1981-1990

ALL-AFRICA SEMINAR ON LOW-COST RURAL AND URBAN-FRINGE WATER SUPPLY

ABIDJAN, OCTOBER 13 - 18, 1986

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DONOR AGENCIES : GERMAN, FRENCH
UNDP/ WORLD BANK
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D12 UNDP/WB HANDPUMPS
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D 7

BLAIR RESEARCH LABORATORY
P.O. BOX 8105,
CAUSEWAY
HARARE
ZIMBABWE.

28th August 1986

WORK OF THE BLAIR RESEARCH LABORATORY IN LOW COST WATER SUPPLY

The Blair Research Laboratory is the research department of the Ministry of Health in Zimbabwe. Its role for many years has been concerned with research aspects of the prevention and control of Malaria, Schistosomiasis and since 1973 with technical aspects of rural water supply and sanitation. The role of the laboratory is to support various aspects of the Ministries Primary Health Care programme operating in all 8 Provinces of the Country. It is directly involved with organising the National Malaria Control Programme and is responsible for designing the water supply and sanitation technology used in all the Ministries rural implementation schemes.

The establishment of the laboratory is as follows: Director 1; Deputy Director 1; Malariologist 1; Medical Research Officers 9; Entomologists 2; Chief Technician 1; Senior technicians 4; Technicians 14; Chief Field Officer 1; Senior Field Officers 3; Field Officers 4; and 60 other field staff.

The Water and Sanitation sector has one medical research officer, one technician, one field officer, one laboratory assistant and ten field staff.

In the water sector, staff are responsible for design and testing, training, production of educational material, and ongoing research. Laboratory undertakes limited number of implementation programmes, most being undertaken by Provincial offices of the MOH and other service ministries like the Ministry of Natural Resources and Water Development and the District Development Fund of the Ministry of Local Government, Rural and Urban Development.

The Ministry of Health, in its Primary Health Programme aims to provide each family living in the rural areas with oneimproved latrine(known as a Blair Latrine) and one protected water point for every ten families. This aim has been set down in the National Water Master Plan. Many Government Departments are engaged in the programme with large num bers of NGO's and other international agencies being involved in financing and project work.in 1986 the coverage was about 30% to 35% for improved water supplies and 15% to 20% for improved sanitation in the rural areas. this is a very active area of rural development work at the present time.

Although there is a variety of types of water supply including piped & gravity supply, most rural water is supplied through the development of ground water sources, notably a combination

of wells and boreholes fitted with handpumps.

The cost of boreholes varies considerably between Z$5000 to Z$13000 per water point depending on the type of rig used and whether the programme is a high speed emmergency programme or not. Deep blasted wells cost between Z$1500 to ZS2500 per unit. Shallow wells cost between Z$300 to Z$500 per unit. Most units serve between 100 and 200 persons.

The most common handpump is known as the "Bush Pump" and has been in use since 1933. Over 10,000 have been installed since that time and it is still the pump of choice for all deep well and borehole water points. It is a standard rod pump with heavy steel head using hardwood bearing block. Recent models have an extractable piston and foot valve assembly.
For lighter duty use for up to ten families, the Blair Pump is the most common, about 3000 are in use.The Zimbabwe Bucket Pump is probably the next most common pump, with approximately 1000 units in use. The National Pump and the Nsimbi pump are also used in some rural programmes, a few hundred of each type in use.

Costs of Pumps depend on length. Cheapest is Blair Pump, a 12m model costing Z$150 + well lining or borehole casing. Bucket Pump Z$200 + Z$150 for borehole casing down to 15m. Bush Pumps costs Z$400 to Z$800 depending on pump length down to 30/40m. Maintenance costs still being evaluated.
M
Ministry of Health undertake lower cost schemes with hand dug shallow wells, hand drilled tubewells, and protected springs. The Blair Research Laboratory staff undertook a water scheme in the Epworth area close to Harare supplying 30,000 inhabitants with a protected ground water supply. A description of the excercise is appended.

The Epworth water supply scheme is of intererst since the community itself participated very fully. Eight hand operated drilling rigs were used, supervised by rig operators employed by Government and drilled by the local people.Pumps were installed by Government field staff of the Ministry of Health. A total of 290 tubewells were drilled and fitted with Pumps. The Blair Pump used for up to ten families (100 persons) the Bush Pump used for heavy duty settings at schools and community and business centres. Blair Pump down to ground water level of 10m with the Bush pump serving below this level. For a 5 years period Z$5000 allocated for spares for Bush pump and Z$10,000 for spares for Blair Pump. In total 250 Blair Pumps were used and 40 Bush Pumps.

In each case a hand operated drilling rig designed in Zimbabwe and known as a "Vonder Rig" was used.This robust piece of equipment can drill through soil down to a depth of at least 20m. Each hole is cased with a PVC lining fitted with a gravel pack.The avergage casing cost is about Z$100 for 12m. A wide concrete apron was built around each pump head with a water run off channel.. Total costs paid by Central Government with labour from community.

Another interesting project in the Masvingo province involves the installation of the "Bucket Pump" in villages. It has been acknowledged that sophisticated hand pumps are dificcult to manage at village level and require specialised training and spare parts . The MOH staff of the Masvingo office have decided to use the "bucket Pump" in its rural water development scheme as this is considered to be manageable at the level of the village. The Bucket pump uses a bucket, chain and windlass common to tradition techniques used throughout the country. The system is fitted on to a tubewell and the bucket is tubular shaped. The specialised part of the pump is the fitting of a simple valve at the base of the bucket to allow water to enter the bucket in the tubewell. The advantage of this system apart from its ease of maintenance is that water quality is enhanced compared to the tradition source. The system is understandable by the villagers and they can manage the pump with little assistance from outside. Cost of the Pump and casing is Z$350. Drlling is performed by the community. Cost of one complete Drlling Rig is Z$ 2700. One pump usually serves 10 families for between 50 and 100 persons.

In family settings the upgraded traditional well is encouraged where the family cannot afford a specialised handpump. Here emphasis is placed on protecting the well with a wide apron and water run off, with raised collar and windlass chain and bucket. This syetm can improve water quality compared to the wells used in traditional practice which are normally poorly protected.

Women have great responsibility in these water projects. With the hand drill it is normally the women who drill the holes, assisted by the men. Local people are involved with siting, drilling , fetching sand and gravel. mixing concrete, building the headworks and taking care of the final water point surrounds.

With these projects O + M costs have not been worked out for an extended period. Maintenance of standard Bush Pumps by Government Department (DDF). Maintenance of Blair Pumps and Bucket pumps by Ministry of Health or local community.

Heavy duty steel pumps are considered better economically in the long term, although they cost more initially.Current research programmes are involved in exact cost of operations and maintenance of handpump schemes. Many years costs of maintaining the Bush Pump are available in DDF records, but these are not to hand.

Gravity schemes cost least to maintain, but are only possible in hilly well watered areas.

Estimated maintenance cost of Blair Pump over 4/5 year period is estimated at Z$ 40 for spare parts, although it could be much higher than this.

Sanitation technology country wide is Blair Latrine a type of ventilated pit latrine. Over 100,000 have been built in last 10 years, coverage about 15½ to 20% so far. Cost to donor is about Z$20 with household supplying bricks, labour, sand ,stone and builders costs. which may be over Z$60. Demand is great since improved sanitation a status symbol and much sought after in most communities. Each Province has an active sanitation programme operating under the technical supervision of the MOH.

Health Education activities: many ~~many~~ thousands of Village Health Workers operating with the MOH. Health Educators operate at all levels from the village upwards. Family hygiene, nutrition and immunisation programmes emphasised.

Water consumption per capita about 15l to 20l in most rural areas. Increases as facilities improve. Tradition sources used if closer or if there is no alternative. Traditional sources will be used less as number of protected water points increases with decade activities. People prefer new sources as water is cooler and tastes better.

Much of the technical data embobied in National Water and Sanitation Master plan which is due to be released in Sept/October 1986.

State of the art is still improving regarding rural water supplies. Protected Springs, shallow wells, deep wells, hand drilled boreholes, and deep mechanically drilled boreholes all have a place in the national water programme togther with the conservation of water in dams. Growth points are fed with piped water schemes usually taking their water from dams for boreholes driven by engine driven pumps.

Water Programmes have a priority in rural development schemes. There is much activity in this sector, which began vigorous growth after independance in 1980. Water and sanitation programmes will continue until full national coverage is complete with whatever is the most appropriate technology.

Peter Morgan
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Ministry of Health,
Harare,
Zimbabwe.

D2

CARE INTERNATIONAL

AFRICAN RURAL WATER SUPPLY STATEGIES AND EXPERIENCES

Paper submitted to the UNDP seminar on Low-cost Rural Water Supply Systems in Africa

by: Mike Godfrey Hydraulic Engineer, CARE International/Rwanda

I. Institutional Structure

CARE has long had a role in the development of rural water supplies, both in African countries and in other countries throughout the world. The experiences of the organization encompass the entire range of technologies and have been conducted within the context of various partnerships with the beneficiaries and host country agencies. This has provided CARE with a unique view of the evolving portfolio of rural water supply programs and an understanding of the urgency of tailor these programs to specific country situations while meeting an ever increasing need. The necessity of doing this in the most cost efficient manner while insuring the long term operation and reliability has become readily apparent.

CARE, as one of the oldest non-governmental organizations working in the development and assistance fields, develops its own financial resources through private contributions in the USA, Canada and Europe. These contributions, either alone or matched with bilateral, muti-lateral, or local government assistance, are then used to finance projects in 36 countries. For 1985, CARE received over $38,000,000 US from private donors and another $57,000,000 US from various government and international agencies to conduct its programs overseas. CARE is currently implementing water supply and sanitation programs in 21 of the countries. Of the 16 African countries where CARE is operational, there are water supply projects in Cameroon, Kenya, Lesotho, Mali, Rwanda, Sierra Leone, Sudan and Uganda.

The responsibility for the development and implementation of CARE's different programs, including water supply, rests primarily with each country's staff of assistants. Working closely with the host country ministries, and at their request for funding of a given project, these individuals prepare project proposals for submission to CARE's program department. The project is then reviewed to make sure it's consistent with the main objectives of the organization and that it's built around experience acquired in similar projects elsewhere. Once a program is approved for funding, its implementation is effected by the team members in that country. CARE also has regional specialists available to assist each country in program planning, execution and evaluation.

II. The Organization's Rural Supply Policy

CARE's current policy in rural development activities, regardless of their specific nature, have a great influence on the type of projects undertaken by the organization. CARE has always attempted to direct its assistance to achieve a fundamental improvement in people's lives and to reach a significantly large portion of an area's population. Beyond this there are three policy objectives that directly affect water supply program design. These are:

1. That all CARE programs work to improve the condition of the poorer people in a developing country.

2. That the participation of the beneficiaries, both in implementation and in long term operation, be given a high priority.

3. That a project considered for funding have the highest chance for sustainability at the close of the project along with the possibility for replication throughout a region or within that country.

From a water supply perspective, this has meant that CARE concentrates on rural water programs where a local community contribution to construction and operation is expected. Practically, this translates into the usual formula whereby CARE is providing resources not otherwise locally available such as cement, PVC, pumps or technical supervision while the community may provide hand labor, basic construction materials like bricks, stone and sand. The community is included in the implementation from planning through construction and is expected to take on the responsibility for operation and maintenance of its system. The benefits from this formula are twofold. First, the local contributions permit CARE to stretch scarce resources to allow more construction. Second, the sense of proprietorship, the understanding of the technical aspects, and the role of principal collaborators all strengthen the community's ability and desire to take on the long term operation of the system.

CARE's rural water supply programs usually include a health education or an extension component that is integrated into the activities of a project. Experience has demonstrated that maximum use of and care for new water systems is directly related to the beneficiaries' understanding of the role of clean water in their lives and the importance of maintenance of the improved water sources. The degree to which a particular health education component focuses on strictly health issues, or to which an extension program concentrates on maintenance issues, depends largely on the nature of the local government agencies and their capabilities and community awareness.

Finally, CARE has recognized, along with many of the agencies and governments it has worked with, that beneficiaries should begin to pay for rural water supplies. The goal, however modest it may be at first, is to cover at least the operation and maintenance costs for providing adequate water supplies. The next step would be to establish payment at levels that will permit eventual renewal of these systems. The current status indicates that just taking the first step will mean a tremendous relief to local authorities struggling to provide continuous clean water supplies under adverse conditions. CARE's current water projects are attempting to put this policy into practice.

CARE's programs throughout Africa have included the various technical options in current practice. These include

1. Large diameter hand-dug wells, open
2. Large diameter hand-dug wells, covered, with hand pumps
3. Small diameter boreholes with handpumps
4. Gravity flow distribution systems with standpipes
5. Piped distribution systems with pumped supplies

CARE's standard policy calls on choosing the most appropriate system for the local conditions while attempting to insure the highest degree of reliability and local management. It has been noted that from the above options the gravity flow distribution systems provide water at the lowest cost and to the maximum number of users. Where this choice is precluded, the large diameter hand-dug wells offer the least expensive alternative. The remaining options all add a degree of sophistication and expense that must be carefully considered before being selected. The experience from the case studies cited below gives the following figures.

Per Capita Investment Costs at Two Levels

	Direct Construction	With Admin/Overhead
Option 2	15 $US	40 $US
Option 4	15 $US	20 $US

The direct costs include only those expenses incurred for a well or water point construction; i.e., cement and technical labor. The overhead includes all the organizations expenses for that particular project and can be calculated from total expenditures and that year's number of beneficiaries. The admin values have not included any expenses for health education or extension programs.

Case Studies

This report concludes with a brief look at two CARE projects currently under way in African countries. These are two with which the author is most familiar and they are representative of the kinds of projects implemented by the organization. Hopefully, these briefs will provide the reader with information that will be useful in the preparation of new programs.

CASE STUDY: North Cameroon Wells Construction

Background

The CARE North Cameroon Wells Construction project is located in the extreme northern portion of the country approximately 200 Kms from Lake Chad. The region is a large plain broken by very rugged mountains along its western border with Nigeria. The climate is typically Sahelian with a long dry season extending from October through May. The project's zone covers an area approximately 150 Kms by 200 Kms and encompasses three different administrative units in the country's Extreme North Province. The population density of the area is moderate and the total population is near 400,000. The entire population depends on rainy season agriculture for its income. The Care project began in 1980 with the intention of providing permanent potable water sources in those villages not yet benefitting from an improved well.

Data on Well Completions

Through June 1986, the project had completed 130 wells serving approximately 70,000 inhabitants of the zone. The normal plan calls for one well per small village although some villages may have two or three. The total number of wells break down into the following types: eight machine drilled boreholes, three handdrilled boreholes and 119 large-diameter, hand-dug wells. All types are capped and equipped with one of two models of imported handpumps. Seventy wells are using the Robbins and Myers Myno (American) handpump while the remaining sixty use the MONO Pumps Monolift (British) handpump. Both pumps are of the helical rotary design and are designed for lifts in the range of 15 to 60 meters. The project switched from the Myno to the Monolift pump in mid-1984 after field tests showed a significantly improved delivery rate with all other factors essentially the same between pumps.

The statistics below have been compiled for the data on the year ending in June 1986 and are indicative of similar statistics for the earlier years.

Total number of installations JUL 85-JUN 86	34
Total nuber of beneficiaries	10,000
Total budget of construction and administration	$478,000 US
Direct construction costs per borehole	$6,000
Direct construction costs per hand-dug well	$2,000
Unit cost per pump installed to 20 meters	$1,500
Project maintenance program for 130 pumps	$12,000

Technical Details

The vast majority of the wells completed have been of the large bore, hand-dug variety. These wells usually penetrate to a depth of 8-20 meters through sediments or lightly compacted materials, although frequent use is made of compressor driven rock hammers and/or dynamite to pass through resistant layers. Wells are lined with prefabricated concrete rings, the bottom ones of a porous construction. These wells

are covered with a reinforced concrete apron which has a raised manhole with a heavy cover. The pumps are set into the apron and in case of pump failure, the cover can be opened to allow drawing of water by traditional means. Digging is accomplished by a team of three technicians supported by the community. The team can use a variety of equipment to purge water and penetrate rock depending on circumstances. Normal completion time has proven to be 3-6 weeks from groundbreaking to pump installation.

Some of the villages have benefitted from boreholes constructed by the project. Two different types have been tried. The first was done using mud-rotary drilling equipment. This year, the four boreholes were done with compressed air/rock hammer drills. The reasons for pursuing boreholes was to provide water in villages where the depth to the aquifer of the nature of the rock prevented the above choice. Boreholes are provided with a concrete apron and equipped with the same pumps.

The project constructs the wells with four teams of technicians. They are supported by a fleet of four heavy-duty pickups and two 7-ton trucks for transporting materials and equipment. During construction the teams are lodged by the communities in which they work. The project maintains a warehouse/garage facility where concrete rings are fabricated and where machinery is stored and repaired. Beyond the field technicians there are two national staff supervisors, a pump technician a team of eight employed at the warehouse and garage and one expatriate project coordinator. An administrative staff of an accountant, a secretary, a procurement assistant, and five drivers round out the project's staff.

Maintenance Structure

The project has been working with the government authorities (the Ministry of Agriculture, Rural Engineering Division) to establish a maintenance system within the zone. To date, however, the project has undertaken all repairs and maintenance for the pumps it has installed. The decision has been taken that the appropriate government service will take on this responsibility at the completion of the project, now scheduled for June 1987. This service now has posted repair technicians in two of the three administrative units. So far, no decision has been reached as to how the government will finance this program and villages have not been instructed in the eventual need for payment of spare parts. There has been no effort to examine private sector support of maintenance programs.

The project has attempted to do the most for maintenance at the village level without disturbing the planned government program. This includes training a local mechanic in the most basic repairs and preventative maintenance. The village must also purchase a tool kit ($40 US) befor a candidate is accepted for training.

It might be interesting to note here the statistics on the repairs to the pumps up to this point in the project. Of the older Robbins and Myers Myno pumps, thirty percent have had repairs carried out. The most common problems are drop pipe and pump rod breakage, handle

loosening and clutch failure. Of the newer Monolift pumps, twenty percent of the recently installed pumps and fifty percent of those over one year in service required repairs. The most frequent problems are those due to wear of the plastic drive components in the pump head. The project has also had to deepen many of the early well that experienced shortages during the dry period of 1983-84.

Community Involvement

In a typical village, the community is expected to contribute in whatever way possible to realisation of the water supply. This means that it contributes sand and gravel for construction, six labourers per day over the construction period, and food and lodging for the technicians. The community becomes involved in the planning for the project almost one year in advance. Representatives are chosen for the maintenance and health education programs and half of the 4-10 people must be women. The community decides the location of the well, within technical limits, and often contributes cash that the project applies to the purchase of cement. The health educators are given special training by the project and are expected to continue a detailed program in their village upon completion of the well. If there is a primary school in the village, the teachers are trained in getting students involved in the health programs. Finally the village constructs an enclosure around the well and sets the rules within the village for use of the well and how it will be kept clean.

Operation and Maintenance Costs/Recovery of Capital

Other than the figure of $12,000 US cited as the last year's maintenance program costs, the project has no other data for these areas. Neither is there a plan to have the beneficiaries pay for the water delivery systems. This point and the one regarding the approach to maintenance have been under discussion with authorities for some time and no adequate policy has yet been formulated.

Health Education and Sanitation

The CARE project has had a very active health education (HEED) program since the beginnning of activities in 1980. In fact, this has been well supported by the counterpart ministry with substantial cash and personnel inputs over the years. The HEED component has had two distinct responsibilities in the project. The first has been to provide an extension service to the project that works in the villages to explain the programs and policies of the project. It is this part that insures that community support is adequate for construction. The second, conducted over a much longer term, has been to give basic health instruction in the villages. For this, the HEED component first trains a group of government development workers in the techniques of rural preventive health care and then takes its programs to the villages where these agents follow up with local volunteers in various activities covering sanitation, personal hygiene, nutrition, etc. The HEED program also works to train primary school teachers in a special curriculum and with rural health clinics to extend their contacts with local populations.

CASE STUDY: Rwanda Rural Water Systems Project

Background

The CARE project in Rwanda began in January 1986 and has only recently started its field construction work. The nature of this project and the characteristics of water programs in general in Rwanda are sufficiently different to merit a brief description here even though the project is very new. The thrust of the CARE program in Rwanda is to demonstrate that much more can be done in rural water supply programs to involve the community in the construction, operation and management of their water systems. This includes the regular payment of fees covering the operation and maintenance of water systems and the authority to collect and manage the receipts.

The Rwanda Rural Water Systems Project is situated in the north-eastern part of the country and covers a relatively small geographical area. It encompasses three administrative units (communes) within the local province. The zone has a population of 125,000 and, as is typical in Rwanda, an extremely high population density. The region is essentially rural with scattered homesteads and no real centers of population. The economy of the area is based on agriculture. The climate is mild with adequate rainfall and moderate temperatures combining to permit two growing seasons per year. The area is mountainous and ranges between 1400 and 2000 meters in elevation.

The government of Rwanda, through its Ministry of Public Works and Energy, recently completed a review of rural water policy within the country. The major recommendations of the review include:

1. Maximizing the contribution from the beneficiaries in the construction of water systems.

2. Turning over operation and maintenance to newly created local authorities and vesting in these agencies the power to levy fees on water provisions and manage these fees locally.

3. Reorganizing the Ministry to turn from being the central authority charged with planning, financing, constructing, operating and repairing water systems to one that provides the necessary technical assistance to local authorities in accomplishing the same.

4. Establishing a national fund supported wholly or partially from user fees that will help in renewal and construction of water systems.

CARE has undertaken to assist the government in developing a model for a rural water system construction program that fulfills the new policy by not only constructing the systems but also establishing a local management system that operates and maintains it.

Technical Package

The current project includes several technologies to meet the water supply needs in the zone. These are shallow wells, rainfall collection devices and gravity flow systems. It is the latter that is most important and the one that is examined in more detail here. The gravity flow system under construction is being designed to serve about 20,000 people in two of the communes. It will include 40 public stand-pipes and connections to a local hospital. It is not foreseen that individual families will be allowed private connections due to the dispersed nature of the farms and the rugged terrain. Approximately

500 people, or 100 families, will be served by each water point. The budget for the project is estimated to be $300,000 US for the construction of reservoirs and standpipes and the laying of 40 kilometers of PVC pipe. Water consumption would approach 13 liters per capita per day under full operation. Actual consumption is calculated at 6-7 liters per day. Administration costs of this and the concurrent programs under this project are $100,000 US for the year.

The project is carried out by a team composed of an expatriate project manager, a Rwandan extension coordinator, and a volunteer field technician. They are supported by a small administrative staff from the country's central office. The remaining positions are filled by skilled labor from within each commune as the construction requires temporary help. All commodities (rebar steel, cement, PVC) and equipment are purchased locally or provided by the community.

Community Involvement

The CARE/Rwanda project has a high level of community participation. First, community leaders are brought into the planning process at the beginning. Knowing how much the project can spend and in what fashion, the local committee sets priorities for study, selects and approves plans, coordinates local contributions and organizes the management structure for their water systems. During construction the community provides sand, gravel, rock, bricks, clay, transport of these and the other materials from central points to the field sites and also day labor for some construction including the digging of pipe trenches. The steering committee also fixes the final location of standpipes according to the community's needs. For the system above, local residents are providing an additional value of $20,000 US, 60 % of which is the value of the contributed labor with the remainder being for local materials and transport.

The biggest role for the community is the creation of a local management structure for the water system. In Rwanda this structure is called a water user association and represents a democratically selected group of users who set local tarif rates, oversee collection, hire and train resident repair technicians, and conduct business concerning their water system. These associations are composed of interested users selected from the community and typical positions include water point watchmen, fee collectors, a treasurer, secretary and accountant. Should a local region have more than one water user assoiciation, a higher authority, a communal water committee, would coordinate activities of the various associations who would have representatives there.

At this time CARE is in the process of organizing the first association established through the project. There has been much enthusiasm in the community for the proposal and general acceptance of the need for such a new policy. CARE has also received support from the counterpart Ministry whose teams have been explaining this policy to local government authorities and their committment to it. Currently the project staff is holding meetings with the users to guide their design of the association and to help get it off the ground. It has not been assumed that a single model will be universally applied, rather the staff allows the community to develop its own structure within the larger policy's guidelines. A major concern is to develop the associations outside of the political structure and to insure that the government enacts the legislation granting legal status to the associations.

Maintenance Considerations

The responsibility for maintenance will rest entirely with the users through its association. They will hire technicians and purchase spare parts and materials locally. To aid in this process, the project uses only local craftsman in the construction of the pipeline, reservoirs and water points. Also, materials for construction all come from within the country. The fees collected are intended to be for the long term operation and maintenance of the system.

Cost Recovery

The new policy intends to cover the O&M costs of the water system. To do this users will be required to pay fees. The accepted plan is to have a flat rate per family per year with the association deciding the collection arrangements. Estimates have placed the annual figure at two to three US dollars per annum. Within the project zone, prevailing opinion tends toward one single payment following the bigger of the two annual harvests. Consideration will be made within the association to cover the needs of very poor families upon request.

Recovery of the capital costs will depend on the relative success of getting the associations to cover the O&M costs. With the system above in place, and with all members of the association actively contributing, there is little doubt that excess funds will be generated. The new government policy foresees two eventual uses for these funds. First, that the associations will use these to construct new systems or extensions to existing ones. Second, the Ministry would like to establish a central "water resources fund" that will be supported partially by government grants and partially by a tax levied on the user association receipts. At this stage these ideas are still tentative and every effort is being made to make the associations work well enough to cover the O&M costs.

Extension and Health Education

The project has a very important community extension component headed by a Rwandan extension specialist. The majority of the work under this heading is to develop an understanding of the project, its goals and how the community will be involved. This has entailed an endless series of meetings cutting through all levels of rural life from administrators to the farmers. The extension component trains community workers in techniques and orchestrates their work with the beneficiaries throughout the zone. The biggest responsibility has been estabilishing the water user associations. Field agents are continually meeting with the users, listening to their opinions and assisting them in setting up the various committees and management groups.

The project has not placed a high accent on traditional health education. This is because there have been relatively successful steps taken by local health services. A measure of this is the large number of public and private latrines constructed in the rural areas. Notwithstanding, efforts are currently under way with local school teachers to incorporate the extension principles with health education and introduce these formally into the primary schools. A curriculum is being prepared for trial use in some of the zone's schools. The community workers also include presentations on health and nutrition during their discussions in the villages.

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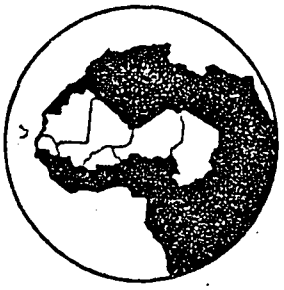

CILSS

PERMANENT INTERSTATE COMMITTEE FOR DROUGHT CONTROL IN THE SAHEL

CLUB DU SAHEL

SAHEL D(83)207
July 1983
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DEVELOPMENT OF VILLAGE HYDRAULICS
IN THE SAHEL COUNTRIES

OVERVIEW AND PROSPECTS

Synthesis

FIFTH
CONFERENCE OF
THE CLUB DU SAHEL

Brussels, 26-27-28 October 1983

DEVELOPMENT OF VILLAGE HYDRAULICS IN THE SAHEL COUNTRIES

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Synthesis

16.239

TABLE OF CONTENTS

SUMMARY

1. A considerable effort has been made, particularly since 1978, to improve the water supply of the rural sedentary population. The Sahel Governments have strengthened their administrative departments responsible for hydraulics and created new para-statal corporations in this sector. International donors have financed a large number of village hydraulics projects.

   The position has begun to improve as a result, but is still far from satisfactory: surveys show that only 25 per cent to 30 per cent of the rural population have satisfactory access to water.

2. The efforts made have relied on structures which are less than fully satisfactory. The diagnosis of the national overviews can be summarised by listing the tasks remaining to be performed:

   - knowledge of water resources: great progress has been achieved. A good overall picture of underground water resources is now available, although there are still gaps,

   - planning of actions: this is a weak point of the present system. The population has had little or nothing to do with the design and implementation of programmes, and projects have been thinly scattered geographically,

   - execution of work: the States have set up official or para-statal bodies for this purpose, but they have not given the desired results. Further, the administration has not adequately monitored sub-contracting work,

   - maintenance of facilities and equipment: this is another area of weakness. Neither governments nor aid sources have paid enough attention to it.

   However, it should also be underlined that the position is beginning to improve. In particular, greater attention is being paid to planning and more provision made for maintenance.

3. To provide each Sahelian with enough clean water at an acceptable cost is not beyond the bounds of possibility. However, the conclusion to be drawn from the national overviews is that better organisation is required to meet this objective:

   - Improved knowledge and better management of resources. There is abundant underground water in the Sahel, but it is not uniformly distributed. It is necessary to set up systems to collect, store and process data on subsurface water and follow trends, especially in poorly endowed areas.

- More sharply defined roles. The administration cannot be replaced in its role of planning and supervision. It is better to concentrate human resources and equipment, which exist in non-negligible but limited quantities, on these priority tasks and to sub-contract the work itself to official, private or mixed firms, which are in a better position than the administration to perform it.

- Strengthened programming resources to improve the management of scarce resources and reduce costs (regionalisation of programmes, judicious selection of types of facilities and equipment).

- Greater participation of the population. Water sources should be perceived by the villagers' as their own, not as those of the government. This presupposes local participation at the design stage of programmes. Participation is also indispensable to solve the maintenance problem: performance of elementary maintenance by the villagers themselves, financial participation in other maintenance operations and the renewal of facilities and equipment. A National Water Fund could be an instrument of national solidarity in this field in favour of the most deprived regions.

