribution financière doit être exigée de la communauté et déposée par le Comité de Développement et/ou de l'eau auprès du service intervenant comme action préalable à l'exécution des travaux.
Pour les adductions et les pompes manuelles, la contribution sera échangée directement contre des pièces de rechange. Dans le cas des sources à aménager, elle sera utilisée pour défrayer une partie du coût de captage.
5. Après la remise de la contribution, tous les fonds recueillis par le Comité de Développement et/ou de l'eau doivent être utilisés directement pour une dépense bien précise. L'utilisation de ces fonds doit se faire le plus tôt possible pour diminuer les risques de baisse de valeur dûs à l'inflation et pour éviter les fuites. .
6. Une cérémonie d'inauguration doit avoir lieu à la fin des travaux.
A cette occasion un certificat de transfert de propriété reprenant les obligations des bénéficiaires leur sera remis.

7. Un responsable, de préférence une femme, doit être désigné par le Comité pour chaque unité du système (borne-fontaine, pompe, source) afin de veiller à son fonctionnement correct et son entretien.
8. Le statut juridique et les droits du Comité doivent être étudiés pour que le Comité puisse connaître ses possibilités d'action.

SERVICE TECHNIQUE

Formation

9. Vu la difficulté d'un suivi régulier, il est important de développer un matériel didactique visuel (boîte à images, poster, manuel des étapes d'entretien) à déposer dans les villages, les centres de santé et chez les agents de services pertinents.
10. Vu la complexité des tâches exigées du Comité de Développement, un programme de formation pour les membres clefs (Trésorier, Président) s'avère nécessaire. Ce programme doit se baser sur les différentes méthodes de mobilisation des ressources financières et aux principes du développement communautaire.
- 11a. Les services techniques intervenant dans les villages doivent bénéficier d'une formation en développement communautaire participatif et en éducation des adultes.
- 11b. Les services techniques doivent former les réparateurs locaux et les agents de développement communautaire.

EVALUATION

12. L'évaluation de tout programme d'hydraulique rurale doit prendre en considération non seulement les quantités d'ouvrages mais aussi en qualité de la prise en charge par les bénéficiaires.

BON FONCTIONNEMENT

13. Le suivi régulier de l'état des systèmes d'approvisionnement en eau potable et des Comités de Développement doit être la responsabilité des Zones de Santé. Une composante sur l'eau et l'assainissement, l'état des ouvrages d'eau potable, et l'efficacité du Comité doivent faire partie intégrante du rapport périodique du Centre de Santé.
14. La compréhension et l'appui des autorités politiques, administratives et traditionnelles doivent être obtenus pour assurer la survie des ouvrages à long terme.
15. Dans les six mois qui suivent l'inauguration, le service technique doit être tenu à effectuer une visite de suivi pour s'assurer que le système répond toujours aux critères techniques, que les activités de fonctionnement et entretien sont exécutées par la communauté, et pour le recyclage des responsables communautaires.

L'ANIMATION

16. Un programme structuré d'animation avec des étapes bien définies est essentiel pour assurer la bonne participation communautaire avant, pendant et après la construction du système, et pour la prise en charge de l'ouvrage par la population.
17. Vu l'importance de la participation communautaire à la survie des ouvrages, il est utile d'attacher directement à chaque station SNHR un spécialiste en développement communautaire.
18. Vu le rythme accéléré des travaux dans le cas particulier des forages avec pompes manuelles, pour chaque foreuse il doit y avoir au moins deux animateurs à plein temps responsables de la sensibilisation des communautés bénéficiaires. Ces animateurs doivent coordonner leurs activités directement avec l'équipe technique et la Zone de Santé.

LES PIÈCES DE RECHANGE

19. Un système de ravitaillement en pièces de rechange, de gestion de stock et un circuit financier et d'inventaire, doit être mis en place dans l'immédiat pour les programmes de forage et d'installation des pompes manuelles.
20. Pour faciliter la distribution des pièces de rechange, il est souhaitable de standardiser le type de pompe, donc d'en encourager la production locale.

LISTE DES PARTICIPANTS

<u>Identité</u>	<u>Organisme</u>
1/ KADIMA MUAMBA	CNAEA
2/ PEEL FRIEDHELM	Banque Mondiale/PNUD
3/ SOWA LUKONO	SNHR
4/ KABAMBA DIBWE	"
5/ LOMBO LEMBE	"
6/ MASUMBUKO RUGINA	"
7/ GOYENS GUY	"
8/ KALONDA wa KABALA	UNICEF
9/ HALL ROBERT	WASH
10/ ALAN MALINA	"
11/ BAKAMBU ba KIONGA	Ecole des Techniciens d'Assainissement/IEM
12/ FRANCK BAER	SANRU
13/ MUBA KABANZA	Département de la Santé Publique
14/ KASONGO NTAMBWE	SANRU
15/ GLENN POST	USAID
16/ CHRIS McDERMOTT	"
17/ PETTA PETULA	REGIDESO
18/ BASILUA NKAILU	"
19/ KINTAUDI NGOMA	Ecole de Santé Publique/UNIKIN
20/ GUY PETIT	AIDRZ
21/ KABAGEMA BIGWI	Projet d'Hydraulique Rurale du Lualaba
22/ LWANUNA W. BIN ASUMANI	CNAEA
23/ BOKOTA TWANGAKA	"
24/ NGOY MBELE	PNA
25/ VITA ya NGONGO	SNHR