- Preparation of supporting action:

  . training of executive staff, technicians, artisanal workers and village-dwellers in techniques of management and basic maintenance;

  . sanitary actions to seize the opportunity opened by the availability of clean water to improve the standard of health;

  . economic development: wherever supplies are sufficient, water must play both an economic as well as a social role: development of market gardening, livestock, craft activities.

The introduction of "rational" water management presupposes a review of the policies pursued by governments and aid sources.

INTRODUCTION

The fourth Conference of the Club du Sahel held in Kuwait in 1980 instructed the Secretariat of the CILSS and the Club du Sahel to "prepare sectoral planning studies by surveys and exhaustive analyses" in several sectors. Village hydraulics was one of these.

Missions were carried out in each of the Sahel countries (except for Chad) in 1981 and 1982 to perform this task. A report was published on each country: "Village hydraulics in CILSS member countries; an inquiry into and proposals for rational management of water". In addition, the Inter-African Hydraulics Study Committee (IHSC) contributed to the investigation in the form of a broader study of the "conditions of use and maintenance of pumping facilities".

It appeared useful to make a synthesis of the basic observations and recommendations found in the different reports.

Scattered information on village hydraulics in many studies on the region has also been drawn on. Included in particular are project evaluations undertaken by aid sources, village hydraulics and rural development studies performed by the BOAD, the CILSS and the Club in 1981.

It should be made clear that in this report the term village hydraulics is used to cover the water supply of the rural sedentary population, whether the water is used for human or animal consumption, or for farming or artisanal work within the confines of the village. The water supply of nomadic herds and irrigated perimeters is not dealt with in this report and will be taken up in later investigations and analyses.

I - THE PRESENT SITUATION

1.1 - POPULATION AND THE HABITAT

Of the 31 million inhabitants of the Sahel in 1980, approximately 26 million or over 80 per cent were rural dwellers.

The population is unequally distributed geographically. Density is very low in the vicinity of the desert, and increases as one moves south towards higher rainfall zones where water resources become progressively better. However, climatic factors and water resources do not alone explain population distribution: the Mossi plateau in Upper Volta is more heavily populated than the better-watered South-West of the country; the Eastern part of Senegal is almost empty, whereas the peanut basin, where water supplies are no better, is overpopulated. History as much as geography explains why people live where they do in the Sahel.

The result has been to create stresses causing population movements: the displacement or scattering of village populations, urban migration, interprovincial migration, emigration to more developed countries. The map of the human population in the Sahel is a perpetually changing one.

Historical and geographical factors also explain the diversity in the grouping of population: large villages in some regions, small villages or even scattered dwellings in others, temporarily-occupied agricultural hamlets, nomads, and semi-nomads of fixed abode for only part of the year.

The population of the Sahel will exceed 50 million by the year 2000. The percentage of rural dwellers will depend on many factors; emigration to towns and abroad will slow down or accelerate depending on the trend of living standards in villages. Water supply will be one of these factors.

Several scenarios have been simulated. Some involve a very high rate of emigration to towns over the next two decades, such that the number of rural dwellers in 2000 will be no greater than it was in 1980. However, most predict a substantial increase in rural population. The estimate of approximately 40 million rural dwellers made by the CILSS and the Club du Sahel will be taken as a working hypothesis, although it may not be attained (i.e. a 50 per cent increase over 20 years).

1.2 - THE WATER SUPPLY SITUATION

Actual conditions of water supply in villages are still badly known; in the absence of census data, it is not possible to know how many villages have enough clean water over the whole year, whether most of the inhabitants draw their water from subsurface layers, how many use traditional wells, or how many of the modern wells or bore holes constructed over the last few years are actually used.

WHO estimates made in 1975 suggested that one in four inhabitants in the rural zones of the Sahel had access to satisfactory water supplies. This is, of course, only a rough order of magnitude based on many extrapolations. The studies undertaken by the CILSS and the Club in 1977 reached similar findings. The surveys carried out in early 1980 together with the programmes drawn up by the Sahel governments suggest an order of magnitude that is scarcely higher.

Many villages still obtain their supplies using traditional wells or surface waters, in less than ideal conditions. Many still only have limited quantities of water at the end of the dry season; women, who are the traditional water-carriers, must often cover long distances to find supplies, and drawing water using rudimentary tools such as calabashes, inner tubes or recovered packaging, which is hard work indeed.

Clean water, even for those with a modern source of water, is available in few villages because the inhabitants are not aware of all the precautions needed to avoid pollution. How much remains to be done here is indicated by the frequency of intestinal diseases and the infant mortality rate, which is in the range of 150 to over 200 deaths per thousand, between the ages 0 and 1, depending on the country (10 per 1000 in Europe), and 60 per thousand in the 1 to 5 year age bracket. All of this is, to a large extent, due to polluted water.

The table below gives an estimate of the number of villages in the different countries and of the number of modern water points. It must be interpreted with caution because the data are not homogeneous: some countries have counted villages and remote hamlets and others only villages; "satisfactory" water installations are not defined identically by each country, and some estimates are doubtful.

	Number of villages	Number of modern water points beginning 1982
THE GAMBIA	1 000	225
UPPER VOLTA	7 600	4 800
MALI	10 200	5 300
MAURITANIA	4 100	1 000
NIGER	17 400	6 000
SENEGAL	14 400	1 500
T O T A L	54 700	18 800

(Cape Verde, where conditions are very special (scattered dwellings, use of springs, etc.) has been omitted from the table because its characteristics differ so greatly from the rest of the region).

Given that many large villages need several water points, the total requirement is on the order of 60 000 to 70 000. The actual number of modern water points in use can be taken to be below 18 000, i.e. some 25 per cent to 30 per cent of needs are met in a relatively satisfactory way.

Considerable efforts have been made in the field of village hydraulics, especially since 1978. The position has certainly improved but overall, it remains poor.

It should also be underlined that until quite recently, water played only a small role in village economic development. The construction of modern water points has only rarely been accompanied by the development of activities such as market gardening, small-scale cattle-breeding or artisanal work. Water is used solely for human consumption, even in locations where supplies are more than adequate and could be used for other purposes, by reason of the lack of sufficiently powerful pumps, and because there is little or no co-ordination between the different departments responsible for hydraulics and rural development.

However, it should also be said that things are changing. In a growing number of projects, especially small projects sponsored by private aid organisations, the creation of a modern source of water now provides the opportunity for true development at village level.

1.3 - INTERNATIONAL AID

Over the last few years, the International Community has earmarked official aid funds for the construction of new sources of water to provide more abundant and cleaner water and improve supply reliability. The recent trend of this official aid is given in the table below.

(in million dollars at current prices)

	1978	1979	1980	1981	1982	TOTAL
Official aid commitments for village hydraulics	12	15	13	42	29	111
Share of above in total aid to the Sahel	0.8%	0.9%	0.8%	2.1%	1.8%	1.4%

(The amounts shown exclude technical assistance advisers made available by certain donor countries to the departments responsible for village hydraulics, a number of studies, and a

share of official aid that is administered by Non-Governmental Organisations (NGOs)(*). The true amounts of official aid for village hydraulics is therefore somewhat greater than the figures indicated).

Private aid donors seem to have given this sector high priority, but the exact figures are not known: certainly at least two million dollars per year and possibly much more.

This aid has increased substantially over recent years. Together with the Sahelians' efforts, it has financed the building of most of the modern sources of water reported above. However, it should be observed that aid has been allocated almost exclusively to construction as such. Very little of it has been devoted to supporting actions in the form of training, maintenance of facilities and equipment.

(*) Non-governmental organisations collect and distribute private aid, and also receive subsidies from some official aid sources for specific projects.

II - PRESENT CONDITIONS GOVERNING THE IMPLEMENTATION OF PROJECTS

2.1 - THE ADMINISTRATIVE FRAMEWORK

All the Sahel governments have seen it as their duty to seek the improvement of the water supply of the rural population. Most projects implemented have been part of government programmes: the remainder have been executed by NGOs.

Each of the States created administrative departments specialised in village hydraulics a long time ago. In principle, these departments are responsible for inventorying need and resources, and planning and controlling the use of public funds for the development of new water points. Likewise in principle, other bodies take care of the construction and maintenance of the water points and their equipment.

In reality, the construction and maintenance of water points are undertaken by:

- the departments themselves, which have established well-building teams and drilling agencies,
- official para-statal organisations created to this end,
- private specialist firms, and
- NGOs.

The structure of administrative departments has been improved and reinforced in recent years. Ministries of Water Resources have been created in some countries. However, in the last analysis, these departments have only limited human and material resources, and allocate them to both design and execution functions. Investigations show that neither of these functions are adequately performed in the Sahel today.

These functions are described below.

2.2 - SURVEYING OF RESOURCES

This function is probably carried out best. With the help of foreign aid and the technical assistance from foreign consultants (in particular the BRGM and the BURGEAP), major advances in the knowledge of the underground water resources of the Sahel, have been made over the last twenty years.

Simplifying a great deal, the region's water resources are divided into two main zones:

- recent sedimentary zones. These contain large, continuous and powerful aquifers, offering amply sufficient reserves for village hydraulics. However, some of this is "fossil" water, i.e. reserves formed in ancient, wetter, times, and as a practical matter, they are no longer recharged;

- ancient sedimentary strata. The water here does not accumulate in continuous aquifers, but is located in deformed pockets or cracks in the rock. These resources are much smaller and also harder to locate and develop. Nevertheless, progress in prospection methods has made the search for water far less subject to the vagaries of chance and progress in boring techniques has made it possible to draw water from cracks which could not be exploited previously because their flow was too limited.

A good picture is now available of the resources in the different provinces of the Sahel and remarkably well-done syntheses, designed for use as basic tools for the administrative departments responsible for drawing up programmes for underground water, have been published.

However, the information is incomplete. For many aquifers, the volume of water which could actually be drawn is still unknown and piezometric readings of their level are not made systematically. And it is of course always desirable to enhance the details known of favourable locations and of the volume of water which can be used, especially in the ancient sedimentary strata.

2.3 - NEEDS AND PROGRAMMING

The situation is much less satisfactory in this area. First, government services, pre-empted by many tasks, especially the execution of work they have undertaken themselves, have generally paid less attention than they should have, to planning the use of public funds. Although many tasks can be sub-contracted, public authorities must do overall planning and programming.

At the same time, somewhat paradoxically, programming has been both heavily concentrated and scattered.

It has been concentrated in the sense that village hydraulics projects - like cereals crop development or reaforestation projects - have to a large extent been designed, decided and undertaken without the participation of the population concerned. A technocratic approach to development has been followed, oriented "from top to bottom", villagers being considered as unable to contribute to the design and development of what are nevertheless matters of prime concern to them. Nor has the intervention of foreign aid sources, anxious to implement their own models, facilitated more attentive understanding of the rural world.

Fortunately, the NGOs, acting most of the time outside this technocratic framework, have brought more flexibility to this rigid approach. It should also be underlined that some countries have made an attempt at a different approach with uneven success: wells as an investment in human resources.

As regards scattering, the rule in programming (or what has been referred to as programming) seems often to have been a "scattered" approach. For quite understandable political reasons, action has not devolved on a regional basis, and work-sites have been

scattered to the four corners of the country, with all the problems of organisation, executive staffing and logistics involved (and, in due course, maintenance). Each aid source, interested in its own programme without paying heed to other projects, and the NGOs acting independently, have intensified dispersion rather than containing it.

Some progress has recently been made towards better programming, a regional approach to action and attention to local needs. However, a method which would allow for more rational use of rare resources in the Sahel, in particular human but also financial resources, and taking into account the needs of the rural world, which are not the same everywhere, nor immutable, has yet to be devised.

2.4 - EXECUTION OF WORK

The Sahel States have almost all chosen to have at least part of the physical work of project implementation performed either directly by the government under force account ("régie") or by para-statal organisations whose autonomy is more statutory than real.

This policy, which stems from a legitimate desire for national independence, has not - except in some rare instances - yielded the results expected. On the one hand, cumbersome administrative constraints are incompatible with the flexibility needed for the efficient performance of work; on the other, skilled personnel are too few in number. The cost-effectiveness ratio achieved has been below expectations.

When work has been sub-contracted to private firms because of a shortage of human resources, it has very rarely been monitored or controlled. There is room for belief that this has not been without incidence in costs.

Basically, the policies pursued by the departments responsible for village hydraulics have not really been adapted to their human resource availabilities. Skills are scarce in the region, and the unfortunate fact is that they will continue to be scarce in the short- and medium-term. The best way out is probably to find what is perhaps not optimum but at least a more effective way of distributing limited resources between the different tasks of design, planning, execution and control, and sub-contracting whatever can reasonably be sub-contracted.

2.5 - MAINTENANCE

The inadequate level of maintenance of facilities and equipment has been increasingly commented on for some years. Government departments have had neither the equipment nor the human resources to maintain widely scattered installations. The population has not felt itself concerned about the maintenance of facilities and equipment which it sees as the government's rather than its own, and in any case, generally has not had the technical know-how needed to perform maintenance. The aid sources have also paid little attention to maintenance.

The outcome has been major deterioration. Foreign donors have had to use part of the funds allocated for village hydraulics schemes for the rehabilitation of facilities or the replacement of equipment which had been installed only a few years ago. This has reduced the rate of creation of new water installations proportionately.

However, it should be stressed that there has been a progressive improvement in the situation. The maintenance aspect has attracted more attention in the design and development of the last generation of projects than ever before; some project designs have included provision for the organisation of maintenance and maintenance training (although others still seem to neglect this aspect of village hydraulics). Some countries have created a national structure for the maintenance of water installations. Local residents are now beginning to participate financially in the maintenance of the equipment they use; this was almost unknown a few years ago. Some countries have created a National Water Fund, one of whose aims is, to finance at least part of the maintenance of facilities and equipment.

Awareness of the needs for maintenance is growing, and concrete measures are beginning to be taken.

III - PROSPECTS

Chapter I described the magnitude of the needs to be met. Given the foreseeable growth of the rural population, and allowing for the renewal of old installations, approximately 60 000 to 70 000 modern water points will probably have to be built by the year 2000 (excluding the Cape Verde Islands and Chad) to generalise adequate water supply.

It is not easy to count the number of water points whose construction is under way or planned in the short term (i.e. for which financing has been secured). The figure seems to be at least 12 000 for the whole of the countries considered.

This order of magnitude demonstrates the substantial effort still required despite the recent acceleration of investment in this field.

There are two questions. Will the Sahel have enough water and the necessary resources to face up to its needs, say, over the next twenty years? Will it find the necessary funds?

3.1 - WATER RESOURCES

First, will water resources be adequate?

It is now known that groundwater, overall, is available in reasonable abundance. While these resources should be more than enough, certain additional points should be borne in mind:

- human water supply is not the sole issue; cattle consumption and water for farming must also be taken into account. Although the high cost of pumping will limit the use of underground water for irrigated farming, this call on resources cannot be neglected;

- water resources are most unevenly distributed geographically. Some layers are fossil or recharged only very slowly; in some areas, the water-bearing strata are difficult to tap; certain layers are subject to major variations in levels which can temporarily dry up wells, etc.

As the volume of water drawn from the reserves rises, careful management of resources will be necessary to avoid jeopardising the future. Some regions are in more danger in the short term than others: for instance, coastal regions where the invasion of fresh water formations by salt water, following excessive pumping, would be irreversible and catastrophic.

Substantial portions of the data needed to manage resources exist already. They will need to be completed, especially by continued measurement of the water level in particular in zones in which the aquifers are discontinuous.

In sum, the resources exist and are generally sufficient at least for the needs of the next two decades, but they must be managed, all the more rigourously when they are scarce; and their uneven geographical distribution must be taken into account in future development schemes.

3.2 - IMPLEMENTATION POTENTIAL

Chapter II has shown that the conditions in which current projects have been designed and implemented have not always been adequate, which raises a second question: is it possible, on the basis of existing resources, to increase implementation capabilities and the pace at which needs will be met? How?

The results of the actions undertaken over the last few years may not always have lived up to expectations, but the Sahel countries have gained worthwhile diversified experience whose value should not be under-estimated. Even if resources, and especially human resources are insufficient, there now exists a potential which can be better utilised. All studies agree on this point.

Implementation potential exists in the government departments, State corporations and private firms. The goodwill of the population can also be mobilised for both development and maintenance. The problem is first and foremost to manage scattered capabilities to best effect and gradually to augment them.

3.3 - THE NEED FOR RATIONAL WATER MANAGEMENT

Existing water resources are not endless; in addition technical potential and experience of village hydraulics exist in the Sahel, but are not over-abundant; the International Community has increased its financial and technical assistance over the last few years, but one thing is certain: neither State funds nor foreign aid are limitless.

Consequently, needs remain very high in relation to resource availabilities.

The general conclusion of the diagnosis of village hydraulics in national reports can be summed up in one sentence: more benefit must be derived from the existing natural, human, technical and financial resources. A "rational water management" policy must be put in place; the management of water availabilities, of technical and human resources and financial resources so as best to meet needs, compose the three interlocking aspects of such a policy.

A number of concrete proposals for the development of rational water management are set out in the national reports. The present paper will now examine these proposals, starting with programming.

IV - PROGRAMMING

Programming involves defining the actions to be undertaken, their order of execution and the resources to be employed. It presupposes the presence of one or several objectives. In the particular case of village hydraulics, the aim is to improve the quantity and quality of the rural population's water supply without forgetting that water is not only used for human consumption, whence its "social" role, but should also have an "economic" impact whenever possible: drinking water for village cattle, irrigation for market gardening.

It also presupposes that priorities are defined, and the guidelines laid down on what could be referred to as a "water development strategy". Each State is of course responsible for its own definition. This point will be returned to in the discussion below.

4.1 - ON-GOING SURVEYING AND EVALUATION

The first step is obviously to acquire knowledge:

- Knowledge of needs, the real needs of the population, and not typological needs as perceived from an office chair in a capital. It will probably be necessary in the future to obtain greater support than in the past from decentralised structures to assess these needs.

  To the extent that groups of villagers develop which are not mere emanations of government services but true producer associations, or groups specialised in water supply are created, these groups are the future opposite numbers of the official hydraulics authorities;

- Knowledge of existing water points, their location, characteristics and equipment;

- Knowledge of resources, the volume of data available has already been referred to. These data must be stored and accessible and must also be improved (critical surveys of flow tests, development and follow-up of piezometric networks);

- Knowledge of techniques, construction and maintenance techniques, specifications for equipment and materials, results of experiments with and use of equipment and materials.

All these data should be stored in a water documentation unit within the national department. Computers are now cheap enough to envisage computerised storage and data processing.

It should be observed that competent personnel are too scarce in the region to be wasted on collecting data on techniques in each State. This information could be advantageously collected and processed at regional level and circulated to each national unit (which presupposes compatible computer systems). There probably is no need to create a new structure for this purpose.

Three organisations dealing with water exist in Ouagadougou: the CILSS, the CEAO and the CIEH. They could agree to collect information in common, circulate it among States and, more generally, act as a pool of expertise at the service of their Member States.

4.2 - PROGRAMMING

This is obviously the key stage at which it is necessary to correlate:

- "social" and "economic" needs, and the motivation of population to participate in investment;

- resources, specifying them if necessary by additional study;

- equipment and human resource availability;

- estimated costs.

Given the magnitude of the needs to be met and the limits to available resources, it will be indispensable:

- to define priorities, for instance, should priority be given to projects which allow an "economic" use of water for market gardening or small-scale cattle breeding? Or should emphasis be placed on social needs, and modern water points established in those villages whose water supply is most precarious?

  The creation of a water strategy at the national level is necessary in this regard. If this is not done explicitly and with due reflection, decision-takers will in any case be compelled to apply an implicit strategy, but one which has not been discussed;

- to avoid "scattering", which increases the cost of projects substantially, by defining a regional development strategy;

- to plan at the design stage of programmes how maintenance will be organised: who will be responsible for the different levels of maintenance? How will the persons in charge of maintenance be trained? And will it be financed through the participation of local communities, from the national budget, out of a national water fund, or in some other way?

- to secure co-ordination between village hydraulics programmes, small-scale rural development actions using water, and sanitary actions.

The national sectoral reviews include many interesting suggestions on the choice of the types of facilities to be built, either wells or boreholes, which summarise the experience gained over the last twenty years. There can be no single recommended alternative; the choice depends on a set of criteria: the terrain, demand, the desired pace of construction, the possibility of undertaking reliable maintenance of borehole pumps, etc.

4.3 - STRENGTHENING PROGRAMMING CAPACITY

The diagnosis of the current situation has underlined the inadequacies of programming. It will no doubt be necessary to strengthen the capacity for this in the national water department. A few suggestions can be made:

- creation of a team specialised in programming within the National Water Department, whose mandate precludes any function of execution. This team will receive support from:

  . the water documentation unit,

  . regional rural development organisations, village groups, etc.

- creation of a National Water Committee at the policy level to define the broad lines of a water strategy and of regionalisation.

V - IMPLEMENTATION OF PROGRAMMES

5.1 - STUDY, EXECUTION AND CONTROL OF WORK

The analysis of the situation of village hydraulics has shown that administrative departments study, execute and control programmes. This accumulation of tasks is detrimental to the smooth performance of any one of them.

In the future, roles must be more distinct:

- the administration's role is first to prepare calls for tenders and especially to establish the specifications of facilities and equipment, then follow up and ensure that the project is carried out in conformity with accepted practice, and finally to take delivery of the completed project.

  It is also up to the administrative services to ensure that maintenance, scheduled at planning stage, is effectively performed after the entry of facilities into service. This point will be amplified below.

- the role of contracting firms.

A number of ways in which the efficiency of working methods for wells and boreholes could be enhanced have been suggested in the national sectoral reviews. They include in particular the creation of mobile mechanised workshops (already in use in Niger) for the construction of cemented wells.

The CIEH has produced a special report on pumping facilities. It lists the advantages and drawbacks of the various kinds of hand-operated pumps used in the region, and the testing programmes for new pumps presently under way. A project for the manufacture of hand-operated pumps is envisaged in the region.

Emphasis should be laid on the value of limiting the number of models of pumps used, or, in the future, the number of models manufactured locally, to ease problems of the storage and distribution of spare parts, thereby facilitating maintenance.

The same remark applies to drilling and well-digging equipment.

5.2 - RESTRUCTURING OF IMPLEMENTATION CAPACITY

Administrative departments are poorly armed to execute the work, but they alone can perform the function of programming and controlling the use of public funds.

The long-term objective should be the creation of national autonomous firms, independent of the administration. They could be official, private, or mixed and would be responsible for drilling wells and boreholes.

In the short- and medium-term, recourse to foreign firms is probably indispensable in order to accelerate the pace of construction; however, a policy of assistance for the creation and development of national firms should be promoted systematically.

In some countries, well-digging is done by traditional craftsmen. These wells will continue to play a major role in water supply. This craft must be preserved and extended.

VI - MAINTENANCE AND SUPPORTING ACTION

6.1 - PREREQUISITES FOR THE IMPROVEMENT OF MAINTENANCE

The studies of recurrent costs have shown the difficulties met by the Sahel States in maintaining and rehabilitating existing water installations. The effort required to provide the rural population as a whole with enough water has been discussed; it is incommensurate with what has been done up to now. This means that a system making the State fully responsible for maintenance and rehabilitation activities and financing, cannot be generalised.

A few suggestions as to conditions for improving maintenance are set out below:

- first, it seems indispensable to have the inhabitants of villages contribute financially to the cost of rehabilitation and maintenance of facilities and equipment. This should be possible: they pay something in any case to cover the annual cost of traditional pumping units. A CIEH study shows that the cost of upkeep of a manual pump (which greatly reduces physical effort!) is rather low. Experience shows that many villagers are motivated enough to set aside money for maintenance or even to invest in a modern water installation, supplying abundant water.

  However, financial participation must be subject to an agreement at the design stage of projects and stipulated at that time in a contract between the administrative department and an ad hoc group of villagers.

- This implies reducing capital and maintenance costs to the minimum and taking them into account in programming, in particular in the choice of the types of facilities and equipment to be installed.

- The cost of maintenance can be reduced if it is performed by the local population and village craftsmen trained in the necessary techniques.

- State participation should be envisaged, e.g. in the form of a National Water Fund, but it should be well understood that this financial aid is only to supplement the investment made by the local community. The National Water Fund could be a tool of national solidarity and act to balance relatively well-endowed areas which can provide funds for maintenance with poorer areas, or to balance areas in which water can play a major economic role with those in which it will mainly play a social role.

6.2 - THE ORGANISATION OF MAINTENANCE

The application of the above principles will require organisational measures.

At village level, the creation of a group, whether a producer association or ad hoc group, will be necessary. The group will be the spokesman vis-à-vis the administration at project preparation stage and later, the manager of the water installation. The group will have to appoint one of its members to collect and manage funds, and perhaps another to be responsible for basic maintenance.

Still at village level, this makes it desirable to train craftsmen to be able to carry out more advanced maintenance and simple repairs on the facilities and equipment.

At the county and provincial level, spare parts centres should be created to supply village craftsmen, and specialised teams set up to provide them with technical assistance and undertake more complex maintenance operations. These specialised teams need not be part of the administration, which is probably not the best qualified for the actual performance of work.

It would be more desirable, as suggested earlier regarding the implementation of projects, to leave it to specialised official, private or mixed firms.

6.3 - SUPPORTING ACTION

Carrying out the actions listed above will necessitate a major effort in the training of:

- government executive staff in their tasks,
- executive staff and technicians of contracting and maintenance firms,
- village water workers, in management and basic maintenance, and
- rural craftsmen.

One of the functions of the water authority could be to organise the training and recycling of village water workers and rural craftsmen, e.g. through training seminars.

It has also been stressed earlier that the development of a modern water point does not, by itself, necessarily improve village sanitary conditions. The precautions to be taken to avoid polluting water installations (suitable latrine facilities, etc.) so that water which is clean when drawn and will still be clean when it reaches the final consumer, are not really obvious to those who do not possess basic notions of hygiene. People must be trained in basic hygiene at the same time the water installation is constructed. This teaching task could also be undertaken by the water administration, in co-operation with the health departments.

CONCLUSION

In the report "Village hydraulics and rural development in the Sahel" (BOAD-CILSS-Club du Sahel - 1981), the capital cost for 60 000 water installations up to the year 2000 was estimated at 350 billion CFA francs at 1981 prices or $1.27 billion at 1981 prices.

It can be seen that the funds allocated to village hydraulics in 1981 are quite close to the level required for completion of the programme within twenty years. The rural population has made a considerable effort in the field of water supply. It will probably have to be intensified if each Sahelian is to be able to count on an adequate and reliable supply of clean water within roughly twenty years. In any event, the objective does not seem to be beyond the bounds of possibility.

However, it can also be seen that this very considerable effort raises several problems.

First, a financial problem: it would not serve much purpose to make substantial investments if the capital is allowed to go to ruin through lack of maintenance or obsolescence. Even though it may be desirable for the International Community to participate in funding maintenance to avoid deterioration of facilities, this assistance can only be temporary. The Sahelians cannot remain forever dependent on foreign aid sources for the supply of a basic need like water.

This presupposes a solution to the financial problem which is possible if the communities undertake whatever maintenance they have the skills to do and pay for the rest. The cost is not overwhelming, and ultimately, the question is more one of organisation than financing. State participation, e.g. via a National Water Fund, could help the most deprived communities in meeting their costs.

The rehabilitation of facilities and the overhaul of equipment presupposes the development of credit systems to enable communities to spread the expenditure over time. This is also as much a question of organisation as of financing.

More generally, it may be asked whether more emphasis should be placed on what has been referred to as the "economic" role of water. Attention has so far mainly been focused on the "social" aspect, i.e. the provision of clean water, easier access, etc. Of course, this essential objective cannot be abandoned. However, the social does not exclude the economic aspect. Water can be used for several purposes: market gardening, livestock, the diversification of food preparations, and to provide additional income. It is also a factor of economic development; to the extent this is more true in future than it has been in the past, the village hydraulics programme will not lay an unbearable financial burden on the region.

The insufficiency of human and material resources is another problem. The national reports show, once again, that it is essentially one of organisation. The existing resources are limited, but they could be used more efficiently. A re-definition of the roles of the different agents responsible for planning, construction and maintenance is necessary, and should bring about a restructuring of the sector.

Once this organisational problem has been dealt with, the overall programme described above will become realistic.

Hence the need for the active participation of the population. This could be the general conclusion of this overview of village hydraulics in the Sahel. Sahelian authorities and aid sources are attempting to improve the water supply of the rural population. They have had limited but encouraging success and the situation has started to improve. However, up to now this water has been "donated" to the population: it is a gift from the government, foreign aid sources or NGOs.

The effort remaining to be made is greater than that applied up to now, and it can be clearly perceived that a generalised and satisfactory water supply will not be had without technical and financial difficulties which would no doubt be insurmountable if the present path is followed. The problem now consists of re-directing action, on the basis of the substantial and precious experience gained. Water must become the population's concern. Communities must become involved in the design, development, maintenance and financing of water points and in the rational use of water. Water must become a development factor and not just a gift from the State, made for social reasons.

This presupposes a revision of their policies by governments and aid sources, which is the price at which the objective of water for all will be attained.

DEVELOPMENT OF VILLAGE HYDRAULICS IN THE SAHEL COUNTRIES

OVERVIEW AND PROSPECTS

Synthesis

16.239

TABLE OF CONTENTS

SUMMARY

1. A considerable effort has been made, particularly since 1978, to improve the water supply of the rural sedentary population. The Sahel Governments have strengthened their administrative departments responsible for hydraulics and created new para-statal corporations in this sector. International donors have financed a large number of village hydraulics projects.

   The position has begun to improve as a result, but is still far from satisfactory: surveys show that only 25 per cent to 30 per cent of the rural population have satisfactory access to water.

2. The efforts made have relied on structures which are less than fully satisfactory. The diagnosis of the national overviews can be summarised by listing the tasks remaining to be performed:

   - knowledge of water resources: great progress has been achieved. A good overall picture of underground water resources is now available, although there are still gaps,

   - planning of actions: this is a weak point of the present system. The population has had little or nothing to do with the design and implementation of programmes, and projects have been thinly scattered geographically,

   - execution of work: the States have set up official or para-statal bodies for this purpose, but they have not given the desired results. Further, the administration has not adequately monitored sub-contracting work,

   - maintenance of facilities and equipment: this is another area of weakness. Neither governments nor aid sources have paid enough attention to it.

   However, it should also be underlined that the position is beginning to improve. In particular, greater attention is being paid to planning and more provision made for maintenance.

3. To provide each Sahelian with enough clean water at an acceptable cost is not beyond the bounds of possibility. However, the conclusion to be drawn from the national overviews is that better organisation is required to meet this objective:

   - Improved knowledge and better management of resources. There is abundant underground water in the Sahel, but it is not uniformly distributed. It is necessary to set up systems to collect, store and process data on subsurface water and follow trends, especially in poorly endowed areas.

INTRODUCTION

The fourth Conference of the Club du Sahel held in Kuwait in 1980 instructed the Secretariat of the CILSS and the Club du Sahel to "prepare sectoral planning studies by surveys and exhaustive analyses" in several sectors. Village hydraulics was one of these.

Missions were carried out in each of the Sahel countries (except for Chad) in 1981 and 1982 to perform this task. A report was published on each country: "Village hydraulics in CILSS member countries; an inquiry into and proposals for rational management of water". In addition, the Inter-African Hydraulics Study Committee (IHSC) contributed to the investigation in the form of a broader study of the "conditions of use and maintenance of pumping facilities".

It appeared useful to make a synthesis of the basic observations and recommendations found in the different reports.

Scattered information on village hydraulics in many studies on the region has also been drawn on. Included in particular are project evaluations undertaken by aid sources, village hydraulics and rural development studies performed by the BOAD, the CILSS and the Club in 1981.

It should be made clear that in this report the term village hydraulics is used to cover the water supply of the rural sedentary population, whether the water is used for human or animal consumption, or for farming or artisanal work within the confines of the village. The water supply of nomadic herds and irrigated perimeters is not dealt with in this report and will be taken up in later investigations and analyses.

WHO estimates made in 1975 suggested that one in four inhabitants in the rural zones of the Sahel had access to satisfactory water supplies. This is, of course, only a rough order of magnitude based on many extrapolations. The studies undertaken by the CILSS and the Club in 1977 reached similar findings. The surveys carried out in early 1980 together with the programmes drawn up by the Sahel governments suggest an order of magnitude that is scarcely higher.

Many villages still obtain their supplies using traditional wells or surface waters, in less than ideal conditions. Many still only have limited quantities of water at the end of the dry season; women, who are the traditional water-carriers, must often cover long distances to find supplies, and drawing water using rudimentary tools such as calabashes, inner tubes or recovered packaging, which is hard work indeed.

Clean water, even for those with a modern source of water, is available in few villages because the inhabitants are not aware of all the precautions needed to avoid pollution. How much remains to be done here is indicated by the frequency of intestinal diseases and the infant mortality rate, which is in the range of 150 to over 200 deaths per thousand, between the ages 0 and 1, depending on the country (10 per 1000 in Europe), and 60 per thousand in the 1 to 5 year age bracket. All of this is, to a large extent, due to polluted water.

The table below gives an estimate of the number of villages in the different countries and of the number of modern water points. It must be interpreted with caution because the data are not homogeneous: some countries have counted villages and remote hamlets and others only villages; "satisfactory" water installations are not defined identically by each country, and some estimates are doubtful.

	Number of villages	Number of modern water points beginning 1982
THE GAMBIA	1 000	225
UPPER VOLTA	7 600	4 800
MALI	10 200	5 300
MAURITANIA	4 100	1 000
NIGER	17 400	6 000
SENEGAL	14 400	1 500
T O T A L	54 700	18 800

(Cape Verde, where conditions are very special (scattered dwellings, use of springs, etc.) has been omitted from the table because its characteristics differ so greatly from the rest of the region).

share of official aid that is administered by Non-Governmental Organisations (NGOs)(*). The true amounts of official aid for village hydraulics is therefore somewhat greater than the figures indicated).

Private aid donors seem to have given this sector high priority, but the exact figures are not known: certainly at least two million dollars per year and possibly much more.

This aid has increased substantially over recent years. Together with the Sahelians' efforts, it has financed the building of most of the modern sources of water reported above. However, it should be observed that aid has been allocated almost exclusively to construction as such. Very little of it has been devoted to supporting actions in the form of training, maintenance of facilities and equipment.

(*) Non-governmental organisations collect and distribute private aid, and also receive subsidies from some official aid sources for specific projects.

- ancient sedimentary strata. The water here does not accumulate in continuous aquifers, but is located in deformed pockets or cracks in the rock. These resources are much smaller and also harder to locate and develop. Nevertheless, progress in prospection methods has made the search for water far less subject to the vagaries of chance and progress in boring techniques has made it possible to draw water from cracks which could not be exploited previously because their flow was too limited.

A good picture is now available of the resources in the different provinces of the Sahel and remarkably well-done syntheses, designed for use as basic tools for the administrative departments responsible for drawing up programmes for underground water, have been published.

However, the information is incomplete. For many aquifers, the volume of water which could actually be drawn is still unknown and piezometric readings of their level are not made systematically. And it is of course always desirable to enhance the details known of favourable locations and of the volume of water which can be used, especially in the ancient sedimentary strata.

2.3 - NEEDS AND PROGRAMMING

The situation is much less satisfactory in this area. First, government services, pre-empted by many tasks, especially the execution of work they have undertaken themselves, have generally paid less attention than they should have, to planning the use of public funds. Although many tasks can be sub-contracted, public authorities must do overall planning and programming.

At the same time, somewhat paradoxically, programming has been both heavily concentrated and scattered.

It has been concentrated in the sense that village hydraulics projects - like cereals crop development or reaforestation projects - have to a large extent been designed, decided and undertaken without the participation of the population concerned. A technocratic approach to development has been followed, oriented "from top to bottom", villagers being considered as unable to contribute to the design and development of what are nevertheless matters of prime concern to them. Nor has the intervention of foreign aid sources, anxious to implement their own models, facilitated more attentive understanding of the rural world.

Fortunately, the NGOs, acting most of the time outside this technocratic framework, have brought more flexibility to this rigid approach. It should also be underlined that some countries have made an attempt at a different approach with uneven success: wells as an investment in human resources.

As regards scattering, the rule in programming (or what has been referred to as programming) seems often to have been a "scattered" approach. For quite understandable political reasons, action has not devolved on a regional basis, and work-sites have been

The outcome has been major deterioration. Foreign donors have had to use part of the funds allocated for village hydraulics schemes for the rehabilitation of facilities or the replacement of equipment which had been installed only a few years ago. This has reduced the rate of creation of new water installations proportionately.

However, it should be stressed that there has been a progressive improvement in the situation. The maintenance aspect has attracted more attention in the design and development of the last generation of projects than ever before; some project designs have included provision for the organisation of maintenance and maintenance training (although others still seem to neglect this aspect of village hydraulics). Some countries have created a national structure for the maintenance of water installations. Local residents are now beginning to participate financially in the maintenance of the equipment they use; this was almost unknown a few years ago. Some countries have created a National Water Fund, one of whose aims is, to finance at least part of the maintenance of facilities and equipment.

Awareness of the needs for maintenance is growing, and concrete measures are beginning to be taken.

In sum, the resources exist and are generally sufficient at least for the needs of the next two decades, but they must be managed, all the more rigourously when they are scarce; and their uneven geographical distribution must be taken into account in future development schemes.

3.2 - IMPLEMENTATION POTENTIAL

Chapter II has shown that the conditions in which current projects have been designed and implemented have not always been adequate, which raises a second question: is it possible, on the basis of existing resources, to increase implementation capabilities and the pace at which needs will be met? How?

The results of the actions undertaken over the last few years may not always have lived up to expectations, but the Sahel countries have gained worthwhile diversified experience whose value should not be under-estimated. Even if resources, and especially human resources are insufficient, there now exists a potential which can be better utilised. All studies agree on this point.

Implementation potential exists in the government departments, State corporations and private firms. The goodwill of the population can also be mobilised for both development and maintenance. The problem is first and foremost to manage scattered capabilities to best effect and gradually to augment them.

3.3 - THE NEED FOR RATIONAL WATER MANAGEMENT

Existing water resources are not endless; in addition technical potential and experience of village hydraulics exist in the Sahel, but are not over-abundant; the International Community has increased its financial and technical assistance over the last few years, but one thing is certain: neither State funds nor foreign aid are limitless.

Consequently, needs remain very high in relation to resource availabilities.

The general conclusion of the diagnosis of village hydraulics in national reports can be summed up in one sentence: more benefit must be derived from the existing natural, human, technical and financial resources. A "rational water management" policy must be put in place; the management of water availabilities, of technical and human resources and financial resources so as best to meet needs, compose the three interlocking aspects of such a policy.

A number of concrete proposals for the development of rational water management are set out in the national reports. The present paper will now examine these proposals, starting with programming.

Three organisations dealing with water exist in Ouagadougou: the CILSS, the CEAO and the CIEH. They could agree to collect information in common, circulate it among States and, more generally, act as a pool of expertise at the service of their Member States.

4.2 - PROGRAMMING

This is obviously the key stage at which it is necessary to correlate:

- "social" and "economic" needs, and the motivation of population to participate in investment;
- resources, specifying them if necessary by additional study;
- equipment and human resource availability;
- estimated costs.

Given the magnitude of the needs to be met and the limits to available resources, it will be indispensable:

- to define priorities, for instance, should priority be given to projects which allow an "economic" use of water for market gardening or small-scale cattle breeding? Or should emphasis be placed on social needs, and modern water points established in those villages whose water supply is most precarious?

  The creation of a water strategy at the national level is necessary in this regard. If this is not done explicitly and with due reflection, decision-takers will in any case be compelled to apply an implicit strategy, but one which has not been discussed;

- to avoid "scattering", which increases the cost of projects substantially, by defining a regional development strategy;

- to plan at the design stage of programmes how maintenance will be organised: who will be responsible for the different levels of maintenance? How will the persons in charge of maintenance be trained? And will it be financed through the participation of local communities, from the national budget, out of a national water fund, or in some other way?

- to secure co-ordination between village hydraulics programmes, small-scale rural development actions using water, and sanitary actions.

The national sectoral reviews include many interesting suggestions on the choice of the types of facilities to be built, either wells or boreholes, which summarise the experience gained over the last twenty years. There can be no single recommended alternative; the choice depends on a set of criteria: the terrain, demand, the desired pace of construction, the possibility of undertaking reliable maintenance of borehole pumps, etc.

V - IMPLEMENTATION OF PROGRAMMES

5.1 - STUDY, EXECUTION AND CONTROL OF WORK

The analysis of the situation of village hydraulics has shown that administrative departments study, execute and control programmes. This accumulation of tasks is detrimental to the smooth performance of any one of them.

In the future, roles must be more distinct:

- the administration's role is first to prepare calls for tenders and especially to establish the specifications of facilities and equipment, then follow up and ensure that the project is carried out in conformity with accepted practice, and finally to take delivery of the completed project.

  It is also up to the administrative services to ensure that maintenance, scheduled at planning stage, is effectively performed after the entry of facilities into service. This point will be amplified below.

- the role of contracting firms.

A number of ways in which the efficiency of working methods for wells and boreholes could be enhanced have been suggested in the national sectoral reviews. They include in particular the creation of mobile mechanised workshops (already in use in Niger) for the construction of cemented wells.

The CIEH has produced a special report on pumping facilities. It lists the advantages and drawbacks of the various kinds of hand-operated pumps used in the region, and the testing programmes for new pumps presently under way. A project for the manufacture of hand-operated pumps is envisaged in the region.

Emphasis should be laid on the value of limiting the number of models of pumps used, or, in the future, the number of models manufactured locally, to ease problems of the storage and distribution of spare parts, thereby facilitating maintenance.

The same remark applies to drilling and well-digging equipment.

5.2 - RESTRUCTURING OF IMPLEMENTATION CAPACITY

Administrative departments are poorly armed to execute the work, but they alone can perform the function of programming and controlling the use of public funds.

The long-term objective should be the creation of national autonomous firms, independent of the administration. They could be official, private, or mixed and would be responsible for drilling wells and boreholes.

VI - MAINTENANCE AND SUPPORTING ACTION

6.1 - PREREQUISITES FOR THE IMPROVEMENT OF MAINTENANCE

The studies of recurrent costs have shown the difficulties met by the Sahel States in maintaining and rehabilitating existing water installations. The effort required to provide the rural population as a whole with enough water has been discussed; it is incommensurate with what has been done up to now. This means that a system making the State fully responsible for maintenance and rehabilitation activities and financing, cannot be generalised.

A few suggestions as to conditions for improving maintenance are set out below:

- first, it seems indispensable to have the inhabitants of villages contribute financially to the cost of rehabilitation and maintenance of facilities and equipment. This should be possible: they pay something in any case to cover the annual cost of traditional pumping units. A CIEH study shows that the cost of upkeep of a manual pump (which greatly reduces physical effort!) is rather low. Experience shows that many villagers are motivated enough to set aside money for maintenance or even to invest in a modern water installation, supplying abundant water.

  However, financial participation must be subject to an agreement at the design stage of projects and stipulated at that time in a contract between the administrative department and an ad hoc group of villagers.

- This implies reducing capital and maintenance costs to the minimum and taking them into account in programming, in particular in the choice of the types of facilities and equipment to be installed.

- The cost of maintenance can be reduced if it is performed by the local population and village craftsmen trained in the necessary techniques.

- State participation should be envisaged, e.g. in the form of a National Water Fund, but it should be well understood that this financial aid is only to supplement the investment made by the local community. The National Water Fund could be a tool of national solidarity and act to balance relatively well-endowed areas which can provide funds for maintenance with poorer areas, or to balance areas in which water can play a major economic role with those in which it will mainly play a social role.

6.2 - THE ORGANISATION OF MAINTENANCE

The application of the above principles will require organisational measures.

CONCLUSION

In the report "Village hydraulics and rural development in the Sahel" (BOAD-CILSS-Club du Sahel - 1981), the capital cost for 60 000 water installations up to the year 2000 was estimated at 350 billion CFA francs at 1981 prices or $1.27 billion at 1981 prices.

It can be seen that the funds allocated to village hydraulics in 1981 are quite close to the level required for completion of the programme within twenty years. The rural population has made a considerable effort in the field of water supply. It will probably have to be intensified if each Sahelian is to be able to count on an adequate and reliable supply of clean water within roughly twenty years. In any event, the objective does not seem to be beyond the bounds of possibility.

However, it can also be seen that this very considerable effort raises several problems.

First, a financial problem: it would not serve much purpose to make substantial investments if the capital is allowed to go to ruin through lack of maintenance or obsolescence. Even though it may be desirable for the International Community to participate in funding maintenance to avoid deterioration of facilities, this assistance can only be temporary. The Sahelians cannot remain forever dependent on foreign aid sources for the supply of a basic need like water.

This presupposes a solution to the financial problem which is possible if the communities undertake whatever maintenance they have the skills to do and pay for the rest. The cost is not overwhelming, and ultimately, the question is more one of organisation than financing. State participation, e.g. via a National Water Fund, could help the most deprived communities in meeting their costs.

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THE ACTIVITIES OF THE CONSUMERS' ASSOCIATION TESTING AND RESEARCH

1. COMPARATIVE EVALUATION OF HANDPUMPS

The World Bank has continued to administer UNDP funds for further handpumps testing, following the initial work which was funded by the Overseas Development Administration, particularly to obtain information on the pumps which the World Bank wished to select for their field trials. Since then they have concentrated on providing assistance to manufacturers in developing countries so that their pumps could be tested. Where necessary, laboratory engineers have helped overcome design or manufacturing difficulties.

A number of manufacturers have funded testing of their own pumps in order to discover how their products compare in performance and endurance with pumps whose results have already been published in the UNDP Project Management Report Series and more recently in Applied Research and Technology (WUDAT) Note No. 2.

The failure of many of the early types of handpumps in both the laboratory and the field has stimulated manufacturers into producing improved designs, paying more attention to quality control and exploring the possibilities of using new materials.

By keeping the details of the handpump test method unchanged, valuable comparative information on handpump behaviour can be determined. It is recognised that laboratory evaluation cannot be a complete substitute for testing in the field, but at least conditions can be carefully controlled and the collection of data easily standardised. In the field, conditions vary widely and they are inherently difficult to control so that obtaining reliable performance or endurance data is difficult and can take much longer than a laboratory test.

Recently, to help purchasers to specify and select the most appropriate handpumps for a particular application, the World Bank has published Sample Bidding Documents. These contain requirements for prospective suppliers to provide either data from field trials or laboratory information on performance and endurance based on a standard test method, so that the technical abilities of handpumps can be compared. The Bidding Documents are also designed to encourage manufacturers in their efforts to improve the reliability and suitability of their handpumps for community water supply.

The World Bank publication Applied Research & Technology Note No. 2 contains full laboratory reports on the GSW, Monarch and Pek pumps from Canada, the Tara pump from Bangladesh and the Volanta pump made in the Netherlands. An engineering assessment of the Moyno pump was published examining differences between the Canadian produced sample and the US made sample. The Monolift report only dealt with inspection, measurement, performance and user evaluation of the new head with thermoplastic drive gears but no endurance testing was carried out. A full test on this pump had been reported in 1984. A further performance test was requested on this pump at a simulated depth of 60 metres which was interesting since it indicated that the pumping effort needed was less than with some other pumps tested at 45 metres.

Reports have just been completed on the Wavin pump from the Netherlands, the Bestobell pump from Zambia, the IDRC-UM from Malaysia, two models of Nira pump from Finland - the AF84 and AF85, and the India Mk II manufactured by Emama in Mali.

Results of recently completed tests can be summarised as follows:-

Wavin Pump

This pump incorporates some interesting innovations principally in the use of epoxy cement for joints in uPVC pipes and of ramie cord as a piston seal. The manufacturer's research has indicated that epoxy cement is likely to be stronger and more durable than solvent cementing. This comparison has not been independently assessed, but the pump completed the endurance test with no failures in the rods or rising main. Ramie cord appears to be an efficient and durable seal but it requires bedding in and appears to be susceptible to contamination by debris which can cause the piston to seize.

Bestobell Pump

A soundly based design though requiring some additional development before it could be seriously considered for large scale application. The manufacturer has shown a commendably receptive and flexible attitude which should help to combat the restrictions on design opportunities imposed by the limited availability of suitable materials in Zambia.

IDRC-UM

A pump designed for Malaysia and with limited scope for wider application. Suitable only for depths of 12 metres or less where it competes with inherently simpler direct-action pumps. The wooden handle links proved to be durable in normal use but susceptible to abuse. The piston seals wore rapidly in sandy water. Many potential design improvements have been suggested.

Nira AF85

Generally a robust direct-action pump although there was considerable wear of the piston seal particularly in sandy water. It should prove reliable now that the valve design has been improved following discussions with the manufacturer. There was no problem with the polyethylene pump rod and rising main.

Nira AF84

Like the India Mk II, the AF84 needs either heavy rods or a deep setting to ensure that the flexible link in the pumpstand remains taut when pumping. Generally reliable now that the valve design has been improved following discussions with the manufacturer, and fairly robust although the handle broke off in the bump stop abuse test.

India Mk II Mali

There were no failures in the endurance test but there are many suggestions for potential design improvement. The majority of these relate to the basic India Mk II design although some are specific to the Mali manufacture of this pump.

A new handpump testing tower has now been constructed at CATR's laboratory in Harpenden in Hertfordshire, together with a 45 and 60 metre borehole and will be commissioned during September 1986. It is anticipated that pumps from Abi, Pumpenboese, Atlas Copco, Merrill and from the first production run of the Afridev from Kenya will soon be under test.

2. DRY BEARINGS

A report was published in December 1985 which described the design, manufacture and laboratory endurance testing of several different dry bearing systems which had been essentially developed for the Afridev pumpstand. It also included results of several types of plastic bushes running on a stainless steel or plastic counterface, spherical plain bearings, wooden bearings and flexural rubber bushes.

Considerable differences in performance were found, the best combination of materials used an acetal outer bush running on a nylon 66 inner bush. Results from tests on machined assemblies indicated that 4 million reversals under extremely arduous test conditions produced no measurable wear. Machined samples were also sent to Malawi and Kenya and results from these field trials indicated similar success. Mould tools have now been produced and it is hoped that further longer term testing will be carried out on the laboratory test rigs and in the field using properly moulded components.

This work has shown that plastic dry bearing systems are a feasible option, they are cheap to produce and very easy to fit in the field compared to the difficulties of replacing ball races.

The design of the Afridev head currently being produced in Kenya with assistance from the World Bank, will use handle fulcrum and hanger bearings moulded from acetal and nylon 66. Further work is in progress, looking at this combination of materials for the India Mk II pump handle bearing. It has also been recommended that further work should be carried out on wooden bushes since under certain circumstances these could form viable options for replacement of other types of bearing system.

3. PLASTIC BELOW-GROUND COMPONENTS

The final report of the work carried out to examine and develop design concepts using plastics in below-ground assemblies for handpumps has now been completed. Funding for this project was provided equally by UNDP, with the World Bank acting as executing agency and the Overseas Development Administration of the UK Government. The report provides an overview of the original objects of the work, discussions with organisations within the plastics industry, the developments of the initial concepts and the testing of machined parts for performance and endurance in the laboratory and in the field. Once suitable prototype designs had developed, mould tools were produced and further laboratory and field testing then occurred on properly moulded parts.

All the plastic components were subjected to very severe conditions of tests within the laboratory in order to examine the integrity of all the parts and also to determine which of the various seal systems able to be used with these components, showed the greatest promise.

Results indicated that the 2.5 inch design configuration which developed was suitable down to 45 metres and the best seal system used with a uPVC cylinder was in nitrile rubber.

One immediate development proceeding from this work has occurred in Kenya where the concept of a common design for both the piston and foot valve has been adapted for a 2 inch system. The concept of snap-in legs for the foot valve to engage in a receiver incorporated in the rising main has also been carried over. Consultants from SKAT, the Swiss Centre for Applied Technology, Optimold,-Swiss die designers and DuPont de Nemours-acetal manufacturers from Switzerland, had previously met in Nairobi in March 1986 with members of the World Bank, engineers from bilateral funded projects in Africa, and CATR to take these plastic design concepts into a fully mass-produced set of below-ground components. Mould tools are expected to be ready mid 1986 with a full production run planned for the end of this year.

It is hoped that some of the design concepts will also be adaptable to the Tara pump, currently in production in Bangladesh.

4. LIGHTWEIGHT PUMPROD PROJECT

The purpose of this project is to determine acceptable operating characteristics for direct-action force pumps initially to depths of about 15 metres and to identify a limited number of materials whose

characteristics fit the criteria established from the assessment of the operating characteristics. A computer model has been developed which considers the distribution of effort involved in pumping compared with the characteristics of the pumprod material. For any pump specification within the range being considered, the pump performance can be determined and particularly the buckling problems are identified. The forces required on both the up and down stroke are determined and the pump efficiency is calculated from a variety of stroke speeds and levels of friction. This computer programme has proved extremely useful in being able to consider a variety of dimensions and characteristics of a wide range of materials and compare the results.

From this work a number of materials suitable for lightweight pumprods have been selected and made up to fit to a Tara pumpstand. Actual performance tests on a borehole have been conducted using the normal laboratory performance instrumentation and from comparison of the results, four of the designs will be set up in the new test tower for endurance tests. Particular attention is being placed on the connection systems between the various sections of the lightweight pumprods, and the importance of the maintenance of watertight joints.

5. RISING MAIN PROJECT

Conventional galvanised iron pipe, used for rising mains of handpumps, often corrodes rapidly in aggresive water supplies. uPVC would appear to be a cheap alternative, it is lighter in weight, is not affected by corrosive water and is readily available in developing countries. Unfortunately field experience indicates that in the particular configurations where the material has been used, numerous failures of the uPVC rising main have occurred. There is obviously concern that thousands of VLOM pumps will be installed over the next few years with uPVC as a rising main and it is therefore important to discover what has actually caused the failure of the material and what other plastic material options exist. A proposal for the evaluation of different products has been produced with the object of examining the problems and suggesting certain solutions.

Sections of rising main, coupled together, will be attached to an India Mk II head, an Afridev head and a Volanta head, which will be operated at different stroke rates or revolutions and the forces transmitted up and down the rising main will be determined. The use of shock absorbers fitted in the pumprod, resilient mountings for the rising main etc. will be considered in order to determine how to reduce the forces on the rising main.

The Overseas Development Administration and the World Bank, acting as an executing agency for UNDP funds have agreed to collaborate over this work.

6. AUTOMATIC TAP CLOSURES

Post evaluation studies of projects funded by the Overseas Development Administration in peri-urban water systems of developing countries, indicated that many of the automatic tap closures provided on standpipes had ceased to function properly. In many cases they had been broken by frustrated users who had either found no water or that the supply would only be delivered in small quantities.

CATR was requested by ODA to conduct an international market survey and establish what automatic tap closures existed, and, together with the ODA, select various types of tap which should be evaluated. Samples closures were then purchased and subjected to a test programme previously developed with ODA. This included initial inspection and performance tests at pressures varying from 0.1 bar to 6 bar and at different ambient temperatures.

The results were reviewed and those taps that were considered to have performed satisfactorily were then tested on a specially constructed endurance rig at high and low pressure. The taps were operated at high pressure for 100,000 cycles in clean water followed by 250,000 cycles in water contaminated with quartz sand and Kiesleghur and for 30,000 cycles in clean and 75,000 cycles in contaminated water at low pressure.

Straight forward robust on/off taps proved to be more reliable than quantity controlled taps. However, in all the on/off designs tested it would not be difficult to devise means of jamming the taps open defeating the object of using an automatically closing tap. All types of tap were generally less reliable at high supply pressures. Most quantity controlled taps were only suitable for use on clean water supplies. Some non-concussive on/off designs were also susceptible to contamination by suspended solids.

It is hoped that, by publication of results and general discussions with manufacturers about the results of the tests, they will be able to improve some of the designs to make them more suitable for use in developing countries.

CONCLUSION

We are greatly indebted to the World Bank and ODA for their continuing support of our activities in helping solve some of the problems in rural water supplies through the application of the skills and experience of our engineers. As a Consumers' Association, we hope that this work will continue so that in some small way we can help consumers in developing countries who cannot help themselves.

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WATER SUPPLY DEVELOPMENT WITH DANISH SUPPORT IN AFRICA

by

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Danish International Development Agency (DANIDA)

Presented at All-Africa Seminar on Low-cost Rural and Urban-fringe Water Supply Systems, in Abidjan, October 1986.

ABSTRACT

The water sector, and particularly the rural water supply and sanitation sector, is a priority area of Danish bilateral assistance. Hence since the launching of the International Drinking Water Supply and Sanitation Decade the percentage of bilateral Danish financed assistance to this sector has grown to about 15%.

The Danish International Development Agency (DANIDA) currently supports water projects in 16 countries in Africa. Strong emphasis is given to maintenance and software issues, such as active community participation in all project stages, health/hygiene promotion activities and training. Low-cost sanitation is encouraged whenever possible. Emphasis is also given to improved groundwater resources management and low-cost technology development, the latter often in close cooperation with UNDP and the World Bank.

The present paper addresses some of the critical hardware and software issues in water supply development, illustrated by examples from DANIDA-supported projects in Malawi.

Guinea (Conakry), Kenya, Liberia, Malawi, Mali, Mozambique, Niger, Sudan, Togo, Zimbabwe (directly, and with UNICEF) and the Central-african republic.

DANIDA's "policy guidelines for rural drinking water supply and sanitation projects" follow the Decade Approach with strong emphasis on maintenance and on software issues, such as active community participation in all stages of a project, health/hygiene promotion and training. Also low-cost sanitation is encouraged.

Socio-economic activities are included in several major projects, primarily addressing software issues as well as improved low-cost technology development and improved groundwater resources management. Hence research and development activities are often included as regular project components (as e.g. handpump testing).

In pursuing these aims, DANIDA tries to cooperate with other donors and regional development banks whenever possible. In the water sector in africa DANIDA has a long-standing cooperation with UNDP, UNICEF, EEC and the World Bank. Collaboration with AfDB has taken place in Mozambique and is being initiated in Malawi.

3. WATER SUPPLY AND SANITATION DEVELOPMENT

With DANIDA-supported water projects in more than 25 countries from the Phillippines in the East to Guinea Bissau in the West experiences are very difficult to generalize. Whereas in the Asian region the necessity for shifting emphasis from water supply development to sanitation and health promotion activities is increasingly obvious, development within the sector in Africa remains to focus heavily on the provision of water, and less on improving sanitary conditions and habits. However, a definite trend towards increased emphasis on integrated water, sanitation and health promotion in African projects is now felt, with Tanzania and Zimbabwe as good examples among DANIDA-supported projects.

In the spectrum of problems facing sector development DANIDA finds those related to software issues the most complex and difficult to tackle, and increased efforts are being devoted to socio-economic investigations and systematic interaction with and organization of user communities.

On the hardware side DANIDA promotes low-cost, simple and robust (i.e. "maintainable") technologies to the

Similar differences are found in operation and maintenance costs for handpump schemes. Parameters affecting these costs are technology and user intensity (as above), general population density, accessibility etc., and not least the level of community involvement in maintenance.

It is now generally recognized that "community involvement" is the key to success, at least in rural water supply development. A motivated and actively engaged user community can contribute to reducing construction costs (depending, of course, on the formula applied in capitalization of voluntary labour!), and by creating a sense of responsibility among users for "their own" water supply installations operation and maintenance costs can be reduced considerably.

Again, however, it is impossible to generalize. Even with the best of intentions and resources allocated for the purpose user communities react differently to participation in water projects, and what appears to work beautifully in one location may not have much impact in a neighbouring country, or even in a neighbouring region in the same country.

The above is related primarily to handpump projects, which generally represent the most economical solution in rural water supply. (Although there are cases where simple gravity schemes compete favorably with handpump schemes, as illustrated below).

Per capita capital and recurrent costs are generally much higher in piped water schemes for urban and urban fringe areas. Again technology (including required degree of treatment), source availability etc. result in a considerable cost range, and the actual definition of "per capita costs" is complicated by the different levels of service in different user groups (urban dwellers with private house connections, and peri-urban users of public standpost water). No general rules can be applied in distributing system costs to different user groups.

A characteristic average cost range for DANIDA financed piped water schemes in Central- and West Africa is 75-150 US$ per capita in investments.

Examples below of DANIDA-supported projects in Malawi serve to illustrate some of these issues.

4.2. Malawi, an illustrative example

DANIDA has supported water supply development in Malawi since the mid-1970'es. Prior to appraisal of a new

away pits. Water usage was reported in the range 15-23 l/cap/day.

The Upper Livulezi Valley project

- serve some 45,000 people (estimated 60,000 in 1990) from boreholes and protected wells equipped with handpumps (primarily MALDEV and Malawi Mark V, but including tests of India Mark II, Consallen and Blair pumps)

- provide one handpump per 250 people at borehole installations, one per 125 people at protected wells, within a maximum walking distance of 500 m

- were constructed in an "integrated" way by combining rehabilitation and new construction of wells and boreholes in one project, with some community participation - organized in main-, village- and pump committees

- will be maintained in a seven-tier system, which was still (1985) being developed, but which also involves maintenance assistants, village repair teams and pump committees/caretakers

- was constructed at a cost per capita of about 7 US$ (1986)

- require expected maintenance costs of about 30 US$/water point/year, or about 0.15 US$ per capita per year (1986).

It is noted, however, that the above quoted costs for the Livulezi project should be considered with the following qualifications:

- drilling depths in the weathered-rock aquifer in Livulezi averaged 24 m, which is low under Malawi conditions. Expected costs per capita in the recently initiated Karonga groundwater development project average about double (i.e 14 US$ per capita), primarily due to expected deeper boreholes.

- the current figure (1985) for borehole maintenance in Malawi is 120 US$/water point/year, i.e. 4 times higher than that expected for Livulezi. The integrated, community-based approach in Livulezi justify the assumption that maintenance cost can be reduced considerably, but operational experience must prove it.

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- inadequate attention to pump surroundings

- total dependence on district-based maintenance teams, resulting in waiting times of up to several months for repairs.

The result of this approach was average capital per capita costs of 25 US$ (compared to 7 US$ for Livulezi and an estimated 14 US$ in Karonga) for installations which were characterized by inadequate function and frequent breakdowns, and hence dissatisfaction and little usage by the intended beneficiaries.

As a result of the discussion following the DANIDA evaluation steps are now being taken by the Malawian authorities to improve the performance of the NBP. A National Borehole Committee has been set-up to improve the programme, some geographical concentration of activities has been accepted, PVC-casing and MALDEV pumps are being introduced (resulting in considerable cost reductions), and a strategy for community involvement in planning, implementation and maintenance is being worked out.

The NBP-example illustrates very clearly the importance of the almost "worn" concepts of appropriate technology and community involvement. It also illustrates that donors and recipient governments can work together in learning from past mistakes and improve development programmes.

The Malawian "case" has been a very encouraging experience for DANIDA as a major donor in the water supply and sanitation sector in the country. The challenge is now to translate the combined experiences from the rural piped water programme and the Livulezi project into the integrated groundwater development project in Karonga (on the Northern tip of Lake Malawi). In this project "integrated" refers not only to combined well and borehole development in an area, but also to the combined development of water supply, sanitation and health/hygiene promotion with active community involvement.

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12.9.1986

FINNIDA AND RURAL WATER SUPPLY IN DEVELOPING COUNTRIES BY GUNILLA KURTEN, COUNSELLOR

1. FINNIDA'S ORGANIZATION

The official development assistance of Finland is considered to be an integral part of the foreign policy and is administered by FINNIDA (Finnish International Development Agency) which is a department within the Ministry for Foreign Affairs of Finland.

Within the Ministry there are four Under-Secretaries of State one of which for International Development Co-operation. FINNIDA is headed by a Director General who has directly under him a Research and Planning Unit, an Information Unit and a Financial Management Unit and some Consultative Ambassadors for special tasks.

The department is divided into three divisions, a Bilateral Division, a Humanitarian and NGO Division and a Multilateral Division each headed by a Deputy Director. The Deputy Director of the Bilateral Division has directly under him a Country Programming Unit which includes also the legal expertise of the division and a Systems Development Unit with Special Advisors in fields in which FINNIDA is active such as forestry, energy, water and health.

The Bilateral Division is further divided into three Bureaus, one for Forestry and Agriculture, one for Social Development and one for Economic Infrastructure each headed by an Assistant Director. The Bureaus are manned by project officers whose official titles are either

Counsellor, Programme Officer of Attaché (Development Co-operation) depending upon their seniority. Rural water supply projects are administered within the Bureau of Social Development by one project officer assisted by a Special Advisor from the Systems Development Unit.

In addition there are 1-3 officers from FINNIDA at a time working at the Finnish Embassies in developing countries with which Finland has established more extensive and long-term development co-operation programmes i.e. Egypt, Ethiopia, Kenya, Sri Lanka, Tanzania, Zambia and Vietnam, and these officers deal especially with the development co-operation programmes. There is also one officer at the Finnish Embassy in Bangkok dealing with Finnish development co-operation in Bangladesh, Burma and Nepal, in which countries Finland has no Embassy. The officers in Egypt also deal with Somalia and Sudan, the officer in Kenya with Uganda, the officers in Zambia with Zimbabwe and other SADCC countries and the officers in Tanzania with Mozambique.

2. FINNIDA'S AID POLICY

Finnish bilateral aid, which has been and is intended to be maintained at a level of 60 % of the total aid, is directed to countries which in their own development plans, aim at strengthening their economic independence and advancing their social and economic development. Special attention is paid by the Government to the efforts of the recipient countries to secure for all members of society equal rights in the political, economic, social and cultural spheres. The Government takes into particular consideration the economic status of the recipient country, which is a matter of growing importance as the economic situation of the developing countries has been declining.

In the programming of of bilateral aid the Government proceeds on the principle of concentration, which serves to promote the efficiency of the aid administration and enables the Government to draw up more extensive development programmes with the major recipient countries. The programme countries of Finland s bilateral development co-operation are Egypt, Kenya, Zambia, Sri Lanka, Tanzania and Vietnam. The Government intends to continue co-operation with these countries on the present basis. The share to the programme countries of total bilateral aid amounted to 46 per cent in 1985. Of the individual countries, most aid has been received by Tanzania.

In 1982 the Government confirmed the principle according to which at least 30 per cent of the bilateral aid should be directed to countries classified by the UN as the least developed countries, of which Bangladesh, Ethiopia, Nepal, Somalia and Sudan are singled out as main recipients. Of the present programme countries, Tanzania also belongs to the group of the least developed countries (LLDC's).

Burma, Mozambique, Nicaragua and Peru also belong to the main recipients of Finnish aid. In the development co-operation with these 15 main recipient countries a system of country programming is applied; it makes longer-term comprehensive planning of the co-operation with the recipient country possible.

In addition to the above mentioned countries, Finland has been engaged in project-based co-operation also with certain other countries.

The distribution of bilateral aid by sector starts out from the economic and social needs of the recipient countries and from Finland s own resources. In the distribution of aid to different sectors, prominence has been given to agriculture and food procuction, forestry and the forest industry, water and energy supply, as well as education and health care.

With the programme countries the priority sectors of co-operation have been agreed upon for the time being and they include the development of rural water supply in Kenya, Sri Lanka and Tanzania and of urban water supply in Vietnam. FINNIDA has not prepared a comprehensive strategy for its co-operation in the development of rural water supply or set any specific targets for 1990 or 2000, but in general the projects supported are long-term and fairly extensive, concerning a whole district, province or region in the country in question.

Emphasis in placed on rehabilitation of existing installations and support for the development of feasible operation and maintenance systems in addition to new investments. Low cost solutions are sought both in water supply and sanitation. Training is considered an intergral part of the projects.

Finnish aid to the water supply and sanitation sector has been about 7-8 per cent of the total bilateral aid (both grants and credits) in recent years, which meant about 10,5 million USD in 1985. In the coming years there are plans to slightly increase this percentage and since the total Finnish aid is expected to increase from about 0,4 per cent of the GNP in 1985 to 0,70 per cent of th

GNP in 1989 the increase in funds available for the water supply and sanitation sector is expected to be considerable. The on-going projects in Kenya, Sri Lanka and Tanzania will be continued, but there will then also be possibilities to start some new projects.

3. CASE STUDY: KENYA-FINLAND RURAL WATER DEVELOPMENT PROJECT

3.1. As an example of the type of rural water supply projects FINNIDA is supporting, a short description of the Kenya-Finland Rural Water Development Project is given below.

The selected project area lies in western Kenya and extends over parts of four districts: Kakamega, Bungoma and Busia Districts in Western Province and Siaya District in Nyanza Province. The total area is 3653 sq km with a population of 810.000 people (1981) and a population density of 225 people per sq km, which is one of the highest in Kenya. A Water Supply Development Plan for the area was prepared 1981-83, with the long term objective to provide, by 2005, the entire population of the area with a safe supply of water sufficient for domestic and livestock consumption. The first implementation phase started in November 1983 and ended in December 1985. A review of the project was carried out in May-June 1985 and the figures given here are taken from the review report. Up to the end of 1985 389 dug wells, 326 borehole wells and 183 spring protections had been constructed in the area. In addition the rehabilitation of 3 existing piped systems had been completed, the rehabilitation of 2 systems started, the construction of one new piped system completed and the design of one new system completed. The water supply coverage by the end of 1985 was about 200.000 people or 20 per cent of the project area population, most of them served by handpump wells.

The number of pumps installed in the project area since the beginning of the investigations up till the time of the review was 644. The majority of these pumps, 551, were of the type NIRA AF 76 from Finland, 87 were India MK II from Kenya, the remaining 6 single pumps taken on trial. The total number of pumps exceeded those in the field, 490, due to replacements.

3.2. The costs of these waterpoints were given as follows:

Spring Protections:	USD
Materials	395
Labour	260
Transportation (fuel and maintenance)	265
Equipment and Vehicles (ammortized capital costs)	455
Workshops and stores (share of costs)	125
Laboratory (share of costs)	15
Technical assistance (share of costs)	1085
Total	2600

Dug wells:	USD
Materials	825
Labour	1050
Transport	355
Equipment	495
Workshop	95
Laboratory	15
Technical assistance	785
Total	3620

The above unit costs for dug well construction and spring protection were based on a production method where the project directly hired a large number of construction teams comprising foremen and labour. Gradually, starting already in 1985, the project has moved to the use of small-scale contractors for production of dug wells and protected springs. It was expected that through these new production methods together with tighter management and cost

control about 20 per cent and 40 per cent cost savings could be achieved in dug well and protected spring production respectively. The review team considered the costs of spring protections very high and recommended that every effort should be made to reduce these costs. The costs of dug wells were not considered unacceptably high, but also in the case of dug wells efforts should be made to reduce costs further.

The cost calculations made by the project in mid-1986 show that some reductions have indeed been achieved. The unit costs of for spring protection are now USD 2100 and for dug well construction USD 2810.

The costs of drilled wells were given as follows in 1985:

Drilled wells:	USD
Materials	2080
Labour	400
Transport	375
Equipment	1560
Workshop	100
Laboratory	10
Technical assistance	825
Total	5350

The review team did not consider these costs excessive and was of the opinion that they compared well with market rates for boreholes in Kenya. However, there might still be room for significant cost reductions, according to the team In mid-1986 the unit costs given by the project are USD 4940, so some reduction has been achieved also in the case of drilled wells.

The above 1985 unit costs gave the following per capita costs for production of point source water supplies using a consumer basis of 200 persons per water point:

	USD
protected springs	13
dug wells	18
drilled wells	27

These costs do not include the amortized costs of housing for the project team or the project offices.

In mid-1986 the corresponding per capita costs are given as follows: USD 11, 14, 25 respectively.

At the time of the review the information available on the actual costs of piped schemes was still limited but the review team collected all the information available and on the basis of this information prepared also estimates of the schemes then underway or to be undertaken during the remainder of 1985. These cost calculations showed that the per capita costs ranged from USD 6 to USD 62 and the team found these costs reasonable. The lower end represents cases where only part of the scheme required rehabilitation at the time. In addition some of the schemes were compact schemes serving schools, health centres etc. and requiring a very limited distribution network.

3.3. Out of the 389 dug wells constructed by the end of 1985 about 90 have been dug with a tractor excavator and all the rest have been hand-dug. The tractor excavator was used only during the investigation phase, during the implementation all wells have been hand-dug.

The drilled wells have been drilled with the help of two rotary rigs, an Atlas Copco Aquadrill 661 and an Atlas Copco Rotamec 50. Drilling has been carried out by the rotary "down-the-hole" hammer method, using the "Odex" system to case the upper, unconsolidated part of the hole.

The project had, according to the review team, had much success with the identification of the location and dimensions of deeply weathered zones associated with fractures, through effective use of refraction seismic investigations with a well-trained crew of Kenyan staff. The success rate was ca 90 per cent and the costs per site relatively low, about USD 160.

3.4. For the maintenance of handpump wells there is no existing system in Kenya, since construction of extensive handpump well networks has started only recently. To develop also a maintenance system for handpump wells is therefore a major task of the project. To begin with maintenance was and still is, to a rather large extent, carried out by two mobile teams from the project. Different methods of transferring the responsibility to the local communities are, however, all the time being looked into and experimented with. Each community that wishes to have handpump well constructed within its boundaries is expected to establish a well committee before any concrete measures to locate and construct the well are taken. At the planning stage the committee is involved in the siting of the well. During implementation, dug wells are dug by the well committees up to the water table and completion is done by contractors employed by the project. Drilled wells are constructed by the project. The well committees are charged with the responsibility of collecting funds for major maintenance, carrying out preventive maintenance and generally ensuring the proper use of the handpump wells. For these tasks the well committee should specifically select at least one pump attendant per well, who is then given a short training course by the project.

Seminars for committee members and other groups such as women s groups, school children etc., who have an interest in the waterpoint, are arranged to sensitise the community to the need for repairs at the right time and imparting general notions of water-borne diseases and their control.

One promising idea for organizing handpump well maintenance is to train bicycle repairmen already working in the area to repair pumps as well. Eight repairmen have so far been trained and they have taken charge of about 440 handpump wells. The results of this experiment are quite satisfactory and four additional repairmen are presently being trained. The repairmen are requested to keep a record of the repairs they have done and report to the project at regular intervals so that statistics can be prepared and cost calculations made. User communities are expected to pay full costs for maintenance in the case of the repairmen, and the equivalent costs (i.e. subsidised) when repairs are carried out by a mobile maintenance unit.

Pumps and spareparts are still mainly procured by the project from abroad, but possibilities for local manufacture are being looked into and successfull cooperation in manufacturing the India MK II pumphead, rising main pipes and socketed stainless steel rods has already been established with the Western College of Arts and Supplied Sciences.

During the first implementation phase construction as well as maintenance of protected springs was almost totally handled by the project. During the second phase efforts have been made to transfer as much as possible of the work and the responsibility to the local communities. They are requested to form spring committees which are given the same tasks as the well committees.

The operation and maintenance of the piped schemes is the responsibility of the Ministry of Water Development (MoWD). To support the development of a more effective operation and maintenance system the project tries to give the operators of the schemes a training which is as comprehensive as possible. Preferable the operators should be involved already in the construction of the facilities and the installation of the equipment, or the rehabilitation as the case may be. At the completion of the scheme the operators are trained in the detailed operation and maintenance of the facilities on the basis of a "tailor-made" manual for each individual scheme. This manual is prepared by the project and complements the MoWD s standard manual which covers all general operation and maintenance aspects for various types of water supply systems and treatment plants. Support is also occasionally given after the handing over of the scheme in the form of transport assistance and/or procurement of spareparts.

3.5. Since the project has so far been going on for only a few years and the maintenance systems are presently being developed, there is too little reliable information on actual costs to base any estimates for the future on. Where piped schemes are concerned, estimates of the operation and maintenance costs of each individual scheme have to be prepared already at the planning stage, since these costs are an important factor when the feasibility of the schemes is considered. There are, however, only a few such estimates prepared as yet and since supporting data on actual costs are scarce, it is too early to draw any general conclusions from them.

3.6. So far there is no recovery of capital costs in connection with spring protection on handpump well construction. A system for the recovery of maintenance costs is being developed, as described earlier.

The question of cost recovery in connection with piped schemes in presently being debated in Kenya and a decision has apparently not yet been reached. In principle consumers are expected to pay for piped water, but there are many difficulties in collecting the charges and they are seldom high enough even in theory to recover operation and and maintenance costs, let alone the capital costs. As the recurrent budget funds are allocated centrally from MoWD headquarters, there is often no direct linkage between the water charges collected from the cosumers and recurrent budget allocations, and this complicates the situation further. These and the many other problems connected with cost recovery and various policy options are discussed at length in a report prepared by the MoWD with the assistance of SIDA through some Swedish consultantants in 1984, and a decision at the national level, based on this report is still awaited.

3.7. The water supply project does not include a sanitation component. Health education on a limited scale is given in connection with the construction of the wells at community level through the seminars for the well committees mentioned earlier. FINNIDA is, however, also supporting a Primary Health Care Project (PHCP) in the same area and this project includes as major components both sanitation and health education. These two projects are expected to complement and support each other to maximise the benefits of the

improved water supply. The PHCD only started in 1984 and the systems for sanitation improvement and health education are presently being developed. It is therefore too early to give any detailed information or figures that would be of statistical importance.

The activities in 1984-85 included refresher courses for Community Health Workers and health education given at health centres and public meetings (barazas) organized at community level. Different latrine components were developed and tested, as well as different superstructure solutions, and demonstration latrines were constructed at schools, markets churches and other public places as well as for some individual households. Local artisans were trained in construction technology. Alltogether 376 latrines were constructed.

3.8. A very limited waterpoint utilization study was carried out in 1984-85 covering 50 springs, 53 dug wells and 53 drilled wells. Each waterpoint was visited one day by an enumerator who remained at the site from 6 a.m. to 6 p.m. Each person who collected water from the waterpoint was counted and a record was made of: the amount of water collected, the number of visits made so far that day, the one-way walking distance from home to waterpoint and the number of people in the family.

The results of the study were not very encouraging. The mean per-capita daily consumption was very low, about half that commonly found in surveys of handpumps usage and only a quarter of the design consumption figure. The most obivious conclusion that can be drawn is that the waterpoints are very

much under utilised. The fact that the survey was carried out in the wet season supports the probability that alternative, unprotected and hence almost certainly heavily polluted water sources are being used for most purposes. In the dry season consumption would most likely increase somewhat. However, in Western Province, where water is available for much of the year, communities must understand the need for protected, unpolluted water supplies, if their use is to be assured and their construction justified. This underscores the essential role of health education in a project of this nature.

There may be also a further explanation for these results. There are some indications that the survey was poorly carried out. Sites were visited for one day only, so that the water use patterns may have been considerably modified by the presence of the enumerator (always a man) beside the pump.

A better planned and executed survey is expected to be carried out 1986-87.

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REPUBLIQUE FRANCAISE

MINISTERE DES RELATIONS EXTERIEURES

COOPERATION ET DEVELOPPEMENT

DIRECTION DES PROJETS DE DEVELOPPEMENT

MINISTERE DE L'AGRICULTURE
ECOLE NATIONALE DU GENIE RURAL,
DES EAUX ET DES FORETS

PROGRAMME SECTORIEL D'HYDRAULIQUE VILLAGEOISE

ELEMENTS D'INFORMATIONS ET PROPOSITIONS D'ORIENTATIONS

MARS 1986

AVANT-PROPOS

Un groupe consultatif "Maîtrise de l'Eau" s'est réuni en 1984 et 1985 sous la présidence de Monsieur Gilbert MANUELLAN, Ingénieur Général du GREF, le secrétariat étant assuré par l'ENGREF* avec la participation de représentants provenant notamment de :

- l'Administration (Ministères des Relations Extérieures, de l'Agriculture, de l'Environnement) ;
- d'organismes d'études et de recherches ;
- d'organisations non gouvernementales - ONG - ;
- d'experts qualifiés.

La liste des participants figure en annexe.

Le groupe a passé en revue un grand nombre de projets intéressant la maîtrise de l'eau sous ses différents aspects. En un premier temps, il s'est plus particulièrement penché sur les questions se rapportant à l'hydraulique villageoise. A cet égard, une documentation importante a été établie (cf. liste en annexe).

Cette note présente les résultats de cette analyse en faisant apparaître comment, dans le cadre d'un "Plan Sectoriel", des orientations stratégiques peuvent être retenues conformément à celles tracées par la Décennie Internationale de l'Eau Potable et de l'Assainissement ; puis, comment une coopération intéressant l'ensemble des opérateurs concernés doit être mise en oeuvre, avec la prise en considération de quelques options prioritaires.

C'est une étape dans l'élaboration d'une coopération concertée dans le domaine de l'hydraulique villageoise. Une actualisation est prévue à échéances périodiques en fonction des éléments nouveaux provenant de l'évaluation des actions engagées et d'un développement des échanges d'informations entre les principaux intéressés : bénéficiaires, opérateurs, organismes

* E.N.G.R.E.F., Ecole Nationale du Génie Rural des Eaux et des Forêts - Paris

d'études et de recherches, bailleurs de fonds.

Parallèlement, il est prévu de compléter ce travail en l'élargissant aux autres aspects de la "Maîtrise de l'Eau", notamment à la mobilisation et la gestion des ressources en eau et à l'irrigation.

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I - PROGRAMME SECTORIEL D'HYDRAULIQUE VILLAGEOISE

1.1 - LE PLAN SECTORIEL EAU

L'eau est une ressource rare ; c'est un élément essentiel dans la dynamique du développement, tant par la portée des problèmes que posent sa mobilisation et sa gestion que par le nombre et la variété des opérateurs privés, publics ou parapublics impliqués en coopération sur ce thème : usagers de l'eau et colllectivités, organismes d'aménagement, distributeurs d'eau, industriels et installateurs, organismes de formation et de recherche ... C'est ce qui a amené le Ministère des Relations Extérieures et le Ministère de l'Environnement à décider de l'élaboration d'un Plan Sectoriel Eau.

Dans l'esprit des plans sectoriels, le Plan Sectoriel Eau a pour but de traduire dans ce domaine les idées forces de la politique française de coopération et de développement : faciliter un développement plus autonome de nos partenaires en tenant compte des intérêts réciproques en présence. C'est un effort de cohérence et de définition de priorités.

Fondé sur un grand nombre d'informations et d'avis autorisés, il doit faciliter la concertation entre les bénéficiaires et les intervenants français dans ce secteur et se traduire finalement en projets élaborés suivant des orientations et des priorités retenues d'accord parties.

La difficulté essentielle du Plan Sectoriel Eau tient à ce qu'il touche les domaines du développement aussi bien urbains que ruraux, qu'il prend en compte les problèmes de mobilisation des ressources comme ceux de lutte contre les pollutions et qu'il n'a en fait, comme élément unificateur que le concept un peu théorique de gestion optimale des ressources. A l'inverse, un plan sectoriel agricole, un plan sectoriel habitat et urbanisme, un plan sectoriel santé, chacun avec sa logique propre, ont d'évidentes liaisons avec le secteur eau. Etablir des priorités en prenant l'eau comme un élément indépendant est donc un exercice difficile et quelque peu artificiel et il importe plutôt de délimiter à l'intérieur du secteur eau des sous-secteurs relativement homogènes sur le plan des objectifs, des orientations stratégiques et des problèmes à résoudre, sous-secteurs pour lesquels puisse être réalisé à partir

de l'expérience acquise, cet effort de mise en cohérence et de définition des priorités.

C'est cette démarche qui a amené à définir un programme sectoriel "Hydraulique Villageoise" objet de la présente note, en harmonie en particulier avec les recommandations du Comité d'Aide au Développement (CAD) de l'OCDE (1) et avec les stratégies d'autres pays européens (cf. par exemple le rapport sectoriel de la République Fédérale Allemande).

1.2 - L'HYDRAULIQUE VILLAGEOISE

Cette expression couramment employée désigne un sous-secteur qui se caractérise à la fois par les besoins auxquels il veut répondre (l'approvisionnement en eau potable et l'assainissement pour les populations rurales) et par le mode de mobilisation de la ressource en eau (essentiellement par des ouvrages indépendants, captages,forages ou puits, conçus au départ sans réseau de distribution important). Alors que près des deux tiers de la population rurale mondiale ne bénéficie pas d'eau potable, l'hydraulique villageoise représente une priorité au niveau international, dans le cadre de la Décennie (1980/1990) del'eau potable et de l'assainissement et un élément important de la coopération française.

Les contributions de l'aide publique française s'élèvent à près de 300 Millions de Francs par an. Elles recouvrent des actions multiformes : participation aux institutions internationales, formation (100 bourses par an), recherches, assistance technique (50 coopérants affectés à des programmes "Eau Potable et Assainissement"), ou aide aux projets. Ces actions permettent, outre les améliorations et le renforcement d'installations, la réalisation annuelle de quelque 3.000 points d'eau nouveaux, pérennes et fournissant une eau de qualité.

Avant de préciser les orientations stratégiques de la coopération française dans ce secteur, il convient d'indiquer que ces orientations peuvent éventuellement être étendues :

- à des espaces périurbains : l'alimentation en eau de quartiers périurbains à partir de points d'eau décentralisés, apparaît en effet souvent comme une solution adaptée. Des problèmes spécifiques d'assainissement dans ce cas sont à étudier.

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(1) Recommandations approuvées par le Comité lors de sa réunion du 12 Septembre 1985

- à une production agricole de jardinage et de petit maraîchage, en particulier dans le cas de cultures de contre-saison ainsi qu'au développement d'activités artisanales telles que briquetterie, poterie, etc..., dans la mesure où il reste un excédent de ressources en eau disponible après satisfaction des besoins prioritaires en eau potable.
- à une contribution à la lutte contre la désertification par l'arrosage de jeunes boisements villageois, qui peuvent servir d'ombrages et de brise-vents, fournir des fourrages d'appoint et augmenter la production de bois d'oeuvre et de feu.

A l'exception de l'abreuvement du bétail de case et des petits élévagesvillageois, le domaine de l'hydraulique villageoise est donc distinct de celui de l'hydraulique pastorale.

L'hydraulique villageoise ne recouvre pas un ensemble figé, mais un processus complexe d'actions, qui se développent avec l'évolution de la demande des populations rurales et les importants progrès techniques qui ne cessent de survenir.

Les projets d'hydraulique villageoise doivent respecter les particularités de chaque région considérée (conditions hydrogéologiques, climat, population, habitat, économie, mode de vie). Les conditions d'expression de la demande, les types d'ouvrages souhaitables, leur implantation, voire leur mode d'entretien, peuvent être très différents suivant les régions considérées.

Sur le plan technique, à une première génération d'aménagements de puits traditionnels peu fiables en période sèche et fournissant généralement une eau de qualité incertaine, s'est ainsi superposée, depuis 1975 environ, une deuxième génération fondée sur la réalisation de puits modernes et de forages qui permettent d'obtenir, à des profondeurs de quelques dizaines de mètres, dans des zones souvent réputées jusqu'à présent stériles,de 10 à 50 m3 par jour d'eau parfaitement potable, suffisants pour l'approvisionnement en eau d'un village avec exhaure à motricité humaine.

Depuis peu, on assiste à la progression d'une troisième génération, les ouvrages étant valorisés au maximum avec desserte des services publics, petite irrigation, renforcement des réseaux peri-urbains, etc... grâce à des équipements appropriés ; une garantie de fonctionnement est alors requise,

notamment pour l'exhaure.

Mais surtout à une logique technique d'équipement s'est substituée une logique plus large de participation villageoise et de responsabilisation des bénéficiaires.

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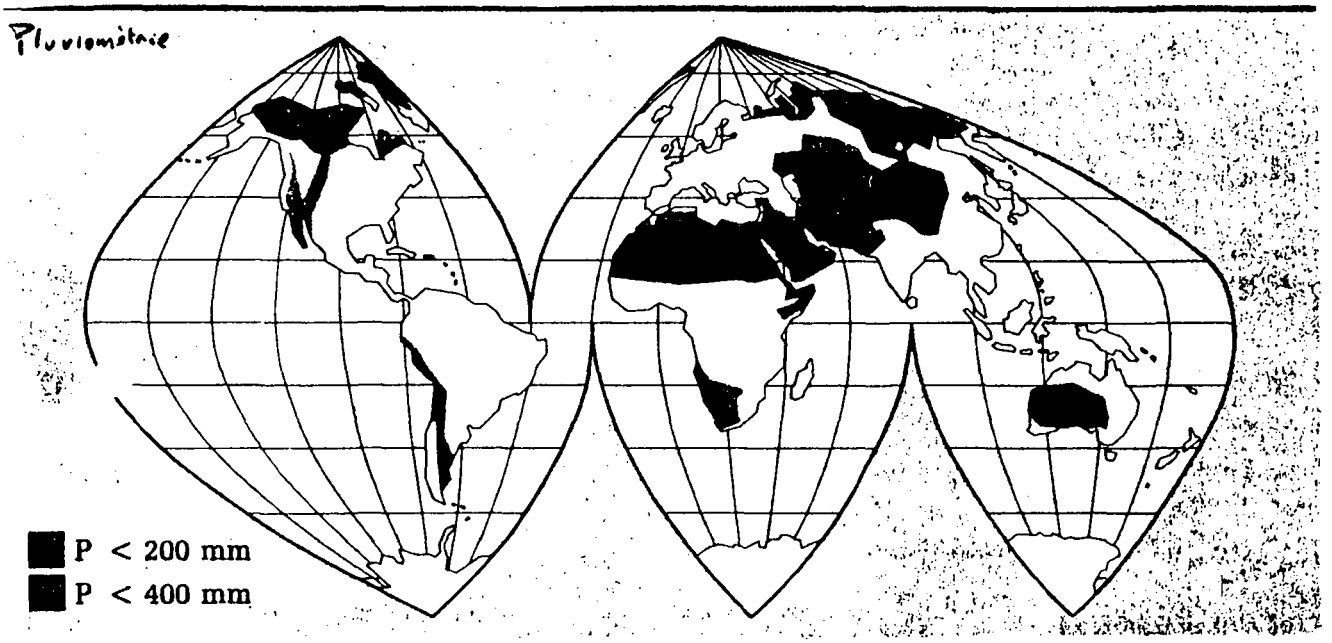
Cette évolution se traduisant par une adaptation réciproque des techniques aux besoins reflète l'importance que les populations rurales et péri-urbaines concernées attachent à l'hydraulique villageoise, dont les programmes font l'objet de financements internationaux de plus en plus substantiels.



D'ores et déjà, on peut affirmer que, là où il pleut plus de 300 mm d'eau par an, il est généralement possible de trouver de l'eau dans les conditions suivantes :

- en milieu de socle cristallin, jusqu'à ces dernières années très dépourvu de points d'eau fiables, à raison de quelques dizaines de mètres cubes par jour à une profondeur de 30 à 50 mètres avec une probabilité de 60 à 80 % de succès pour un coût unitaire moyen de l'ouvrage équipé de pompes à motricité humaine de l'ordre de 100.000 F.

- en milieu sédimentaire récent, type Continental terminal ou intercalaire, des volumes très importants pouvant atteindre plusieurs centaines, voire milliers de mètres cubes par jour, à des profondeurs variables, mais parfois faibles, grâce à des remontées des nappes, pour un coût moyen de 100.000 F à 200.000 F.

Zones de socle rocheux (grisé) et grands bassins sédimentaires (blanc)

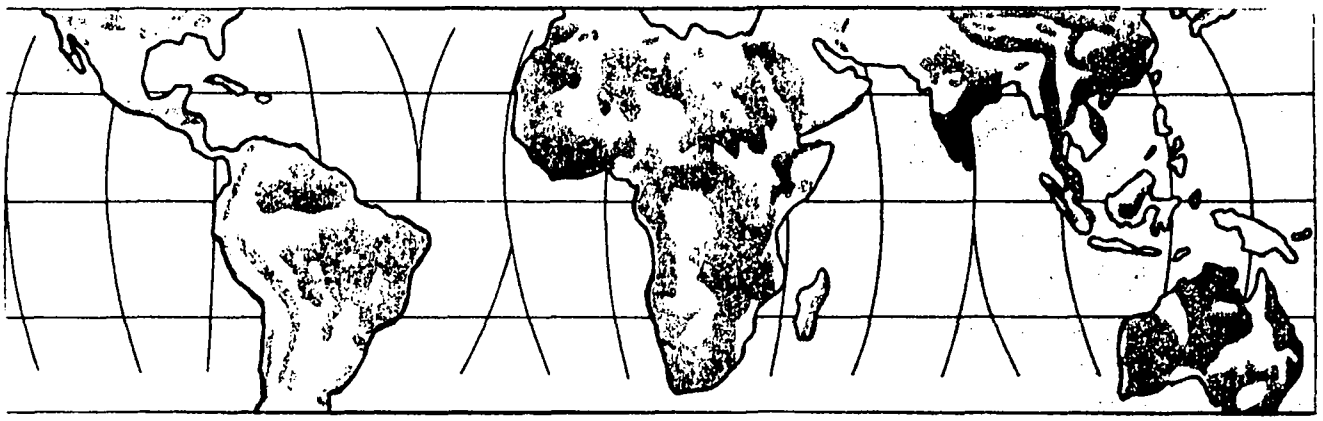
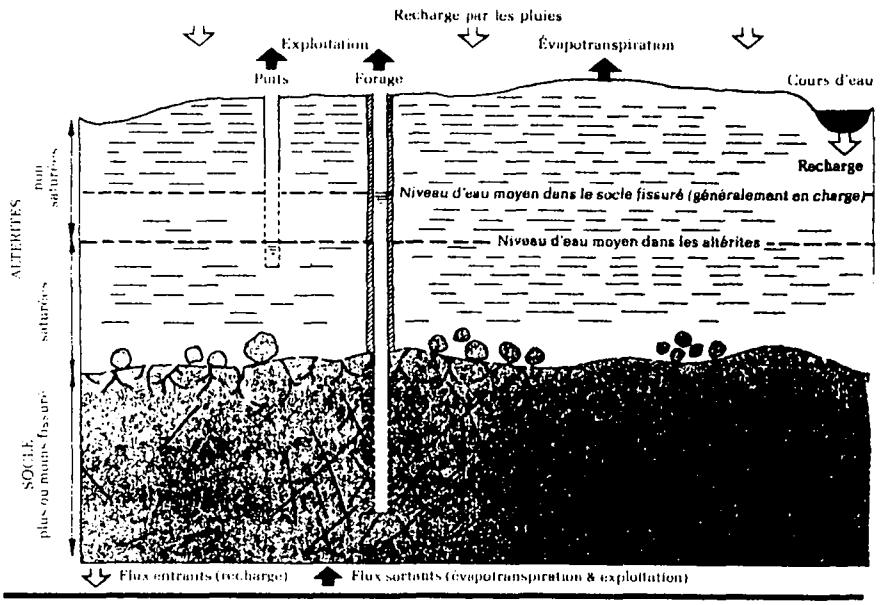


Schéma hydraulique du milieu fissuré sous couverture altérée



II - LES ORIENTATIONS PRIORITAIRES

2.1 - DES PRINCIPES D'ACTIONS

Les expériences, réussites et échecs, dans le domaine de l'hydraulique villageoise, amènent à définir un ensemble de critères qui conditionnent le succès des actions et sur lesquels existe maintenant un consensus au sein de nombreuses instances (cf. par exemple : recommandations du Conseil des Ministres SCP.CEE de Nairobi, 1980 ou recommandations du Comité d'Aide au Développement de l'OCDE, 1985).

* La participation des populations : C'est un facteur essentiel et la plupart des échecs portent sur des installations qui ne fonctionnent pas ensuite de façon autonome, parfois même ne sont pas utilisées du tout, en raison du manque d'intérêt et de motivation des personnes concernées. La participation des populations, ou plus exactement la maîtrise du projet par les populations, impliquant en particulier la prise en charge organisationnelle, technique et financière de la gestion, s'avère une condition indispensable de réussite. Elle inclut notamment, et c'est une des recommandations essentielles du CAD, que l'entretien des ouvrages soit pris en charge par les populations, ce qui suppose :

. qu'un statut juridique approprié des ouvrages soit établi, spécifiant la dévolution de leur exploitation aux collectivités locales bénéficiaires ;

. que les coûts de fonctionnement soient compatibles avec les ressources financières des villageois. L'utilisation de l'eau pour une petite irrigation ou des activités artisanales peut améliorer considérablement la situation.

L'association de la population au projet doit se situer le plus en amont possible, dès la conception et durant toute la réalisation, et elle entraîne des conséquences sur les choix techniques et la nature du projet (cf. ci-après § 2).

* La valorisation des acquis : Que ce soit dans l'optique de la minimisation des coûts ou de la bonne utilisation des équipements en place, il importe, plutôt que de réaliser de nouveaux équipements, de valoriser ceux

qui existent par des équipements complémentaires ou par des actions de formation et de suivi.

* L'utilisation de techniques appropriées : Compte-tenu de l'élément essentiel que représente la maîtrise du projet par les populations, il importe de choisir des techniques et des montages financiers adaptés à la situation locale, mais aussi compatibles à la fois avec les compétences et les habitudes de la population et avec les coûts de maintenance et d'entretien qu'ils peuvent réellement supporter.

* L'intégration au sein d'un plan de développement global : L'objectif d'un programme d'hydraulique villageoise est d'abord d'améliorer les conditions de vie des villageois et, partant, de favoriser un développement local à partir des villages. L'eau potable est l'un des éléments de ce développement. Il convient donc de ne lancer un programme d'hydraulique villageoise que si les conditions sont réunies pour que le programme favorise réellement le développement local.

L'application concrète de ces critères implique certaines approches, qui peuvent être précisées, en particulier sur le plan technique et sur le plan du développement villageois.

2.2 - UNE APPROCHE DES PROBLEMES TECHNIQUES

Il existe des techniques récentes et bien adaptées (forages au marteau fond de trou, pompes à motricité humaine ...). L'application des critères précédents entraîne cependant certaines conséquences :

* Sur les choix techniques : en particulier, mais pas seulement, sur le choix entre puits et forages, quand l'un et l'autre sont possibles. Les choix ont des répercussions sur le coût et la rapidité de l'exécution des travaux, sur les modes d'utilisation et d'entretien. Ils ne peuvent se faire qu'avec la population concernée et doivent être un des premiers moyens pour la mobiliser. Cela implique une bonne présentation des avantages et inconvénients de chaque solution et la mise en place, pour la solution retenue, des moyens de formation et d'organisation nécessaires (gestionnaire de village, collecte des financements, réseaux d'artisans réparateurs, approvisionnement en pièces détachées). Le financement de ces moyens (formation et organisation) doit être prévu dès le début de la réalisation des travaux.

* Sur la normalisation : Les problèmes de formation et d'approvisionnement en pièces détachées impliquent qu'on évite au maximum de faire varier le matériel au seul gré du donateur. La France a déjà agi dans ce sens ; il importe que, dans l'intérêt de ses propres industriels, elle participe au mieux aux programmes multilatéraux de mise au point de matériel, comme c'est le cas actuellement dans le cadre du programme PNUD/Banque Mondiale de la Décennie de l'Eau.

Il est souhaitable que dans ce cadre, la France défende des systèmes de normes adaptés aux besoins et non à des standards de pays développés. Une attention spéciale doit être portée à la mise en place d'un réseau de distribution des pièces d'usure et au transfert progressif,sur place, de la fabrication des matériels.

* Sur la recherche et l'expérimentation : Quelle que soit l'adaptation des matériels actuels, tous les progrès en matière de diminution des coûts, de fiabilité, ou de simplicité doivent être encouragés. L'hydraulique villageoise ne se développera à l'échelle nécessaire que lorsque le coût du matériel - et pas seulement de la maintenance - sera à la portée des communautés villageoises les moins riches. Ceci implique à la fois des programmes de recherche, d'expérimentation et de transfert technologique, avec le concours d'organismes régionaux tels que le CIEH* et des partenaires industriels intéressés, en France et dans les pays d'accueil.

2.3 - UNE APPROCHE DU DEVELOPPEMENT VILLAGEOIS

Un programme d'hydraulique villageoise doit avoir plusieurs objectifs, plus ou moins immédiatement perçus par la population.

* L'assurance d'un approvisionnement en eau potable plus facile et plus régulier. C'est l'objectif immédiatement perceptible, particulièrement par les femmes, responsables de cet approvisionnement. Le temps ainsi gagné permet la création de nouvelles activités.

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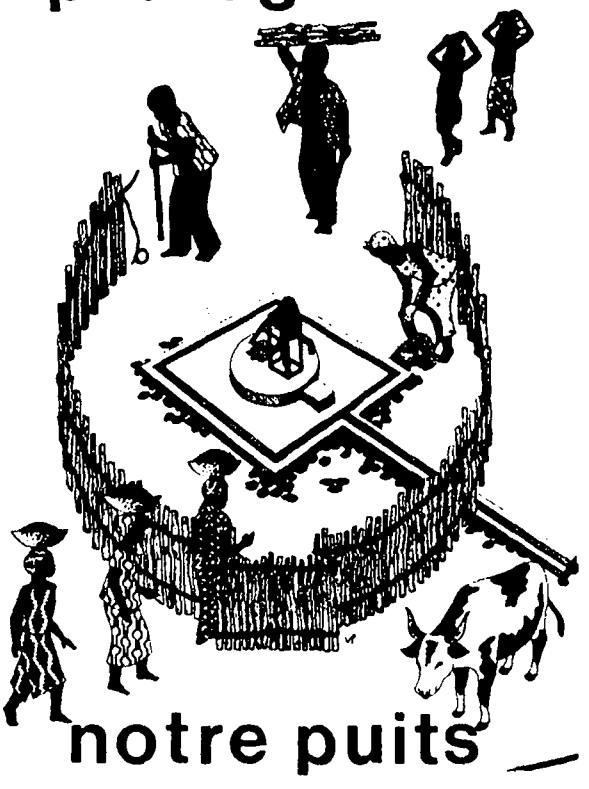
* CIEH : Comité Interafricain d'Etudes Hydrauliques - Ouagadougou.

Selon l'OMS, plus de 50 % des maladies sont d'origine hydrique et l'usage de l'eau de surface en est la cause principale



* L'amélioration des conditions d'hygiène et de santé. Cet objectif n'est pas forcément perceptible à court terme. Il n'en est pas moins fondamental. Il est de toutes façons conditionné par des actions complémentaires pour maintenir la potabilité de l'eau au cours des opérations d'exhaure, de transport, de stockage et des manipulations domestiques de l'eau, et doit s'inscrire dans un plan global d'améliorations sanitaires (éducation sanitaire, soins de santé primaires).

* L'amélioration des conditions économiques, en particulier par la production, parallèlement à la fourniture d'eau potable, de cultures de contre-saison, susceptibles d'améliorer le revenu ou la ration alimentaire des villageois.

Ce type d'actions relativement récent est limité et s'est développé spontanément dans certains pays tels que le Niger, le Sénégal, le Burkina Faso ...

* La participation à un processus de développement villageois. L'apport d'eau n'apparaît ici que comme un élément parmi d'autres, mais la mise en place effective de procédures précises et de structures telles que les "Comités Villageois" (1) favorisent le processus de développement.

(1) Comités Villageois composés en particulier de femmes des villages et chargés de la gestion des programmes d'hydraulique et d'amélioration sanitaire.

III - LA MISE EN OEUVRE DE LA COOPERATION

3.1 - LES ORIENTATIONS STRUCTURELLES

Le volume actuel de l'Aide publique française en matière d'hydraulique villageoise est de l'ordre de 300 M.F. par an et ne devrait pas diminuer dans l'avenir.

La nature des interventions va néanmoins connaître une évolution importante en particulier pour répondre aux orientations précédentes.

* L'association des programmes d'hydraulique villageoise à des programmes de soins de santé primaires, avec les conséquences qui en découlent en termes financiers et en termes d'intervenants.

* Une contribution substantielle des collectivités territoriales françaises, notamment à travers le programme "Solidarité Eau", dans lequel se sont engagés les gouvernements de la Communauté Européenne, permettant ainsi, dans le cadre des politiques nationales de l'eau des Etats et compte-tenu des projets de l'Aide publique française, une application rapide et efficace de la "Coopération décentralisée", avec toutes les garanties requises.

* Une bonne concertation des intervenants concernés afin d'éviter les incohérences des programmations souvent déplorées par le passé entre petits programmes de type ONG et programmes à grande échelle comme celui du Conseil de l'Entente (5.000 points d'eau en 8 ans). Les différents moyens : FAC, prêts de la CCCE, assistance technique, programmes de formation, doivent être mis en oeuvre d'une façon coordonnée et complémentaire, compte-tenu de la spécificité de chacun. La participation de financements publics doit être soumise à cette condition de cohérence.

* Une insertion plus poussée dans les projets des opérateurs implantés sur le terrain : cadres nationaux, coopérants, bureaux d'études, instituts de formation et de recherche, entreprises, fabricants et fournisseurs de matériel, etc...

3.2 - LA NATURE DES ACTIONS

La mise en oeuvre du présent programme sectoriel implique en complément des réalisations d'ouvrages eux-mêmes, des actions dans les domaines suivants :

a) Information et formation au niveau de la conception, de la réalisation et du suivi des aménagements (forages, puits, fourniture de pompes, organisation de la gestion et de la maintenance) pour les différents agents concernés : cadres administratifs, techniciens, agents sanitaires, responsables villageois, etc....

b) Evaluation des résultats obtenus, en particulier en ce qui concerne la capacité contributive des populations et l'évolution des maladies d'origine hydrique.

c) Amélioration de la programmation des équipements en fonction des besoins exprimés et des ouvrages existants, suivant des inventaires et fichiers de données informatisés susceptibles d'être actualisés chaque année.

d) Promotion d'artisans et d'entrepreneurs locaux capables de poursuivre les programmes et d'assurer la maintenance des ouvrages.

e) Expérimentation pour la mise au point de matériel d'exhaure fiable, les essais de techniques améliorées, le transfert de technologies, etc... (pour lesquels le rôle du CIEH déjà cité devra être amplifié), les actions d'accompagnement dans le domaine de la santé.

Une réflexion est en cours sur l'importance relative à accorder à ces différents éléments et en particulier sur le rôle de la puissance publique française en la matière.

On peut distinguer :

. les programmes généraux
. les programmes nationaux
. les programmes localisés.

Le schéma proposé pour la politique française de coopération est le suivant, en termes de priorités et de moyens :

1) Programmes généraux

a) Formation de cadres susceptibles de développer des programmes d'hydraulique villageoise en liaison avec des organismes régionaux du type CIEH et des organismes français comme le CEFIGRE ou la Fondation de l'Eau (+ Services de Santé).

Action prioritaire sur financement d'intérêt général de type FAC.

b) Expérimentations et essais de techniques améliorées en liaison avec les organismes internationaux (PNUD, ...).

Sur financements publics de type FAC ou ANVAR* avec des industriels afin de parvenir à des normalisations et labels de qualité.

c) Inventaire, recherche et suivi des ressources en eau.
Ce type de programmes n'est pas spécifique d'un plan sectoriel hydraulique villageoise, dans la mesure où les seuls besoins d'eau domestique ne sont pas en général susceptibles de rompre l'équilibre des ressources. C'est, en particulier, lorsqu'il y a utilisation agricole des eaux qu'il faut l'envisager.

Le financement de ces programmes pourrait relever du FAC.

2) Programmes nationaux

Ce sont des programmes importants de plusieurs centaines, voire milliers d'ouvrages, devant assurer une couverture d'ensemble des besoins sur une région ; ils sont décidés au niveau ministériel et justiciables de financements de l'Aide publique, type FAC et CCCE.

Ils associent nécessairement l'investissement à l'organisation de la gestion et de la maintenance dans le cadre d'un programme sanitaire et, si possible, d'un programme plus général de développement villageois.

3) Programmes localisés

Ces programmes localisés, complètent les programmes nationaux. Ils relèvent d'abord de financements locaux, associés par exemple à des financements de collectivités territoriales françaises ou des financements ONG.

La participation directe de crédits de l'Etat français peut être de deux ordres :

* ANVAR : Agence Nationale pour la Valorisation de la Recherche

- assistance technique : mise à disposition de coopérants pour assurer sur place l'animation et la formation, dans la mesure où il s'agit de projets pilotes.
- FAC pour des actions d'accompagnement bien définies telles que : formation et appui à la gestion et à la maintenance, mise en place d'ateliers décentralisés de forage ou de maintenance avec une dimension transfert de technologie, actions d'accompagnement dans le domaine de la santé, expérimentation agronomique.

4) Les négociations avec nos partenaires

La réflexion française que constituent les plans et programmes sectoriels ne représente qu'une position dans la négociation avec nos partenaires. C'est cette négociation qui permet de définir réellement les orientations de notre coopération devant déboucher sur :

* Les points d'application réels des programmes avec un éventuel infléchissement vers des projets péri-urbains, l'importance à accorder à la valorisation d'équipements existants plutôt qu'à des nouveaux projets ainsi que le poids relatif des différents types de programmes.

* Les mesures à mettre en oeuvre pour la réussite des programmes : conditions juridiques d'attribution des ouvrages, organisation des circuits d'approvisionnement des transferts de technologie, ...

Il importe en particulier que les subventions du FAC soient soumises à des conditionnalités plus précises.

IV - QUELQUES OPTIONS IMMEDIATES

Dès aujourd'hui, compte-tenu des résultats obtenus et des concertations entre partenaires, les orientations majeures suivantes seront appliquées pour la poursuite des projets auxquels contribue l'aide française :

- La prise en charge par les bénéficiaires (villageois ou habitants du quartier) du fonctionnement de la maintenance des ouvrages, ce qui implique une participation financière compatible avec les ressources des ménages et la promotion d'artisans locaux.
- Une garantie de la maintenance des appareils d'exhaure en veillant à la qualité technique du matériel, à la mise en place du réseau d'après-ventes et à la formation des villageois.
- Un suivi en quantité et en qualité des eaux, avec la généralisation de mesures faites par l'exploitant, sans négliger de porter l'attention sur les problèmes plus difficiles du contrôle nécessaire de la qualité bactériologique.
- La valorisation des eaux au profit des usagers, notamment par la petite irrigation.
- La mise à niveau des équipements existants avant l'engagement de nouveaux programmes.

Dans l'immédiat, les crédits publics de l'aide française favoriseraient donc, conformément aux recommandations de la Décennie de l'Eau, l'amélioration de la valorisation des aménagements existants au profit des usagers, et la création d'équipements nouveaux dont la garantie de fonctionnement soit parfaitement assurée.

Parallèlement une attention particulière sera apportée à la promotion d'initiatives et d'actions décentralisées, dans l'esprit qui a présidé à l'élaboration du Programme Solidarité-eau déjà cité.

ANNEXE 1

PARTICIPANTS AU GROUPE "MAITRISE DE L'EAU EN HYDRAULIQUE VILLAGEOISE"

Le groupe s'est réuni les 18/06/84, 20/09/84 et 24/06/85. Chacun de ses membres a ensuite été consulté, avant l'élaboration de la synthèse définitive.

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. M. SARNIGUEL	SEDES
. M. SERRES	BURGEAP
. M. VAUBOURG	BRGM
. M. VERZAT	SOGREAH

ANNEXE 2

LES OUVRAGES AYANT SERVI DE SUPPORT A LA REFLEXION DU GROUPE :

MAITRISE DE L'EAU EN HYDRAULIQUE VILLAGEOISE

- Méthodes d'étude et de recherche de l'eau souterraine des roches cristallines de l'Afrique de l'Ouest -
  C.I.E.H. - Géohydraulique - L.C.H.F. - 2 volumes 1978 et 1979.
- Hydraulique villageoise et développement rural dans le Sahel - R. HLAVEK - CILSS-OCDE-B.O.A.D. - Novembre 1981.
- Projet Hydraulique villageoise Yatanga - Comoe - Assistance technique - BURGEAP - Sept. 1983.
- Méthodes de recherche des eaux souterraines - CATEES - Ouagadougou.
  PRUDHOMME - Géohydraulique - Octobre 1983.
- Eau et problèmes de santé au Sahel
  Dr. L. MONJOUR.
- Gestion des aquifères exploités dans le cadre de l'hydraulique villageoise - J.J. COLLIN - B.R.G.M. - Mars 1985.
- Manuel de formation des formateurs villageois - CIEH - Géohydraulique - CINAM - J.L. HENRY - Janvier 1984.
- Evaluation de la ressource en eaux dans les milieux fissurés sous climats arides et semi-arides. T. POINTET - B.R.G.M.
- Mise en oeuvre d'un programme de solidarité entre les pays européens de la CEE et les pays du Sud : solidarité-eau.
  (Ministère de l'Environnement) - Septembre 1984.
- De l'eau potable pour tous les villages d'Afrique.
  J. LEMOINE-BURGEAP - 1984.
- Champ d'action de l'hydraulique villageoise.
  J. DERCLAYE-CINAM - Septembre 1984.
- Valorisation de l'hydraulique villageoise par une utilisation diversifiée de la ressource en eau. BRGM-SATEC Développement - Octobre 1984.

- Compte-rendu de la réunion de Grigny - Femmes et développement du 23/10/84.

- Plans et programmes sectoriels. Objectifs et schéma général. MRE-DPR-SED - Septembre 1984.

- Les principales contributions de l'aide française au programme d'appui à l'eau potable. Eléments de politique française de coopération française dans le domaine de l'eau. D. PETER.
MRE-DPR - Octobre 1984.

- Projet étude technique et socio-économique des possibilités de mise en valeur des aquifères du socle pour l'irrigation villageoise - Analyse de l'expérience acquise en Inde et de ses possibilités d'application en Afrique.
BRGM - Octobre 1984.

- Elaboration d'un dossier type d'hydraulique villageoise.
CIEH - CIEPAC - G.T.Z. - Novembre 1984.

- Contribution des Organisations Non Gouvernementales - Novembre 1984
J.M. DOUCET - IRAM
J. BRISSON - CIEPAC
N. CAMPHUIS - GRET
L. CHABERT - Eau vive

- Participation des populations à la gestion des projets d'hydraulique villageoise.
BEAULIER - BDPA - Mars 1985.

- Définition de l'hydraulique villageoise . Le champ étudié. Note de M. BERGER - Géohydraulique - Mars 1985.

- Communication présentée au : Forum Eau et Développement,
par le Docteur Tonio AMAT - CINAM - 17 Avril 1985.

- Alimentation en eau des collectivités rurales de la zone intertropicale - BRGM - Avril 1985.

- Gestion et maintenance des points d'eau en hydraulique villageoise.
F. CONAC (CNRS) - Mai 1985.

- Insertion sociale des points d'eau en hydraulique villageoise : juin 1985
et
- Stratégie de la maintenance des ouvrages d'hydraulique villageoise en République Populaire du Bénin - Décembre 1985,
par J. ACBOTON - J.L. HENRY - M. HAUBERT.

- Maintenance des équipements hydrauliques en Afrique : communication du CIEPA au treizième conseil des Ministres du 5 au 13/11/85 au CIEH à Ouagadougou.
- Stratégie du développement du recours aux eaux souterraines pour l'irrigation en Afrique sub-saharienne. J.J. COLLIN - BRGM - Janvier 1986.
- Comprendre les enjeux de la Décennie de l'eau. D. DESJEUX - Ecole Supérieure d'Agriculture d'Angers.
- Education et santé : un exemple de formation. T. AMAT et A. GIRARD
- Les maladies de l'eau. J.F. DESJEUX - INSERM.
- Les programmes d'hydraulique villageoise au Sahel : un cas d'intervention dans les sociétés paysannes. P. PARIS -GRET.
- L'eau, élément de survie ou facteur de développement ... l'indispensable intégration des stratégies Eau aux politiques locales de développement - A.F.V.P..
- La convention de Lomé III et l'environnement. Ministère de l'Environnement - Mission Environnement-Développement.

Bundesministerium für wirtschaftliche Zusammenarbeit
BMZ

Ministère fédéral de la coopération économique
Republique fédérale d'Allemagne

APPROVISIONNEMENT EN EAU ET ASSAINISSEMENT DANS LES PAYS EN VOIE DE DEVELOPPEMENT

"Rapport sectoriel"

Principes de planification et de réalisation de projets de coopération bilatérale de la République fédérale d'Allemagne dans le secteur de l'approvisionnement en eau potable et de l'assainissement

Bonn, le 22 mai 1984

TABLE DES MATIERES

I. REMARQUES PRELIMINAIRES

Ce rapport sectoriel remplace celui intitulé "Approvisionnement communal en eau dans les pays du tiers monde", en vigueur depuis mai 1974. Il s'inspire notamment de l'expérience acquise dans le cadre des projets mis en oeuvre au cours des dix dernières années et inclut désormais le domaine de l'approvisionnement en eau des zones rurales et celui de l'assainissement.

Une série d'évaluations effectuées au cours des dernières années a permis d'identifier les goulots d'étranglement et les points faibles en matière de planification, de réalisation et de fonctionnement des projets. Compte tenu des résultats de ces évaluations ainsi que des expériences d'autres organismes donateurs, des orientations et recommandations ont donc été élaborées pour les futurs projets de coopération dans le secteur "Approvisionnement en eau potable et assainissement"[1].

Le nouveau rapport sectoriel s'attache à situer l'approvisionnement en eau et l'assainissement dans le cadre plus général de la politique de développement et définit les principaux objectifs pour le choix et la mise au point des projets.

Ce document de référence sera complété par une liste de critères d'appréciation des projets (destinée essentiellement aux bureaux régionaux du BMZ) ainsi que par des instructions détaillées intitulées "Lignes d'action pour mesures d'approvisionnement en eau potable et d'assainissement dans les pays en voie de développement". Ces dernières s'inspireront des principes de ce rapport et comprendront un catalogue concret pour la collecte et

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1) "L'assainissement" regroupe toutes les mesures d'évacuation des eaux usées, matières fécales et déchets, ainsi que d'éducation sanitaire des populations.

l'appréciation des données concernant les projets[2)]. Elles permettront de systématiser et de simplifier la planification et l'appréciation des projets, notamment pour les ingénieurs-conseils et les maîtres d'oeuvre dans les pays en voie de développement.

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2) La liste des critères et les lignes d'action seront mises au point dans les prochains mois par le BMZ, la GTZ et la KfW sur la base des spécifications du rapport sectoriel. Dans le domaine de la coopération financière, la KfW adaptera son guide "Eau potable" au contenu du rapport sectoriel et aux recommandations pratiques, en y ajoutant le domaine de l'assainissement.

II. ROLE DU SECTEUR "APPROVISIONNEMENT EN EAU POTABLE ET ASSAINISSEMENT" DANS LE PROCESSUS DE DEVELOPPEMENT

Disposer d'eau potable saine[3)] est l'un des besoins essentiels de l'homme. Pour des raisons sanitaires il importe de toujours prendre en considération, lors de l'étude de projets d'approvisionnement en eau, non seulement l'évaluation et la préservation des ressources en eau, mais aussi l'évacuation des eaux usées résultant de l'utilisation de ces ressources ainsi que celle des matières fécales et des déchets et, si nécessaire, d'intégrer ces aspects aux projets.

Le gouvernement fédéral allemand a pour objectif général la satisfaction des besoins essentiels des populations (nourriture, eau potable, santé, logement, habillement, formation) et encourage donc les mesures prises à cet effet.

Particulièrement orientées vers les besoins essentiels, les actions dans le domaine de l'approvisionnement en eau et de l'assainissement se sont vu attribuer une importance particulière en tant que facteur de développement économique et social et en raison de la poussée démographique croissante dans les pays en voie de développement. Du fait des interactions évidentes entre les conditions naturelles d'environnement et le comportement de la population, le mode de vie traditionnel de cette dernière ainsi que ses activités économiques étaient étroitement tributaires des ressources en eau disponibles au niveau local et régional. Par suite des modifications profondes de la structure socio-économique des pays en voie de développement, qu'il s'agisse de modifications volontaires (colonisation, monoculture, industrialisation, etc.) ou d'effets secondaires (croissance de la population, urbanisation, ingérence dans l'environnement, raréfaction des ressources, modification des structures politiques,

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3) "Safer water supply" (World Health Statistical Report, 1976, volume 29, X, p. 546). Des directives en matière de "safe water" figurent dans le volume I du "WHO Guidelines for Drinking Water Quality", OMS, Genève, 1983 (EFP/82.39).

etc.), des situations de pénurie, autrefois de durée et d'étendue limitées, se sont peu à peu transformées en symptômes chroniques à l'échelle mondiale. L'approvisionnement en eau potable et les mesures d'assainissement jouent de ce fait un rôle clé de plus en plus évident pour assurer la capacité de survie des agglomérations urbaines et des zones rurales.

Bien que comptant parmi les besoins essentiels des êtres humains et bien qu'ayant un impact direct sur leur santé et leur productivité, l'approvisionnement en eau et notamment les mesures complémentaires d'assainissement ne se sont pas vu accorder par le passé, dans de nombreux pays du tiers monde, la place qu'elles méritent dans le processus de développement. D'après des estimations de l'Organisation mondiale de la santé (OMS), seulement

73 % de la population urbaine et seulement
32 % de la population rurale

avaient accès, en 1981, à de l'eau potable de qualité acceptable; de plus, seulement

53 % de la population urbaine et seulement
15 % de la population rurale

des pays en voie de développement disposaient d'installations satisfaisantes d'évacuation des matières fécales. Ces chiffres sont considérés par certains spécialistes comme étant même trop optimistes.

Les dangers allant fondamentalement de pair avec une eau potable de qualité douteuse et des équipements sanitaires déficients se traduisent souvent par des conditions de vie insupportables, notamment dans les zones urbaines à forte densité de population.

Cette situation extrêmement préoccupante se caractérise en général par les états de faits suivants :

- Etant donné qu'une partie seulement de la population des pays en voie de développement est approvisionnée en eau potable de qualité acceptable, le reste de la population doit utiliser comme eau potable une eau impropre, souvent

fortement souillée et contaminée, d'où des dangers et des dommages considérables pour la santé, dont la présence passe souvent inaperçue, dont les effets sont sous-estimés ou dont les causes sont mal interprétées.

- Les centres de villes et les zones résidentielles les plus appréciées sont en général approvisionnés en eau - même si la qualité et la quantité sont souvent insuffisantes - par des systèmes d'approvisionnement centraux. Ces systèmes ont été construits ou agrandis au cours des deux dernières décennies et, dans beaucoup de cas, avec une aide extérieure. Par contre, les zones urbaines à problèmes ainsi que les zones rurales n'ont pas trouvé, la plupart du temps, l'appui nécessaire au développement de leur approvisionnement en eau potable et encore moins à la promotion des mesures d'assainissement.

- Les dangers que présente pour la santé de larges couches de population l'absence de mesures d'hygiène complémentaires (assainissement; éducation sanitaire) ne sont généralement perceptibles qu'au bout d'un certain temps après l'amélioration de l'approvisionnement en eau. Leurs répercussions souvent catastrophiques sont encore largement sous-estimées à l'heure actuelle, tant par les intéressés eux-mêmes que par les responsables. S'y ajoute le fait que la collaboration entre les autorités responsables et les services de santé n'est souvent pas coordonnée de manière suffisante et que la médecine curative se voit généralement accorder la préférence par rapport aux mesures préventives.

D'après les enquêtes de l'OMS, 80 % de l'ensemble des maladies observées dans les pays en voie de développement sont pourtant "liées à l'eau", une partie considérable étant imputable à l'insuffisance de l'approvisionnement en eau potable et des mesures d'assainissement ainsi qu'au manque d'éducation sanitaire.

III. OBJECTIFS ET POSSIBILITES DE LA "DECENNIE DE L'EAU"

Objectifs :

Compte tenu notamment des dangers que présente pour la santé l'insuffisance de l'approvisionnement en eau et de l'évacuation des eaux usées, les Nations Unies ont déclaré en 1977 à Mar del Plata que la période 1981 à 1990 serait la "Décennie Internationale de l'Eau potable et de l'Assainissement", l'objectif étant d'assurer d'ici à 1990 pour plus de 2 milliards d'hommes dans le tiers monde

- un approvisionnement minimal en eau potable de qualité acceptable pour tous les habitants des villes comme des campagnes, et
- une amélioration des conditions d'hygiène grâce au développement de l'évacuation des eaux usées, des matières fécales et des déchets.

Autrement dit, un quart de la population urbaine et deux tiers de la population rurale de ces pays doivent encore être approvisionnés en eau potable; de même, environ la moitié de la population urbaine et près des trois quarts de la population rurale devront bénéficier d'une infrastructure minimum d'évacuation hygiénique des eaux usées, des matières fécales et des déchets. S'y ajoute la nécessité d'entretenir les équipements existants d'approvisionnement et d'assainissement et d'en remettre également un grand nombre en état.

Probabilité d'atteinte de ces objectifs

En supposant que l'on continue à utiliser des technologies conventionnelles mal adaptées, que l'on rencontre fréquemment dans les pays du tiers monde, la réalisation de cet objectif nécessiterait, selon des estimations de la Banque mondiale et de l'OMS, environ 500 à 600 milliards de $ US d'ici à 1990. Même en cas d'utilisation de technologies moins chères et bien adaptées,

environ 300 milliards de $ US seraient encore nécessaires, soit approximativement 30 milliards de $ US pour chaque année de cette décennie; sur cette somme, un minimum de 6 milliards de $ US devraient être fournis, selon l'OMS, par l'aide étrangère (en réalité celle-ci n'a atteint que 2,175 milliards de $ US en 1981).

Si, à l'avenir, des solutions adéquates ne sont pas choisies pour la planification et la réalisation de mesures d'approvisionnement en eau et d'assainissement, ces chiffres sous-entendent que, dans le meilleur des cas, l'objectif de la décennie ne pourra être atteint qu'à 30 % seulement. Et ce, sans tenir compte du fait qu'en réalité, une partie considérable des moyens mis en oeuvre dans ce secteur est déjà actuellement utilisée à des fins de réinvestissement, c'est-à-dire uniquement pour la sauvegarde de l'état actuel des équipements. En fait, on est maintenant plus éloigné des buts de la décennie qu'on ne l'était en 1977.

Aggravation de la situation :

Dans un grand nombre de pays en voie de développement, la situation en matière d'approvisionnement s'est encore dégradée du fait de

- l'augmentation de la population, alliée aux mouvements de concentration dans les agglomérations urbaines;

- l'augmentation inattendue de l'ensemble des besoins en eau, due en partie à de fortes pertes d'eau et au gaspillage, avec par conséquent la saturation prématurée des capacités des installations d'approvisionnement en eau existantes;

- la diminution parfois dramatique ou l'épuisement des ressources disponibles et adéquates pour l'approvisionnement en eau potable (dus, par exemple, à la désertification croissante et au déboisement, à la surexploitation, à la pollution et à l'absence de gestion des ressources en eau);

- la préférence accordée à des projets utilisant des technologies d'approvisionnement et d'assainissement chères et inadaptées, le manque d'entretien ou d'amélioration de l'exploitation des installations techniques ainsi que de mesures complémentaires pour la mise en place de structures efficaces de mise en oeuvre (y compris systèmes de tarification progressive basés sur les coûts réels, formation et rémunération de personnels qualifiés);

- la planification généralement isolée de projets ponctuels, sans les mesures complémentaires nécessaires et sans la participation de la population concernée (par exemple, approvisionnement en eau potable sans évacuation des eaux usées et des déchets; mesures d'approvisionnement et d'assainissement sans éducation en matière d'hygiène; construction de logements et implantation d'industries sans approvisionnement en eau ni mesures d'assainissement).

Conséquences :

Pour parvenir néanmoins à une amélioration significative de l'approvisionnement en eau et des conditions d'hygiène dans les pays en voie de développement, pour endiguer les risques de maladie et couvrir les besoins essentiels des populations cibles, les moyens de financement actuellement disponibles, dont une augmentation sensible est peu probable au cours des prochaines années, devront être mis en oeuvre avec plus d'efficacité. A cet égard, une plus grande participation de la population concernée est notamment nécessaire lors de la planification, de la construction, de l'exploitation et de l'entretien des installations.

Pour des raisons tant économiques que techniques, il importera d'utiliser des technologies aussi simples que possible, adaptées à la situation du pays ou de la région concernée, ainsi que d'abaisser les normes techniques et les niveaux de consommation, généralement calqués sur ceux des pays industrialisés. A cet égard, les processus de changement de mentalité déjà amorcés doivent être renforcés, tant dans les pays en voie de développement que chez les organismes donateurs.

IV. ADAPTATION NECESSAIRE DES OBJECTIFS

La réalisation des objectifs de la décennie exige un volume d'investissement qui ne pourra guère être financé, si l'on reste aux systèmes d'approvisionnement à 100 %, généralement réalisés jusqu'ici, en utilisant des technologies conventionnelles. Ceci reste vrai même si, dans une optique réaliste, on prolonge jusqu'à l'an 2000 l'horizon de planification pour la réalisation des objectifs de la décennie, ainsi que l'ont déjà prévu certains pays.

Il conviendrait à l'avenir de promouvoir en priorité les projets destinés aux régions où l'approvisionnement en eau potable et l'assainissement ne satisfont pas aux normes minimales de santé. Il s'agit essentiellement des zones à problèmes des agglomérations urbaines et des zones rurales.

Les instances de décision des pays en voie de développement ainsi que les organismes donateurs sont appelés à mieux harmoniser à l'avenir les possibilités économiques limitées, d'une part, et les exigences en matière d'approvisionnement en eau et d'assainissement ainsi que les normes techniques, d'autre part.

En d'autres termes, il faudra éventuellement imposer aux consommateurs des normes d'approvisionnement plus modestes et économiquement acceptables, faisant appel à des technologies plus simples et mieux adaptées aux conditions locales. Cette approche se justifie également par le fait que des normes démesurées d'approvisionnement et d'assainissement ne visent pas seulement à améliorer la santé, mais sont souvent axées en priorité sur un accroissement du confort. Il conviendrait donc d'exploiter à fond les possibilités d'améliorer la santé en combinant l'éducation sanitaire et l'utilisation de technologies adaptées, avant d'adopter des normes techniques plus élevées pour l'approvisionnement en eau et l'évacuation des rejets.

De nombreuses installations techniquement inadaptées, dont certaines sont même financées par l'aide internationale au développement, cessent partiellement ou totalement de fonctionner au bout de quelque temps faute de personnel technique qualifié et/ou de moyens d'exploitation, par suite de l'absence ou du manque d'efficacité des structures responsables ou à cause de conditions politiquement inapplicables. Ces expériences doivent également conduire à ne développer, à ne planifier et à ne mettre en oeuvre, dans la mesure du possible, que des technologies adaptées, en faisant appel à la participation des groupes cibles concernés. Il convient de promouvoir autant que possible des installations décentralisées, qui peuvent être entretenues au niveau de la commune, sans subventions permanentes de l'Etat.

V. CRITERES DE CHOIX ET DE CONCEPTION DES PROJETS

Le choix des projets est plus facile lorsque le pays considéré dispose déjà, dans le cadre de la planification de son développement de plans directeurs régionaux pour l'approvisionnement en eau et l'assainissement, ou d'un "plan décennal" spécial pour l'ensemble du pays.

A cet égard, il importe de veiller autant que possible à ne promouvoir que des projets revêtant à juste titre une grande priorité dans la politique et la planification du développement du pays considéré, c'est-à-dire des projets qui correspondent aux objectifs de la décennie et qui servent à combler des déficits particulièrement grands dans le domaine de l'approvisionnement en eau et de l'assainissement[4)].

Le choix des projets nécessite en outre des critères d'appréciation susceptibles de garantir la prise en considération des planifications existantes ainsi que la réalisation d'autres objectifs sectoriels. Des critères d'appréciation des projets sous l'angle de la politique de développement seront présentés et développés dans la suite du texte. Il s'agit en fait d'exigences fondamentales, qu'il convient de prendre en considération déjà au moment de la décision concernant la réalisation du projet et qui doivent être notamment respectées par les bureaux régionaux et sectoriels du BMZ.

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4) Des plans de réalisation des mesures d'approvisionnement en eau et d'assainissement nécessaires dans le secteur de l'hydraulique villageoise et urbaine (dits "plans décennaux") ont été ou seront mis au point à l'initiative des Nations unies ou de l'OMS par de nombreux pays du tiers monde, et, pour un certain nombre de pays, avec l'aide de la République fédérale d'Allemagne, dans le cadre d'un programme de coopération OMS-BMZ/GTZ.

V. 1. PRINCIPES DE PLANIFICATION ET DE REALISATION

V. 1.1 Généralités

Pour chaque projet, il convient d'élaborer une planification intégrée des mesures nécessaires à l'approvisionnement en eau potable ainsi qu'à l'évacuation des eaux usées, des matières fécales et des déchets, cette planification nécessitant une concertation entre le maître d'oeuvre du projet et l'organisme de financement. Une planification intégrée doit comprendre des conceptions pour la planification et la mise en oeuvre des programmes, des horizons de réalisation, des étapes qualitatives et quantitatives de développement, le financement, l'organisation de l'auto-assistance, la formation et l'éducation sanitaire de la population cible.

Les projets doivent dès le départ être conçus de manière à pouvoir couvrir l'essentiel des besoins en eau de l'ensemble de la population de la région considérée. A cet égard, il conviendrait que les principaux éléments du projet (par exemple, le captage, le stockage et la distribution de l'eau) soient conçus pour couvrir les besoins attendus dans un horizon de 10 à 12 ans à compter du début de la planification. Il convient également de s'efforcer d'intégrer le projet dans une planification à plus long terme, de manière à parvenir à la solution la moins coûteuse dans l'ensemble.

Les extensions projetées et les coûts globaux doivent être adaptés aux conditions locales et aux possibilités économiques de la région du projet afin d'arriver, avec les moyens financiers limités dont on dispose, à satisfaire au moins les besoins de base de l'ensemble de la population .

Lors de la planification des mesures d'extension dans le secteur de l'approvisionnement en eau et de l'assainissement il conviendra de prendre en compte les possibilités existantes et les alternatives privées d'approvisionnement et d'assainissement ainsi que les habitudes actuelles de

consommation de la population, afin de s'assurer que les installations pourront être effectivement acceptées par la population. La planification doit être conçue de telle manière qu'elle permette des améliorations progressives et que la population puisse tirer immédiatement profit de mesures peu coûteuses et soit ainsi incitée, si sa situation économique s'améliore, à encourager d'elle-même l'étape suivante de développement (p.ex. pour l'approvisionnement : prise d'eau - borne-fontaine collective - branchement individuel; pour l'évacuation : latrines - toilettes avec fosse septique - tout-à-l'égout).

Lors de la planification, il convient également de veiller à ce que la conception des installations soit autant que possible effectuée par des spécialistes locaux et - là où cela est réalisable sur le plan technique, politique et organisationnel - avec la participation de la population.

Les différentes installations devraient être bien adaptées au niveau technologique du pays, afin qu'elles puissent être construites, dans la mesure du possible, par des spécialistes locaux et - là où les conditions techniques, politiques et organisationnelles le permettent - avec la collaboration de la population, de telle sorte que leur exploitation et leur maintenance puissent être assurées par du personnel local formé sur place.

Il convient de ce fait d'utiliser des procédés à forte intensité de main-d'oeuvre pour la construction et l'exploitation des installations (par exemple, pose de conduites d'eau, construction de latrines, emploi de poubelles rudimentaires) dans la mesure où ceci ne représente pas des coûts économiques et sociaux (investissements et frais de fonctionnement) trop importants pour l'économie nationale.

Dans les zones rurales, il convient de planifier et de réaliser les mesures d'approvisionnement et d'assainissement de telle sorte qu'elles n'entraînent que de faibles charges récurrentes. Les équipements techniques devraient donc être conçus de manière suffisamment simple pour que les inévitables travaux de répara-

tion et de maintenance puissent être en majeure partie assurés sous forme d'apports propres de la population concernée.

Une importance particulière doit en outre être accordée à la réhabilitation des installations et systèmes existants, notamment pour des raisons de coût et de préservation des ressources.

V. 1.2 Préservation des ressources en eau

Les ressources en eau étant partout limitées, il convient d'attribuer la plus haute priorité à leur préservation lors de l'étude de projets d'approvisionnement en eau et d'assainissement ainsi que lors de la construction et de l'exploitation des installations correspondantes.

La gestion et la protection du potentiel hydrique font partie de toute planification intégrée de l'environnement et permettent d'obtenir à long terme des effets plus efficaces et généralement moins coûteux qu'en se limitant à l'extension de systèmes d'approvisionnement et d'évacuation déjà existants ou, plus tard à des interventions techniques pour la réparation des dommages.

Toutes les formes d'exploitation des ressources en eau doivent toujours être en accord avec la législation et le droit national en matière d'eau. L'approvisionnement en eau potable doit se voir accorder la priorité sur les autres usages.

Les étapes nécessaires à la gestion et à la protection des ressources en eau comprennent :

- la prospection, le recensement et l'évaluation des ressources en eau,
- la planification et la mise en oeuvre de l'exploitation des ressources.

La prospection vise à obtenir une vue d'ensemble du potentiel disponible et utilisable en eaux de surface (fleuves, lacs), eaux souterraines (sources également) et autres ressources en eau (précipitations, par exemple). Le recensement des ressources et l'établissement de bilans hydriques nécessitent que l'on procède à l'inventaire des ressources existantes et éventuellement à des études hydrogéologiques et hydrologiques supplémentaires. L'évaluation des ressources doit fournir des indications sur leur

localisation, les quantités économiquement utilisables et la qualité de l'eau, ainsi que sur les limites de ces ressources.

La planification de l'utilisation de l'eau doit mettre en évidence les possibilités et les limites de l'exploitation des ressources dans la région du projet, pour tous les secteurs (approvisionnement en eau potable, élevage, production artisanale ou industrielle, énergie hydraulique, ou autres). Il convient à cet égard de considérer comme facteur limitant les dangers que présente pour l'eau la pollution par les eaux usées, les ordures ménagères, les déchets de l'industrie, des mines, de l'agriculture, etc. La planification de l'utilisation de l'eau doit indiquer les priorités d'ordre technique pour la gestion et la protection des ressources en eau. Des mesures de protection de l'eau doivent toujours être intégrées dans les plans d'utilisation (par exemple, zones protégées de captage d'eau potable). Outre les mesures techniques (par exemple au niveau des installations de captage), il convient de prévoir également des mesures législatives ou administratives.

L'utilisation d'eaux de surface pour l'approvisionnement en eau potable peut être tout aussi intéressante que l'utilisation de la nappe phréatique si l'on dispose d'une eau de qualité acceptable sur le plan de l'hygiène et s'il est possible d'employer des technologies simples de traitement et de distribution.
La décision d'utiliser des eaux de surface ou des eaux souterraines doit être prise en premier lieu en tenant compte des aspects économiques, mais en prenant également en considération les habitudes socio-culturelles de consommation. Un équilibre doit toujours être maintenu entre l'utilisation de l'eau et le lent renouvellement des ressources, ce qui implique d'éviter toute surexploitation.

Lors de la planification et de la conception des installations de captage et de distribution, il convient d'éviter toute dégradation à long terme des ressources en eau (par exemple, par rejet d'eaux usées dangereuses).

V. 1.3 Approvisionnement en eau potable

Besoins domestiques

Les projets d'approvisionnement en eau visent en premier lieu à fournir à toutes les couches de la population de l'eau potable en quantité suffisante pour ses besoins essentiels (boisson, cuisine, lavage) et d'une qualité acceptable sur le plan de l'hygiène

La quantité d'eau à considérer comme nécessaire et suffisante dépend des habitudes de consommation de la population ainsi que des conditions climatiques et culturelles. Un approvisionnement de base suffisant peut être assuré avec 20 à 40 l par habitant et par jour - 20-40 l/cd - (OMS: 30 l/cd).

D'une manière générale, il convient de ne promouvoir que les projets visant essentiellement les couches les plus pauvres de la population. Les projets qui prévoient l'aménagement d'un grand nombre de prises d'eau et de branchements collectifs ont donc une priorité particulière.

Lors du choix des normes d'approvisionnement pour une région donnée, il convient normalement de partir dans un premier temps d'un approvisionnement assuré exclusivement par des bornes-fontaines publiques. Dans la mesure où des normes plus élevées (branchements collectifs ou individuels) sont prévus pour certains consommateurs, pour certaines zones ou pour l'ensemble de l'aire d'un projet, il convient de justifier ce choix sur la base des conditions locales. A titre indicatif, les consommations raisonnables et dignes de faire l'objet d'une promotion dans le cadre de la politique de développement sont :

jusqu'à 40 l/cd pour les bornes-fontaines publiques
jusqu'à 60 l/cd pour les branchements collectifs
jusqu'à 120 l/cd pour les branchements individuels.

L'espacement des bornes-fontaines ou des branchements collectifs doit être fonction de la densité de la population et d'un temps d'attente raisonnable. Dans les zones urbaines, la distance à parcourir à pied par l'utilisateur entre son domicile et le point de distribution ne devrait pas dépasser 300 m. Dans les zones rurales, il faudra éventuellement s'accomoder d'un éloignement plus important du point d'eau ou du puits. Même pour les zones d'habitation en régions arides, l'eau potable devrait autant que possible être disponible à une distance correspondant à environ 1 h de marche. Dans les régions d'extrême pénurie d'eau, l'approvisionnement doit être adapté aux ressources disponibles et limité aux besoins minimaux, voire même rationné.

Les projets d'approvisionnement en eau potable doivent inclure toutes les composantes requises, c'est-à-dire depuis le captage de l'eau et son traitement si c'est nécessaire, jusqu'à sa distribution aux consommateurs, la mise au point d'un système d'entretien des installations et l'éducation sanitaire de la population. Des mesures partielles ne seront financées que si les autres éléments nécessaires existent déjà ou si leur réalisation simultanée est financièrement assurée par ailleurs.

Besoins publics

La sécurité de l'approvisionnement en eau potable du secteur public est indispensable, notamment dans les zones urbaines, et doit donc faire partie intégrante des projets. Vu le risque de consommations incontrôlables et excessives, il convient de prendre, lors de la conception des installations et des équipements toutes les mesures techniques permettant une consommation économique de l'eau potable et une réduction des coûts.

Besoins du secteur industriel artisanal et commercial

L'approvisionnement en eau des entreprises artisanales et industrielles est une condition nécessaire au développement économique d'une région et devrait donc être prise en considération, au

moins lors de la planification de projets d'approvisionnement en eau. Compte tenu du prix de revient plus élevé de l'eau potable il importe, s'il existe d'autres possibilités d'approvisionnement, de n'utiliser l'eau potable du réseau public que pour couvrir les besoins des entreprises industrielles et artisanales qui nécessitent réellement une eau de cette qualité (production de produits alimentaires, eau potable pour le personnel, etc.). Là où une telle qualité de l'eau n'est pas requise pour la production, les entreprises devraient autant que possible assurer leur propre approvisionnement; il conviendrait toutefois de prendre également en considération les impératifs de préservation des ressources lors de l'octroi de droits de captage à des fins d'auto-approvisionnement.

Particularités en zones rurales

Dans les zones rurales, il est particulièrement important de s'en tenir au principe de la conception la plus simple possible des installations d'approvisionnement en eau, non seulement pour des raisons de coût, mais également parce qu'il est plus difficile d'y assurer une bonne exploitation et une bonne maintenance des installations. Cela signifie que, selon les conditions locales, l'on devrait opter pour la construction de puits ou forages simples, équipés de pompes manuelles d'un entretien aisé, de citernes de collecte des eaux de pluie ou le captage de sources reliées à la région à approvisionner par des conduites à écoulement gravitaire. Il conviendrait de n'utiliser des pompes à moteur que dans des cas exceptionnels, non seulement en raison des coûts élevés de fonctionnement et de maintenance, occasionnant généralement des sorties de devises, mais surtout pour des raisons de protection de l'environnement et de préservation des ressources (surpâturage aux alentours des puits; surexploitation de la nappe phréatique).

En cas d'approvisionnement individuel par des puits ou citernes simples, la construction de réseaux de distribution n'est pas nécessaire. Ce n'est que dans des cas spéciaux (captages de sources avec écoulement gravitaire, puits isolés en dehors des agglomérations) qu'il conviendrait de construire des réseaux simples de distribution d'eau potable vers les points d'approvisionnement. A cet égard, un seul point d'eau peut suffire dans les très petites localités.

V. 1.4 Evacuation des eaux usées et des matières fécales

Dans l'étude de tout projet d'approvisionnement en eau, il importe de prévoir une évacuation appropriée des eaux usées (eaux sales ménagères et, le cas échéant, eaux de pluie) et des matières fécales, en précisant si nécessaire la question du financement. Sans un bon système d'assainissement, il n'est généralement pas possible d'obtenir une amélioration durable des conditions d'hygiène.

Le choix de la technologie d'évacuation (p.ex. latrines - fosses septiques - tout-à-l'égout) est en premier lieu conditionné par l'importance de la consommation d'eau potable et par la quantité d'eaux usées qui en résulte. On s'efforcera de choisir des solutions décentralisées, tant pour des raisons de coûts que pour des raisons de protection de l'environnement. Du fait de leur coût de construction et d'exploitation extrêmement élevé, les réseaux de tout-à-l'égout ne peuvent se justifier que dans des zones urbaines à forte densité de population, produisant de fortes quantités d'eaux usées. La construction d'un système de tout-à-l'égout exige la construction simultanée d'une installation d'épuration dans la mesure où il n'existe pas d'autres possibilités d'élimination hygiénique des eaux usées. L'épuration des eaux usées doit autant que possible s'effectuer par des procédés simples, notamment des procédés naturels (p.ex. étangs d'oxydation).

Les programmes de construction de latrines, tels que ceux mis au point par la Banque mondiale/PNUD, sont des solutions adaptées et, de ce fait, particulièrement dignes d'être encouragés, d'autant plus que la population peut participer à la construction et à l'entretien des équipements. Les mesures d'assainissement se doivent d'être complétées par des programmes d'éducation en matière d'hygiène, spécifiques à chaque projet.

V. 1.5 Elimination des déchets

Pour des raisons de protection de l'environnement et d'hygiène domestique, l'élimination des déchets (ordures ménagères) doit également être considérée comme partie intégrante des projets d'hydraulique villageoise ou urbaine; il convient à cet égard de tenir compte de toutes les couches de la population et de toutes les zones d'habitation. Les projets d'évacuation des eaux de pluie devrait également inclure l'évacuation des déchets, même si des mesures d'approvisionnement en eau potable ou d'autres mesures d'assainissement ne sont pas prévues ou réalisées en même temps.

Lors de l'étude des projets, il importe de tenir compte de la composition très variable des ordures ménagères dans les pays en voie de développement ainsi que des procédés traditionnels de collecte et de traitement (récupération de matières premières par des procédés à forte intensité de main-d'oeuvre; compostage). On s'efforcera par la récupération et la valorisation des matières premières, notamment par compostage, de réduire les coûts engendrés par l'élimination des déchets.

V. 2. MESURES PREPARATOIRES ET COMPLEMENTAIRES

La sensibilisation de la population, la promotion des organismes responsables et la formation de personnel spécialisé doivent faire partie intégrante de tout projet d'approvisionnement en eau et d'évacuation des eaux usées, selon les nécessités locales.

V. 2.1 Sensibilisation de la population

L'approvisionnement en eau potable et la réalisation de mesures d'assainissement ont une influence directe sur la santé de la population dans les régions des projets.

A cet égard, l'un des aspects les plus importants sur le plan de la santé consiste à procéder à temps à une large sensibilisation des groupes-cibles - notamment des femmes - sur

- l'importance pour leur santé d'une eau irréprochable sur le plan de l'hygiène;

- la nécessité d'utiliser réellement et exclusivement la nouvelle eau de bonne qualité qui leur est proposée;

- l'utilisation de l'eau potable dans de parfaites conditions d'hygiène (protection des nouveaux points d'eau contre la pollution par les personnes et par les animaux; utilisation de récipients propres pour le puisage et le stockage; respect de la durée de conservation limitée);

- la nécessité de construire et d'utiliser en outre des installations d'évacuation.

Sans éducation sanitaire, les projets d'approvisionnement en eau potable risquent même d'avoir des répercussions négatives sur la santé des groupes cibles, car la consommation d'eau propre réduit l'immunité traditionnelle contre certaines maladies. Si

de l'eau contaminée est à nouveau consommée occasionnellement, le risque de contracter une infection particulièrement grave est nettement plus élevé qu'auparavant. L'éducation sanitaire devrait donc être assurée par du personnel approprié - intégré si possible aux structures existantes de soins de santé primaires -.

La participation de la population à la planification, à la construction, à l'exploitation et à la maintenance d'installations d'approvisionnement en eau et d'assainissement doit permettre de garantir à long terme leur acceptation et contribuer ainsi à améliorer de manière décisive la capacité de fonctionnement des installations et à augmenter leur durée de vie.

V. 2.2 Maîtres d'oeuvre des projets

Des maîtres d'oeuvre compétents et efficaces sont une condition essentielle pour la réussite des projets d'approvisionnement en eau et d'assainissement. Du fait de leur interdépendance, il conviendrait que l'approvisionnement et l'assainissement soient placés sous la responsabilité d'un seul et même maître d'oeuvre ; ceci n'est pas obligatoire dans le cas de l'élimination des déchets.

Les maîtres d'oeuvre devraient avoir des compétences bien définies ainsi que les capacités techniques nécessaires pour pouvoir organiser l'étude, la construction, l'exploitation et la maintenance des installations. Dans la mesure où l'étude et la construction sont confiées à d'autres organismes, il conviendrait toutefois que les organismes responsables de l'exploitation et de la maintenance collaborent à l'étude et à la construction de leurs installations. Les maîtres d'oeuvre devraient autant que possible être autonomes et pouvoir faire appel, pour l'exploitation, à du personnel local rémunéré de manière adéquate. Il convient de faire en sorte que des redevances puissent être effectivement perçues et autant que possible utilisées en toute responsabilité par le maître d'oeuvre concerné.

S'il n'existe pas d'institutions capables d'assurer la maîtrise d'oeuvre ou si celles-ci ne sont pas encore suffisamment efficaces, il conviendra de créer, avant le début des travaux, les conditions nécessaires à un bon encadrement, le cas échéant par des mesures d'assistance technique et de formation. Il importera en particulier d'apporter aux maîtres d'oeuvre une assistance pratique sur les plans technique et organisationnel et en matière de gestion. Ceci vaut notamment pour l'assistance dans les domaines de l'exploitation et de la maintenance.

V. 2.3 Tarification

On s'efforcera de prélever systématiquement pour la mise à disposition d'eau potable ainsi que pour les services d'évacuation des eaux usées et des déchets des redevances permettant de couvrir les coûts correspondants. A cet égard, il faut qu'au niveau des projets ou des maîtres d'oeuvre des projets, les dépenses courantes (frais de fonctionnement et d'entretien ainsi que petits investissements de remplacement) puissent au moins être couvertes par des recettes effectives.

Les projets dans lesquels les recettes actuelles ne remplissent pas encore cette condition du fait de tarifs trop bas ou du mauvais fonctionnement des systèmes de recouvrement ne méritent de faire l'objet d'une promotion que s'il est possible d'imposer des augmentations de tarifs ainsi que des améliorations des systèmes de recouvrement et de gestion.

Si aucune redevance n'a été prélevée jusqu'à présent pour la fourniture d'eau potable, la première étape devra consister à imposer au moins une redevance forfaitaire (p.ex. redevance fixe par habitant ou par ménage desservi) à titre de participation aux frais. Il convient cependant, ici aussi, de s'efforcer de mettre en place des redevances indexées sur la consommation (redevance par unité de consommation), condition indispensable à une bonne gestion de l'organisme maître d'oeuvre. Aux fontaines

publiques également, l'eau ne devrait être fournie que moyennant une redevance. Dans les zones rurales, notamment, une partie de la redevance pourra être remplacée par des prestations adéquates des consommateurs.

Pour les niveaux de consommation dépassant les besoins de base, il y a lieu d'appliquer des tarifs supérieurs. A cet égard, on s'efforcera de mettre en place des tarifs progressifs, de manière à faire supporter entièrement par les consommateurs concernés les coûts de mise à disposition et d'évacuation des quantités d'eau dépassant ce seuil et à compenser également le déficit enregistré dans les zones à problèmes. Les tarifs doivent être conçus de telle manière que les gros consommateurs industriels payent des redevances couvrant la totalité des coûts correspondants.

La mise en place de tarifs à forte progression pour l'approvisionnement en eau s'impose pour plusieurs raisons :

- ils conduisent à une utilisation plus économique des ressources en eau, qui sont très limitées dans de nombreux pays en voie de développement;

- ils aident à restreindre la quantité d'eaux usées à évacuer et donc à éviter la construction de réseaux de tout-à-l'égout et de stations d'épuration coûteux et contribuent, de ce fait, à protéger l'environnement; ils permettent d'éviter une nouvelle dégradation des conditions d'hygiène par des quantités excessives d'eaux usées;

- ils permettent de compenser ("cross-subsidizing") les coûts de l'approvisionnement de base non couverts, pour des raisons sociales, par les tarifs minimums.

Dans certains pays en voie de développement (notamment dans les pays les moins avancés), la perception de redevances ne permettra pas d'atteindre à court ou à moyen terme une couverture de la totalité des coûts (exploitation et maintenance, amortissements,

paiement d'intérêts raisonnables), ni même une couverture des dépenses courantes. En pareils cas, il conviendra d'assurer par une aide financière extérieure la couverture des coûts, des équipements et des pièces de rechange ainsi qu'une partie des frais d'entretien pendant une phase de démarrage (jusqu'à 5 ans), si le maître d'oeuvre du projet est disposé et en mesure de prendre à sa charge une part croissante du financement.

Des redevances permettant de couvrir les coûts d'évacuation des eaux usées devront être mises en place si la consommation d'eau est telle qu'il s'avère nécessaire de collecter les eaux usées par un système de tout-à-l'égout. La tarification devra alors reprendre la même progression que celle adoptée pour l'eau potable. Il est souhaitable que l'organisme responsable de l'approvisionnement en eau soit également chargé de percevoir les redevances pour l'évacuation des eaux résiduaires.
Même si, dans le cas d'installations individuelles d'évacuation (latrines, fosses septiques, etc.), le maître d'oeuvre n'a pas de frais d'investissement, d'exploitation ni d'entretien, il doit, dans l'intérêt de la santé publique, assumer une fonction d'encadrement et de contrôle lors de la planification, de la construction et de l'entretien des installations.

Pour l'évacuation des déchets, il conviendrait de prélever des redevances par habitant et selon le mode d'évacuation. Dans les pays où la perception d'une redevance par ménage n'est pas réaliste en raison du faible revenu par habitant, il convient que d'autres recettes (par ex. impôt foncier) destinées à des objectifs d'intérêt général soient prévues pour le maître d'oeuvre.

VI. CONCLUSIONS

Compte tenu des possibilités financières limitées, et notamment du manque évident de devises dans la plupart des pays en voie de développement, ainsi que des moyens limités mis à la disposition de ce secteur dans le cadre de la coopération, il ne sera probablement possible d'atteindre qu'une partie des objectifs fixés pour la "décennie". Il est donc absolument indispensable de ne promouvoir à l'avenir que les projets qui correspondent aux objectifs et aux critères définis dans ce rapport sectoriel et qui permettent donc d'atteindre une efficacité aussi grande que possible sur le plan de la politique du développement.

A l'avenir, il conviendra également, pour des raisons économiques, de faire accepter autant que possible par les instances de décision des pays en voie de développement les valeurs indicatives proposées dans ces rapports et dans la liste des critères et, en cas de négociations communes, de les défendre également vis-à-vis des autres donateurs.

En conclusion, il y a lieu d'attirer l'attention sur les "Lignes d'action pour les mesures d'approvisionnement en eau potable et d'assainissement dans les pays en voie de développement", dont il faudra également tenir compte lors de la préparation et de la réalisation des projets[5)].

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5) Voir page 3

IRC
international reference centre
for community water supply
and sanitation

who collaborating centre

CIR
centre international de référence
pour l'approvisionnement
en eau collective et l'assainissement

centre collaborant de l'oms

LE CENTRE INTERNATIONAL DE RÉFÉRENCE POUR L'APPROVISIONNEMENT EN EAU COLLECTIVE ET L'ASSAINISSEMENT EN ACTION

Présentation pour le colloque international sur les systèmes d'alimentation en eau potable à coûts réduits pour zones rurales et périphérie urbaine; Côte d'Ivoire, 13-18 octobre 1986.

Introduction

Le Centre International de Référence pour l'approvisionnement en Eau Collective et l'Assainissement (CIR) dont le siège se situe à La Haye, a été créé en 1968 à la suite d'un accord entre l'Organisation Mondiale de la Santé et le Gouvernement des Pays-Bas. Dès le départ le but du CIR a été d'aider à assouvir les besoins de millions d'êtres humains souffrant du manque d'eau potable et d'équipements sanitaires. Dans cette perspective, le CIR s'est efforcé d'apporter son soutien à ceux qui se consacrent à l'amélioration des conditions ce vie des communautés rurales et urbaines défavorisées. Le CIR est une organisation indépendante et sans but lucratif. Son action se base sur la conviction que la meilleure façon d'aider ceux qui sont chargés de l'approvisionnement en eau potable et de l'assainissement, et de leur donner les moyens de mener des actions efficaces, est de mettre à leur disposition les expériences et les connaissances pratiques nécessaires.

Travaillant dans le cadre de la Décennie Internationale pour l'Eau Potable et l'Assainissement, le CIR se consacre à la génération et au transfert d'informations concernant les technologies appropriées, l'éducation, l'organisation des communautés, la planification et autres composantes des programmes d'alimentation en eau et d'assainissement. Les principales activités du CIR sont les suivantes:

- recherche appliquée dans le domaine de la génération et de l'adaptation des informations de base;
- collecte, traitement, sélection et mise sur ordinateur des données;
- diffusion des informations au moyen de publications et d'autres média;
- transfert des informations dans le cadre d'actions de soutien, de formation, d'évaluation et de conseil.

Depuis l'époque de sa fondation, le CIR a acquis une connaissance approfondie de la masse des documents existants, des projets et des différentes sources d'information. Il a établi un réseau de relations, entre autres avec un certain nombre d'experts disposés à participer à ses activités. Il a assemblé un nombre considérable de documents concernant l'alimentation en eau et l'assainissement. Son personnel, qui utilise couramment plusieurs langues, comporte des professionels expérimentés. Il dispose enfin d'un abondant matériel et d'équipement pour la formation.
La suite de ce document contient des renseignements a) sur les services d'information, b) sur les différents projets exécutés par le CIR, y compris les projets de démonstration et c) sur les autres activités du CIR.

A. Services et réseaux d'information

Depuis 1971, le CIR a distribué plus de 3500 publications en anglais, en français et en espagnol, ainsi que 450.000 exemplaires de son bulletin d'information "CIR Faits Nouveaux". Vingt deux "documents techniques" ont été publiés, faisant le point sur des sujets aussi divers que la technologie de la filtration lente sur sable et la participation communautaire. Les versions françaises et anglaises de "CIR Faits Nouveaux" sont lues par quelques 5400 abonnés. Le CIR a aussi contribué à des publications en espagnol, tels que les "Noticias" du centre d'étude panaméricain pour l'environnement et la santé (CEPIS). D'autre part, le CIR a publié des bulletins sur des sujets spécifiques, ainsi que des documents occasionnels, liés à des projets bien définis. Ces publications ont pour but de présenter aux lecteurs un apperçu des toutes dernières tendances en ce qui concerne les aspects techniques, sociaux et économiques de l'alimentation en

eau potable et de l'assainissement. Récemment, le CIR a fait parraitre un document traitant du rôle de la femme: "Participation of Women in Water Supply and Sanitation; Roles and Realities", (Technical Paper no.22); et un manuel pour l'entretien des filtres lents sur sable: "Manual for Caretakers of Slow Sand Filtration", (Training Series no.1).

Parmis les activités actuelles du CIR, on peut noter:

- La préparation d'un document contenant des directives pour l'utilisation des sources d'énergie renouvelable dans le cadre de l'alimentation en eau potable dans les pays en voie de développement.
- La préparation d'un manuel destiné aux agents chargés de l'alimentation en eau potable et de l'assainissement dans les villages. Ce manuel traitera aussi bien des aspects techniques que de l'organisation et de la mise en oeuvre des programmes.
- La mise à jour du document technique sur les systèmes d'alimentation en eau potable par bornes fontaines, tenant compte des expériences acquises dans les projets en cours.
- La mise en train d'une étude sur le pré-traitement des eaux de surface. Le but de ce pré-traitement est de réduire la turbidité, permettant ainsi d'utiliser des filtres lent sur sable là où auparavant cela était impossible.

Parrallèment, le CIR a entrepris une série d'activités visant à augmenter la masse des connaissances disponibles dans un certain nombre de domaines, pour lesquels ces connaissances peuvent jouer en rôle critique, par exemple pour la conception, l'installation et l'utillisation des pompes à main. En ce qui concerne l'alimentation en eau potable, des millions d'être humains dépendent en effet du bon état de marche de ces pompes. Ceci ne dépend pas seulement de la qualité technique de leur conception, de leur construction et de leur entretien. Un certain nombre de problèmes d'ordre économique et organisationnel sont encore loin d'être résolus. La mise en circulation d'informations appropriées pourra contribuer de manière efficace à les résoudre. C'est la raison pour laquelle le CIR a décidé de remettre à jour le document technique sur les pompes à main, à l'usage des agents responsable de l'alimentation en eau potable et de l'assainissement dans les zones rurales des pays en voie de développement. Cette mise à jour

tiendra compte des derniers développement en la matière. En plus des sujets déjà traités dans la première version, la nouvelle édition abordera des sujets tels que la participation communautaire, les techniques d'installation des pompes, la conception des dalles anti-bourbier, la fabrication locale des pompes et l'utilisation des matières plastiques.

Le maintenance des équipements servant à l'alimentation en eau potable et à l'assainissement est un autre point critique. Un document faisant le point sur les tendances actuelles dans ce domaine est en voie de préparation. Ce document sera fondé d'une part sur une étude extensive de la littérature actuelle et d'autre part sur des entrevues avec des professionels ayant une bonne expériences des condition sur le terrain. Il contiendra entre autres un inventaire des différents aspects à prendre en compte lors de la conception et de la mise en oeuvre des systèmes de maintenance.

Il s'est avéré dans la pratique que l'amélioration des installations sanitaires et l'introduction de nouvelles pratiques hygiéniques peuvent avoir autant d'effet sur la santé des gens que l'installation d'un réseau d'alimentation en eau potable. Malheureusement, ces aspects sont trop souvent négligés. C'est pourquoi le CIR a pris la décision d'étendre la série de documents traitant de l'hygiène et de l'assainissement. D'ici peu il publiera un cataloque pratique de références concernant ces sujets.

La gestion financière est aussi un facteur important. Souvent les fonds nécessaires pour couvrir les dépenses courantes et pour assurer la bonne maintenance des équipements doivent être collectés au niveau local. Ces maigres ressources doivent être gérées judicieusement. Ici aussi le manque de connaissances pratique est une sérieuse contrainte. Une étude à ce sujet a été mise en train et bientôt un document sera publié concernant les différents aspects de la collecte et de la gestion des fonds au niveau local.

L'alimentation artificielle des nappes d'eau souterraine offre de bonnes perspectives non seulement pour le maintien du niveau de ces nappes, mais aussi comme moyen simple et bon marché d'épurer les eaux de surface. La techniques est d'autant plus intéressante qu'elle ne nécessite ni produits chimiques, ni installations compliquées. Les Pays-Bas ont acquis

dans ce domaine une expérience considérable. Le CIR désire mettre cette expérience ou service des pays en voie de développement. Un document traitant de l'alimentation artificielle des nappe souterraines est donc en voie de préparation. Il donnera un aperçu des différents ouvrages publiés à ce jour, ainsi qu'un certain nombre d'exemples pratiques. Il aura pour objet d'aider à identifier les possibilités pratique qu'offre cette techniques pour les systèmes de petite et moyenne dimension.

Le CIR fait partie d'un réseau à l'échelle mondiale, formé d'organisations impliquées d'une manière ou d'une autre dans l'alimentation en eau potable et l'assainissement. Son rôle consiste entre autres à contribuer au renforcement de ce réseau. Pour ce faire, il a entrepris par exemple, en collaboration avec le Centre de Recherche pour le Développement International (CRDI), la publication d'un répertoire des sources d'information et d'un thésaurus multilingue (anglais, français, espagnol) à l'usage des documentalistes et des spécialistes de l'information. En collaboration avec le CRDI, le CIR apporte aussi son soutien à des institutions chargées de l'échange et du transfert de l'information concernant l'alimentation en eau potable et l'assainissement au Sri Lanka, en Thaïlande et en Indonésie. La plupart de ces activités visent à améliorer l'accès à l'information au niveau national.

Depuis peu, le CIR participe à un projet de la Banque Mondiale et du Programme des Nations Unies pour le Développement. Le but est de promouvoir les activités du réseau international de formation des gestionnaires pour l'eau et l'assainissement. Dans ce cadre, le CIR se chargera de préparer un module de formation concernant les techniques d'échange d'information. De plus il mettra "CIR Faits Nouveaux" à la disposition du réseau. Il fera parraitre des annonces et des articles de promotion. Actuellement, il participe à l'organisation d'un atelier régional pour instructeurs et formateurs qui aura lieu en Indonésie.

B. Projets de developpement et de démonstration

Il serait erroné de croire que toute information au sujet par exemple des nouvelles technologies, de la formation professionelle ou de l'administration des projets serait immédiatement appréciée à sa juste valeur, qu'elle serait comprise et qu'elle serait utilisée a bon escient. Peu de changements se réalisent aussi facilement. Par ses projets de développement et de démonstration, le CIR a prouvé qu'il existait des moyens efficaces de promouvoir l'acceptation et l'utilisation des informations. C'est une approche très pragmatique, qui donne au personnel des organisations participant aux projets l'occasion de contribuer à l'adaptations et à l'amélioration des méthodes et des techniques utilisées aussi bien au cours de la construction qu'au cours des phases ultérieures. Un des avantage majeurs de cette approche est qu'elle encourage la mise en place de structures permanentes de formation, de recherche et de gestion des informations.

L'origine des projets de développement et de démonstration se situe en 1971. A cette époque, le CIR a apporté son concours à l'expérimentation de techniques appropriées de filtration lente sur sable. Au cours de la première phase du projet, des instituts de recherche dans cinq pays en voie de développement (Inde, Colombie, Kenya, Soudan et Thaïlande) ont expérimenté avec succès les différents aspects technqiues du traitement. Durant la deuxième phase, l'effort principal s'est porté sur la mise en oeuvre d'installations de démonstration dans un certain nombre de villages dans les cinq pays mentionnés ci-dessus. Par la suite, le CIR a mis en train la diffusion des informations receuillies au cours des phases précédentes, sous forme d'articles et de manuels d'entretien en anglais, en espagnol, en arabe et en thaï. Le transfert des informations s'est aussi fait au travers d'ateliers de formation au niveau national. Grâce aux activités de démonstration et à la diffusion de l'information, les techniques de filtration lente sur sable ont acquis à présent une solide réputation en tant que méthode simple, fiable et bon marché de traitement des eaux de surface.

Un second projet de développement en de démonstration, traitant cette fois de l'alimentation en eau potable par bornes fontaines, mais dont l'approche s'inspire du projet précédent est en voie d'exécution. Ici,

l'accent a été mis sur l'utilisation combinée de technologies appropriées et de méthodes visant à encourager la participation des communautés. Cette dernière a été obtenue grâce à une connaissance approfondie des facteurs socio-culturels, et à l'application de solides principes de vulgarisation et d'organisation des communautés. Dans cette approche, qui se veut complètement intégrée, l'accent a été mis aussi bien sur la planification que sur la construction et sur la gestion des systèmes. Des projets de démonstration de ce type sont en voie d'exécution en Indonésie, au Malawi, au Sri Lanka et en Zambie.

Découlant logiquement des deux projets précédents, le nouveau projet de démonstration, concernant cette fois les petits réseaux d'alimentation en eau potable, sera mis en oeuvre en 1987. Ce projet, comme les précédents, s'éntendra sur plusieurs pays. Il mettra à profit l'expérience acquise lors du projet concernant les bornes fontaines. L'accent sera mis sur l'intégration des technologies d'alimentation en eau potable et d'assainissement, des méthodes d'éducation sanitaire et des méthodes de gestion opérationnelle, concernant entre autres le financement et la maintenance.

C. Activités et projets spéciaux

Grâce à l'apport financier et à l'appui technique de plusieurs organisations internationales, le CIR a entrepris un certain nombre d'activités dans lesquelles il a d'ailleurs obtenu des succès remarquables. Il s'agit d'évaluation de projets, de formation, d'éducation sanitaire, de vulgarisation et de participation communautaire. Parmis les activités auquelles le CIR a contribué, les suivantes valent la peine d'être mentionnées.

- Assistance technique directe à la conception, la mise en oeuvre et l'évaluation de projets, en particulier en République Arabe de Yémen, au Togo, en Colombie, au Bourkina Fasso et au Nigéria.
- Promotion de la participation communautaire. Un bon exemple de l'apport du CIR dans ce domaine est la préparation et la publication, en collaboration avec le projet USAID/WASH, d'un répertoire des sources d'informations. En Tanzanie, d'autre part, le CIR a aidé à préparer et à tester un manuel pratique destiné aux agents chargés de l'éducation sanitaire et de la participation communautaire.

- Le rôle de la femme. En 1985 le CIR a publié un document technique sur la participation de la femme dans l'alimentation en eau potable et l'assainissement. Ce document a connu un grand succès. Il en est allé de même du rapport du symposium international sur "La Décennie Locale", qui s'est tenu à Amsterdam en 1984. Il y était question de la complémentarité entre l'apport des communautés et celui des organisations extérieures. En plus de ses publications, le CIR met ses connaissances au service d'organisations qui désirent étudier le potentiel que pourrait offrir la participation des femmes aussi bien dans des projets en cours d'exécution que dans des projets en cours de préparation.
- Méthodes d'évaluation de projets. A la demande de l'UNICEF, le CIR a préparé du matériel de formation concernant l'évaluation de projets d'alimentation en eau potable et d'assainissement. Ce matérial a été testé au Nigéria. Un deuxième test est prévu pour le début de 1987.
- Traitement et diffusion d'informations. De diverses manières, le CIR apporte son soutien au renforcement d'institutions nationales et régionales en Asie, en Afrique et en Amérique Latine, dans le domaine du traitment et de la diffusion des informations.
- Cette liste serait incomplète si l'on négligeait de mentionner les glossaires, les listes bibliographiques et le matériel de formation préparés par le personnel du CIR ainsi que les informations diverses qu'il fournit journellement à la suite de demandes qui lui parviennent de tous les coins de monde.

Mettant l'accent sur les applications concrètes et pratiques des technologies appropriées, sur l'échange et la diffusion des informations, sur l'intégration des différentes approches visant à l'assainissement de l'environnement et sur le rôle que doivent jouer les hommes aussi bien que les femmes et les enfants dans chaque communauté, le CIR espère pouvoir collaborer avec vous à aider ceux qui par millions souffrent encore du manque d'eau potable et de l'absence d'équipement sanitaires satisfaisants.

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PAPER PRESENTED BY MR. ARMON HARTMANN, CHIEF OF THE SECTORAL SERVICE FOR DRINKING WATER SUPPLIES AND SANITATION ON OCCASION OF THE ALL AFRICA SEMINAR ON LOW-COST RURAL AND URBAN-FRINGE WATER SUPPLY, ABIDJAN 13th TO 18th OCTOBER, 1986

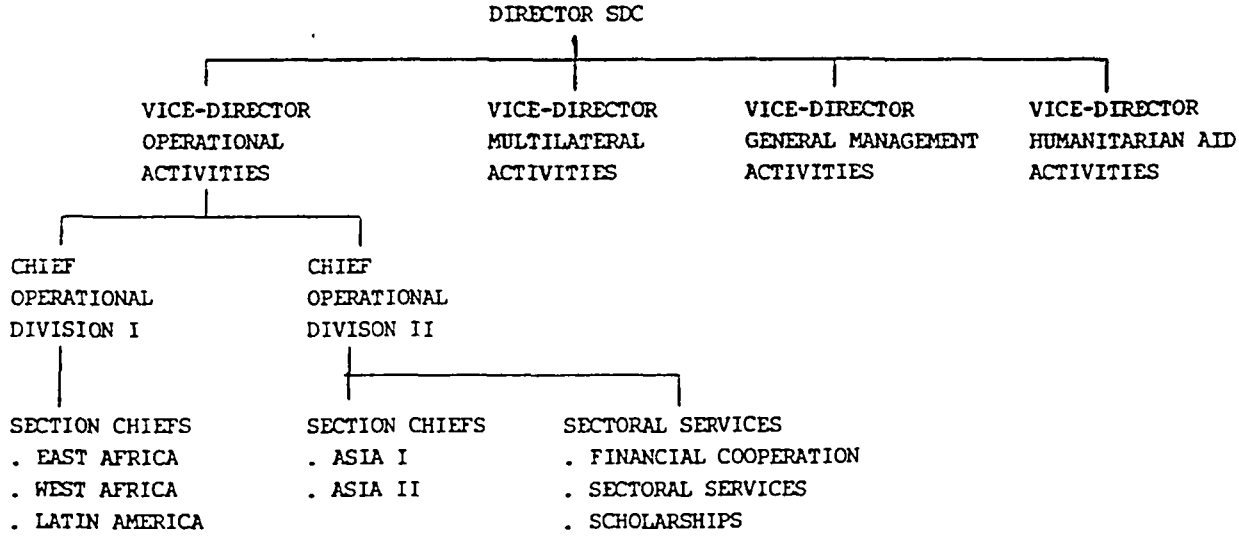
Contents :

Bern, 1st September, 1986.

1. INSTITUTIONAL STRUCTURE OF THE SWISS DEVELOPMENT COOPERATION (SDC)

Within the Swiss Government's Federal Department of Foreign Affairs the Directorate of the Swiss Development Cooperation is responsible for all activities of technical and financial cooperation.

The institutional structure of SDC is based on a geographical built-up :



About 2/3 of the annual budget are contributed to bilateral and multibi activities, the remaining 1/3 to multilateral activities. Country programmes are prepared by the individual geographical sections for all priority countries according to the bilateral and multibi budget allocations. The geographical sections are in charge for all activities in their respective countries. According to the needs defined during the preparation of a new project they will be assisted by specialists of the financial cooperation and the sectoral support services. These services can, however, also be made partly or fully responsible for an individual project whenever financial or sectoral influence on the project is predominant.

Operational activities include presently projects in the following countries :

	East Africa	West Africa	Latin America	Asia I	Asia II
First Priority Countries	Kenya Rwanda Tanzania Madagascar Mozambique	Benin Burkina Faso Mali Niger Tchad	Peru Honduras Bolivia	Bangladesh Pakistan India Sri Lanka	Nepal Indonesia Bhutan
Second Priority Countries	Burundi Zimbabwe Lesotho	Cabo Verde Cameroon Senegal Guinea Bissau	Ecuador Haiti Nicaragua	Yemen Turkey	Burma Thailand Malaysia

The sectoral support services of SDC are being established and include presently the sectors agriculture and livestock, socio-economic aspects, forestry and energy, industry and small scale entreprises, health, professional education, drinking water supplies, sanitation and infrastructure.

2. SDC's WATER SUPPLY AND SANITATION POLICY

Within the goals of the International Drinking Water Supply and Sanitation Decade (IDWSSD) about 75% of the activities within the water sector programme of SDC are related to rural water supply projects. Usually, project support includes quite a substantial component of technical cooperation besides financial assistance through delivery of equipment and building materials.

The sector evaluation carried out in 1982 and covering practically all projects financed or co-financed by SDC show clearly that the particular attention already given to the aspects of

- training (in-service, external, refresher for all technical and administrative staff on all levels)
- operation and maintenance
- community participation

should be continued. Through the information received on all water supply projects, guidelines for the preparation, the execution and the evaluation of projects have been prepared. These guidelines cover mainly technical, training and operation/maintenance aspects.

Based on these guidelines and information from other bilateral agencies a sector policy paper on water supply and sanitation projects in developing countries is in preparation.

Only about one third of the water supply projects are direct SDC-projects. The remaining 2/3 are carried out by Swiss non-governmental organizations (who have specialized and acquired a wide knowledge in the field of rural water supplies), either receiving a substantial financial contribution or carrying out the project on behalf of SDC.

3. FINANCIAL ASPECTS

Disbursement in 1986 for projects within the water and sanitation sector amount to about Sw.Frcs. 32 millions or roughly about 10% of the bilateral budget. About 2/3 of the funds are allocated to rural water supply projects in sub-saharan Africa.

Detailed information on the pro capita costs is not yet available from all the projects, but it is anticipated that investment costs in other projects are more or less comparable with those presented in the case study of Lesotho.

Cost recovery studies (operation and maintenance costs) have already been carried out in several rural water supply projects. The most detailed study was made in the VWSS project in Lesotho, where detailed information on all 504 repair and maintenance jobs (labour costs, material costs, transport costs) were analysed covering a one-year-period from July 1984 to July 1985. It is intended to gather similar information from additional projects, too.

4. CASE STUDY : LESOTHO - VILLAGE WATER SUPPLY SECTION, MINISTRY OF COOPERATIVES AND RURAL DEVELOPMENT

4.1 Basic Data

Size:	30'355 km2
Population:	1'577'000 Basotho (1986) 86 % is rural Growth rate: 2,3 % or ca. 35'000 per year 45 % of the population are younger than 14 years 50 % of the working classes are miners in South Africa.
Language:	Sesotho and English
Currency:	Malot / Rand (Rand Monetary Area RSA, Swaziland, Lesotho)
Income:	80 % out of the custom union with RSA
GNP:	$ 530
GDP:	$ 250

4.2 Achievements (as per 12/85)

Population served:	1981 14,1% or 162'400 people 1985 30,3% or 396'200 people
- Power pump systems:	32'500 people served
- Gravity systems:	256'700 people served
- Handpumps:	107,000 people served with 1'032 handpumps
- Type of handpumps:	The American Moyno ($ 800.--) The South African Mono ($ 600.--) Alternative pump: India Mark II

4.3 Cost, per capita

The following costs per capita have been figured out for the various types of projects.

Spring Protection	$ 7.50
Hand Pump	$ 15.00
Gravity	$ 25.00
Power Pumping	$ 25.00 - 35.00

4.4 Investment costs, overheads

In 1985 the Village Water Supply Section supplied 95'000 people.
With an average per capita figure of $ 25.-- the investment costs amount to $ 2,5 Mio.

The main donors are:
- USAID
- UK
- EEC
- Helvetas
- CARE
- Caritas etc.

Overheads, depreciations etc. are carried by the Government of Lesotho. This contribution towards the rural water supply project was about 15% or $ 450'000.-- for the year 1985.

Most of the managerial posts in VWSS are filled by expatriate experts (SWISS, USAID). Expatriate costs are not included in the cost calculations.

4.5 Drilling

The drilling section is equipped with 12 cable tool rigs. Each rig is capable to drill a 50-m-borehole in 2 weeks. Contract drillers, who are operating with rotary drilling rigs are capable to drill one 50-m-hole in a day.

The total output on boreholes was in 1985 about 700. With a success rate of 70% about 500 handpumps could be installed in 1986.

The target for the second half of the decade is to install approximately 600 handpumps per year.

The costs for a handpump installation are as follows:

Drilling (Average 50 m)	$ 700.--
Handpump (Moyno)	$ 800.--
Pump Pad	$ 100.--
Labour for installation	$ 50.--
Total	$ 1'650.--

These prices vary with the Rand-Dollar exchange rate and source of the handpump.

4.6 Maintenance / cost recovery

Village Water Supply has implemented a maintenance policy in 1985, with the objection to define a standard procedure for all maintenance work Village Water Supply Section has to deal with.

The main points of the policy are:

- Maintenance is basically the responsibility of the villagers.
- In case of a repair job done by VWSS the village has to pay 50% of the costs. (It is intended to increase the village contribution to 100% in a later phase).

Presently the costs are shared between the village and the Government as follows:

The village:	- Basic cost contribution [1] US $ 7.50 per repair job - Free labour - Costs for material (according to materials used for the repair job).
VWSS:	- Travel-time-costs - Transport-costs

(1) Calculation of the basic cost contribution in US $ (Base:1985)

VWSS maintenance budget	US $ 76'000.--
./. Overheads (not chargeable costs)	US $ 36'000.--
Remaining costs to be paid by villagers	US $ 40'000.--
Total maintenance jobs in 1985	540
Average cost for maintenance chargeable to the community	US $ 75.--

Presently, US $ 1.-- per person is collected for the maintenance fund prior to construction activities. Considering that the average size of a village is about 500 persons and by the assumption of one repair job every two years the average amount collected for the maintenance fund should cover the chargeable costs over a period of at least 10 years. Thus, the average basic cost contribution per capita amounts to US $ -.10 per capita and year.

4.7 Community participation

Duties and responsibilities of the community are laid down in the basic principles of VWSS.
The following participation principles (which are mainly carried out by women) are within the responsibilities of the villagers:

- Constitute a Village Water Supply Committee which is responsible for administrative and organisational matters during the planning implementation and operation/maintenance.
- Provide voluntary labour (cutting stones to build the structures, digging trenches, distributing building materials within the project area, such as pipes, sand, cement etc.).

Besides, the community also participates in decision-making processes (placing the public standipes).

In the average, the villagers contribute through voluntary labour about 25% or US $ 6.-- per capita to the total cost. (Average total construction cost is about US $ 25.-- per capita).

4.8 Sanitation

VWSS has a sanitation component. This sub-section works very closely with the Ministry of Health and is still in the pilot phase.

The acceptance by the villagers is very good although the costs for a VIP are fairly high.

The strategy of the sanitation programme is:

- decentralize management and implementation
- minimal financial Government input
- involving the private sector wherever possible
- close coordination with the water supply project
- integrated health education programme.

Costs

The total costs of a VIP latrine range between $ 50.-- and $ 200.--.
The socio-economic study has shown that only 45% of the population can afford a latrine,
30% would require access to the credit.
25% would require some form of subsidy.
The actual rate of implementation is about 40 VIPs per month.
The target for 1987 is about 40 VIPs per week.

4.9 Health

The health programme plays an important role, supporting the measures taken by the water and sanitation project.

The health education plan consists of the following activities:

- district workshops for government health workers,
- community health education,
- training of health workers in clean water and sanitation practices,
- water quality testing,
- close cooperation with the programme of the Ministry of Health.

4.10 Water consumption

Several studies have been carried out in Lesotho on water consumption since 1978.

Study	Type of Supply	Consumption (liter per person and day)
Dr. Feachem 1976	Gravity and Traditional	18
Dr. J. Gay 1984	Traditional	8 to 10
Dr. J. Gay 1984	Gravity	14 to 36
Helvetas 1984	Gravity	9 to 18
Helvetas 1984	Handpump	8

Although Dr. Feachem concluded in his study in 1976 that there is no variation in consumption between villages with improved sources and those using traditional sources, the study of Dr. J. Gay in 1984 shows that consumption in a village with an improved source is significantly higher. Observations and reports from VWSS staff show that villagers with improved water sources do supplement their needs by collecting water for bathing, washing clothes, gardening etc. from unimproved, traditional sources. In addition, it should be noted that villagers with an improved supply have a reluctance to use clean water for any other purpose than drinking, cooking and personal hygiene.

Practical experience shows that the Helvetas study present the most accurate figures on gravity systems, although the study was done during the drought period in Lesotho.

During drought periods, several villages lock their taps or handpumps during certain hours of the day in order to prevent over-use of the clean water.

Consumption figures on handpump systems are very low according to the Helvetas study. This figure is based on very few samples only and does therefore not represent a reliable base.

D 12

UNDP/WORLD BANK RURAL WATER SUPPLY HANDPUMPS PROJECT (INT/81/026)

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UNDP/WORLD BANK RURAL WATER SUPPLY HANDPUMPS PROJECT (INT/81/026)

INTRODUCTION

An estimated 1,800 million rural people will have to be provided with improved water supplies in the fifteen years to the end of the century, if developing countries are to approach full coverage targets of the International Drinking Water Supply and Sanitation Decade (IDWSSD), 1981 - 1990. The first half of the Decade has seen increases in the percentages of the rural population with access to safe water supplies in Africa, Asia and Latin America, but only in Asia has the pace been quick enough to envisage a target of essentially full coverage by the end of the century (ten years later than the original Decade goals). In Africa, present progress rates would leave half of the rural population still without safe water in the year 2000, while in Latin America, it may be 30-40 years before widespread coverage is achieved unless progress improves dramatically.

Accelerated progress is hampered by financial and technical resource constraints faced by many developing countries, and the problem is aggravated by the growing number of completed projects which are broken down and abandoned, or functioning well below their intended capacity. Attempts to increase the pace of providing improved rural water supplies have often been frustrated because the technology used has proved impossible to sustain in village conditions.

To make a lasting impact on the urgent needs, rural water supply (RWS) strategies must be based on sustainable and replicable technologies and systems, and must take account of the pace at which resource constraints can be overcome (institutional and human resource development programs take time to produce results, and economic/financial changes can only be accomplished gradually).

THE SYSTEMS APPROACH

Successful RWS programs involve a combination of hardware and software -- technology and institutional/organizational support elements -- matched in such a way that each community recognizes the benefits of the improved supply, can afford at least the costs of operating and maintaining it, and has the skills, spare parts, materials and equipment available to sustain it. To maximize health benefits, parallel investments in health education and sanitation programs should accompany implementation of the RWS improvements.

This "systems approach" to RWS planning involves consideration of a number of key issues, each individually important, and with the final project put at risk if they are neglected or inadequately addressed:

- Influential involvement of the community in the design, implementation, maintenance and financing of planned improvements, with promoting agencies providing technical

assistance and support services as needed. Villagers' needs and wishes have to be reconciled with their capacity and willingness to pay for the level of service planned.

- Provision for full recurrent cost-recovery, with support of construction costs for poorer communities offset by full recovery where higher service levels are provided.

- Maximum involvement of in-country industry in the supply of services and materials for project construction and maintenance (e.g. supply of pumps and spare parts, servicing and repairs), with the important proviso that quality control and reliability should be assured.

- Technology chosen to match the resources available.

- Institutional and manpower development programs matching the needs of the planned water supply system.

- Parallel programs in health education and sanitation improvements.

SERVICE LEVEL AND TECHNOLOGY CHOICE

The decision about the level of service to be provided for a particular community or district involves consideration of many of the issues listed above. Choices may have to be made between surface water and groundwater as the source, and then from yardtaps, public standpipes, or handpumps, as the method of distributing the water to the beneficiaries.

Groundwater has many advantages over surface water as a source for RWS improvements, the main one being that no treatment should generally be needed to produce safe water. The resource demands of water treatment plants needed to safeguard supplies from surface water sources are beyond the reach of most rural communities, and use of untreated surface water represents an unacceptable health risk. In cases where an upland catchment can be protected against contamination, a gravity-fed system can be reliable and safe, but only a small percentage of the rural population in need of improved supplies live in such areas. It will therefore be rare for RWS programs to be based on surface water as the source, and the technology choices analyzed in this report are focused largely on groundwater-based RWS systems, which will be the right choice for the great majority of rural areas.

The three main technology options (handpumps, standpipes, and yardtaps) represent progressively increasing service levels, and call for increasing financial and technical resources for their implementation and maintenance. The choice of appropriate service level for a particular project or program can only be made when resource constraints have been taken into account, including the capability of the users to operate and maintain the proposed system.

Capital costs of the three technologies generally range from US$10-30 per capita for wells equipped with handpumps to US$40-60 per capita for motorized

pumping and standpipes and US$80 per capita or more for yardtap services. In global terms, that means that cost estimates for meeting rural water supply needs to the year 2000 range from US$50,000 million to US$150,000 million, depending on the choice of technology. With the obvious difficulties of mobilizing financial resources for this scale of investment, rapid progress in meeting basic needs can be achieved only if a large proportion of the rural population in need receives services at the lower end of the cost range. Upgrading to a higher service level may then be financed by the community later, as benefits from the initial investment and from other sources increase available resources.

Analysis of other resource demands of the different technologies also points to a substantial role for handpump-based systems in meeting present needs. The most significant difference between handpump projects and those based on standpipes or yardtaps, is the switch to mechanized pumping, and the consequent need for dependable power/fuel supplies and skilled pump mechanics.

In cases where reliable low-cost electric power is available from a central grid, an electric pump can be a relatively inexpensive and operationally simple means of lifting water. Communities which have the financial and technical means available to implement and sustain projects based on electric pumping should be given every encouragement to do so, as this frees scarce public sector funds and external aid for projects serving poorer communities. However, the number of rural villages with dependable electricity supplies is presently small -- well below 10% of the total rural population in Africa and only a little higher in most countries in Asia.

In the absence of reliable electric power, the alternative power source for mechanized pumps is diesel engines. The logistic problems of ensuring dependable diesel supplies for dispersed communities have rarely been successfully overcome, and there are few examples of diesel-powered RWS systems operating successfully in the long term. The cost of trucking diesel fuel along hundreds of kilometers of rural roads will usually prove prohibitive. Future developments in solar technology may eventually make solar pumping economic for drinking water supplies, but at the moment such schemes have very high initial costs.

Adding the institutional constraints and the severe shortage of skilled mechanics in developing countries, it is clear that systems involving mechanized pumping are appropriate for only a minority of those in need of new supplies in the coming years. For the rest, it seems clear that drilled or dug wells equipped with handpumps will be the right choice, which makes it vitally important that handpump-based projects are planned and implemented in ways which will ensure that they perform reliably and can be sustained in the long term and widely replicated.

THE HANDPUMPS PROJECT

In 1981, as one of the activities in support of the Decade, the United Nations Development Programme and the World Bank initiated a global/interregional project for the Testing and Technology Development of Handpumps for Rural Water Supply and Urban-Fringe Areas (the Handpumps Project). The main objective of the project is to promote the development of

designs and implementation strategies which will improve the reliability of schemes based on groundwater and handpumps, and which will enable schemes to be managed by the communities and replicated on a large scale.

Technology was thought to be at the root of past problems experienced with handpump-based RWS systems, and the Handpumps Project has carried out laboratory tests in the UK and field trials in 17 countries to measure the performance of a total of 2,800 handpumps. Field trials lasted at least two years on each pump, with some 70 different pump models represented in the lab and field trials.

From the beginning, the Handpumps Project has promoted the concept of VLOM (Village Level Operation and Management of Maintenance) as a means of overcoming some of the major obstacles to sustainable water supply systems. Now recognized as one of the fundamental principles of handpump design and RWS project planning, the VLOM concept seeks to avoid the high cost, long response time, unreliable service and other operational difficulties in the repair of handpumps through central maintenance systems. Many past failures of RWS systems can be blamed on the inadequacies of central maintenance, in which a water authority dispatches teams of skilled mechanics with motor vehicles from a base camp, often serving a large district, to respond to requests for repairs or to carry out routine maintenance. Instead, maintenance should be a community responsibility, and this in turn means that the pump design has to be suitable for repair by a trained caretaker or area mechanic with basic tools, and that spare parts should be affordable and readily available to the community.

The Handpumps Project strongly advocates that pump maintenance should be delegated partly or wholly to village committees and that pumps used should be suitable for village-level maintenance. Developing country governments and donor agencies are increasingly changing their policies to include these principles in projects or programs. This is a significant departure from previous practice, particularly in Africa, where unsuitable pumps have often been brought in through donor assistance, and recipient agencies have taken on unmanageable maintenance commitments depending on public-sector mobile maintenance teams.

PLANNING AND IMPLEMENTATION

Few handpump system failures can be blamed solely on the pump. Other major causes are: inadequate or unrealistic provisions for maintenance; poor well design or construction, allowing sand to enter and damage pumping elements; and the corrosive effects of groundwater, which are much more extensive than had previously been suspected. Experiences in the field trials and data from many other RWS projects have enabled the Handpumps Project to formulate guidelines for the planning and implementation of RWS projects using wells equipped with handpumps.

The guidelines deal with five critical elements -- maintenance system; community involvement; aquifer analysis; well design and construction; and the handpump.

Community management of maintenance

Under the recommended system, the community organizes and finances all repair and routine maintenance of the handpump. Work is carried out either by a designated community member with minimal training and basic tools, or by an area mechanic (usually with a bicycle or moped) covering several pumps. The public authority has an important role to play in the training of caretakers and mechanics and in the organization of an adequate spare parts distribution system, but should then hand over maintenance of the scheme to the beneficiaries.

Community involvement

The highest potential for sustainability is achieved when the community is involved in all phases of the project, starting from the planning stage. If the scheme is to continue to operate satisfactorily, villagers have to recognize the need for the improved service, be able and willing to pay for the maintenance cost (and eventually the construction cost), and be willing to manage its maintenance.

Aquifer analysis

Competing demands for other water uses, such as irrigation pumping, have to be taken into account when evaluating aquifer potential for handpump projects. The well needs to be deep enough to allow for seasonal and long-term lowering of the water table, but no deeper, because of the additional cost and complexity. Legislation and administrative enforcement are needed in some areas to prevent overpumping for irrigation leading to future loss of groundwater as a source of domestic supply.

Well design and construction

Wherever the rock is not fully consolidated, screens and filter packs are essential to prevent sand and silt intrusion. Otherwise rapid damage will occur to commonly-used types of seals and valves. The right choice of drilling equipment, backed by appropriate organization of drilling can significantly reduce drilling costs and result in more dependable wells.

Handpump selection

Quite a number of factors influence handpump selection, in addition to the cost of the pump itself. Among the most important are the suitability for the intended maintenance system (e.g. can it be repaired by a trained pump caretaker?), durability, and discharge rate. Pump choice will depend on the required lift and the planned number of users per pump. Standardization on one or a few pump types for any one country can have a significant impact on maintenance and is an important selection criterion; and corrosion resistance has to be taken into account when groundwater is aggressive.

TODAY'S HANDPUMPS

The standard test procedures used in the laboratory and field trials revealed many shortcomings in existing handpump designs. Manufacturers responded well, by modifying their products and introducing new models, and there are now many more pumps on the market which are durable and which allow for substantial involvement of villagers in pump maintenance. Manufacturers from industrialized countries are also being encouraged to combine with enterprises in developing countries to manufacture pumps under licensing or joint-venture agreements. Local manufacture strongly improves the likelihood that spare parts will be available when needed, and facilitates standardization on pump types in a country to simplify caretaker training and stocking of spare parts.

Encouraging as these developments are, there remains a scarcity of handpump models which can be described as VLOM and are suitable for lifting from depths of more than about 25 meters (though the majority of the rural population lives in regions where the water table is not so deep). The depth of installation and heavy pump construction make removal of downhole components difficult. An added problem is that, due to the high cost of the well, deep pumps tend to serve more people per well and so suffer rapid wear.

For low lifts (up to about 12 meters), direct action pumps, like the Tara prototype developed in Bangladesh, in which the operator lifts and lowers a T-bar handle directly attached to the pumprods, have a number of advantages. Elimination of the bearings that are part of lever- or flywheel-operated pumps reduces maintenance needs, and the pumps can be manufactured in developing countries at a relatively low cost. They make extensive use of plastics materials, which make the pumps light-weight and corrosion-resistant. Direct action pumps have the great advantages over suction pumps that they can lift from more than the 7-meter limit for suction (important since groundwater levels are falling in many parts of the world) and that they do not need priming and therefore avoid the risk of contaminating the well with polluted priming water.

For high lifts (down to about 45 meters), a below-ground design which allows extraction of the piston (and footvalve if desired) without removal of the cylinder and rising main appears to be the most promising VLOM design. However, low-cost, durable and corrosion-resistant VLOM designs for below-ground components have only been used successfully in preliminary tests for lifts of up to 25 meters. Development of VLOM pumps below 25 meters remains an important task for the next phase of the Handpump Project -- and for manufacturers and implementing agencies.

To take standardization further, attempts are now being made to develop designs in which some of the same components can be used for pumps operating in different depth ranges. In East African development work, for example, a standard 50mm diameter cylinder with the same piston, footvalve and pumprod is being tested with different pumphead configurations for the whole range of lifts from 0 to 45 meters. For low lifts, the below-ground components are connected to a T-bar handle to be operated as a direct action pump; at higher lifts, a lever handle is used, with the handle length varying (two options) depending on the lift.

It is clear that some pumps are much more suited than others to conditions in developing countries, and that as pumping lift increases, the number of pumps suitable for village-level maintenance declines rapidly. Nevertheless, the Handpumps Project has shown that, even from the pumps presently on the market, it is possible to design a handpump-based water supply system for the vast majority of conditions prevailing in developing countries, which can be sustained in reliable operation without dependency on a significant level of support from a central authority.

THE FUTURE

The need to accelerate large-scale implementation of RWS schemes to meet urgent needs calls for a more systematic evaluation of past and proposed strategies and for the preparation of detailed guidelines for implementation at the regional and possibly country level. Lessons and conclusions about the implementation, operation and maintenance of handpump-based community water supplies have to be implemented initially through demonstration projects in specific regional conditions. The demonstration projects will also include evaluation of measures to enhance the benefits from rural water supplies, to develop recommendations on the synchronizing of related health and other interventions with water supply improvements. The proposed comprehensive RWS package therefore includes:

1. Well design, construction and development.
2. Implementation of projects with VLOM handpumps.
3. Community participation in planning, construction and management of maintenance.
4. Selection and training of caretakers, establishment of incentive schemes, and increasing the role of women.
5. Spare parts supply and distribution.
6. Implementation of sanitation components.
7. Health education.
8. Cost recovery by the community to cover at least recurrent costs.
9. Measures to reduce capital and recurrent costs.
10. Non-domestic water use, such as micro-irrigation and cattle watering, wherever applicable.

A joint effort is needed by donors and developing country governments, to initiate demonstration projects on a large enough scale to permit development and analysis of country- or region-specific ways of implementing relevant

items of the package. There may, for example, be several different ways of organizing spare parts supply and distribution, which make best use of private and public sector activities in particular countries.

From the demonstration projects, guidelines on implementation of each package element will set the stage for large-scale implementation of RWS schemes at a comparatively low cost to the public sector, managed by the users at affordable cost -- in other words, schemes with a good chance of providing a satisfactory service for many years to come.

UNDP Interregional Project INT/83/003 - PROWWESS
(Promotion of the Role of Women in Water and Environmental Sanitation Services) D13

TAPPING A NEW RESERVOIR FOR WATER

> "When you're talking about water, you're talking about women: the old woman, the middle-aged, the youth ... in that village. But you're not only talking about women, you're talking about communities ... When the people are involved, - using their time, their money, their opinions being taken very seriously ... they feel the project is theirs. It's no longer a government project; it's no longer a KWAHO project; it's no longer a Water Aid project or UNICEF or UNDP - they see it as their project."

This comment by Margaret Mwangola, Director of the Kenya Water for Health Organization (KWAHO) sums up the guiding principle behind UNDP's interregional project INT/83/003-PROWWESS (Promotion of the Role of Women in Water and Environmental Sanitation Services).

Initated by UNDP/DGIP in mid-1983 with funding from the Norwegian and Canadian Governments, PROWWESS is one of a growing number of UNDP projects which apply a strategy of people-centred development, and which pay special attention to women's roles within this framework. When 1980-1990 was declared International Drinking Water Supply and Sanitation Decade (IDWSSD), it had become clear that past approaches which relied on high technology solutions and large amounts of external financing were totally incapable of meeting the goal of safe and adequate drinking water and sanitation for all people. A WHO report had estimated that over half of new pumps installed in rural areas broke down within three years and countless others go unused. Causes were not only technical - design which was inadequate or inappropriate to developing country conditions; or institutional - lack of systems for operations and maintenance. They were also human: the absence of a feeling of real involvement and responsibility on the part of the user community. Based on needs perceived and solutions conceived externally, new facilities were delivered to beneficiary communities in rural areas. They were expected to receive them gratefully, use them faithfully and provide for their operation and maintenance. "Participation", if considered at all, was usually interpreted to mean communities contributing their labour or financing to construct the facilities, thereby reducing the cost. UNDP/PROWWESS has focussed its efforts on changing this approach to start with the user.

It happens that in the case of water, the user community consists primarily of women. They have traditionally been managers of water for household use. They decide, from the alternatives available to them, which source they will use, how much, and for what purpose; as well as how it will be stored, used, reused, and discarded. Moreover, women have primary responsibility for instructing their children in water and health-related behaviour and knowledge. This primary role of women had been recognized by the Water Decade Steering Committee when, in 1982, it established the Inter-agency Task Force on Women in the IDWSSD. UNDP

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then took the initiative to obtain resources to actually implement some of the Task Force recommendations in concrete field activities. It is against this background that PROWWESS has set itself the task of finding ways of tapping the often hidden reservoir of initiative and creativity which these women have, in order to solve their water and sanitation problems in partnership with technical agencies and services. The attitude we are seeking to bring about was expressed eloquently by a participant at the end of a PROWWESS-assisted training workshop in Indonesia: "It's clear outsiders can't solve all our problems. We have to do it ourselves ... Let's start with our own resources and then, if we need help, we can ask people from the outside."

A first step was to gather information on existing experience. Initially this proved to be difficult. While some informants spoke of projects which had "involved women", we normally found on further investigation, that the experience had not been written up or analyzed. Reports which had been prepared usually referred to people's participation, without making a distinction between men and women. Nevertheless, working with the International Reference Centre in the Hague, an annotated bibliography and literature review on the Participation of Women in Water Supply and Sanitation: Roles and Realities was compiled and published in 1985, drawing on almost 800 articles, reports and "gray" literature, most of them primary sources.

It became clear early on, however, that there was no general blueprint which we could follow. There were a number of examples of individual communities which had organized to obtain their own services, but these spontaneous initiatives did not provide much guidance for technical agencies aiming to cover whole districts or regions. Because of the complexities of the social process involved, the approach would need to be custom-designed for the particular social, cultural and institutional conditions in each case. We therefore decided to undertake a number of demonstration activities at the field level, wherever possible linking up with a UN system or bilateral donor agency project which was providing resources for "hardware". On this basis we hoped to be able to arrive at certain principles and lessons of experience which could guide others in the future. Moreover, we believed that we would have more impact on future activities of the technical agencies which control the majority of resources going to this sector if they themselves directly experienced the benefits to be gained from involving the users. To this end, we are now collaborating with WHO (Indonesia, Egypt), IBRD (India, Kenya, Lesotho), UNICEF (India, Lesotho, Nepal, Sri Lanka) and UNDP/OPE (Nepal); as well as with SIDA (Kenya) and NORAD (Zambia).

A key factor in each case has been identification of a local partner agency which could serve as intermediary between the communities' perceptions of their own needs and the external resources being made available by the donor agency and the technical ministry (usually Water, Public Works or Health) for their solution. In some cases, there may be staff of a Government agency who can play this role. For example, in

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Nepal, we are working with extension workers of the Women's Development Section in the Ministry of Panchayat and Rural Development; in Sri Lanka with the Women's Bureau; and in Lesotho this role is played by extension workers of the Ministry of Health and the Ministry of Cooperatives and Rural Development. More often, however, local NGOs have been selected because of their greater flexibility, the dedication and motivation of their staff, and their ability to respond to and gain the trust of villagers. In the demonstration projects which PROWWESS now supports in 11 countries worldwide, we are working with six local NGOs, four international NGOs, and three local research institutions. The latter are conducting case studies of the experience of the pilot activities.

For a better idea of how this works out in practice, it may be useful to look more closely at one of these activities. The one in Nusa Tenggara Timur in Indonesia is typical. This remote Province, which consists of a total of 111 islands, is one of the poorest in the country, with low rainfall, limited arable land, widely scattered population and a variety of socio-cultural traditions. Since 1980 UNDP has been co-operating in a Rural Water Supply project there, executed by the Ministry of Health in co-operation with WHO. Dr. Nafsiah Mboi, the very dynamic woman who is head of the local chapter of the PKK (national Family Welfare Movement), expressed interest in testing a community-based approach focussing principally on women, with technical suport concerning exploitation of water sources to be provided by the UNDP/WHO project team. Four villages were selected for inclusion in the pilot programme, and a flexible action plan was prepared. PKK field agents and village volunteers joined extension agents of the Ministries of Health and Home Affairs for orientation and training in participatory techniques of working with community women. A local research team has carried out a baseline survey concerning water sources, useage, beliefs, village institutions and male/female attitudes which provided much useful information on which the PKK agents are drawing for their community liaison work. Village men and women are planning their water systems improvements in consultation with the MOH/UNDP/WHO technical team, and programmes for training community women in water management, group organization, and health education are being initiated.

Similar activities are underway in Nepal, with the Social Services National Coordinating Council and the Women's Development Section, Ministry of Panchayat and Rural Development; in Thailand with the Girl Guides Association and the Ministry of Health; and in Sri Lanka, with the Women's Bureau and UNICEF. In Kenya, PROWWESS has joined UNIFEM in supporting the Kenya Water for Health Organization to do community liaison and motivation work in communities in the coastal Kwale District covered by a UNDP/IBRD/SIDA/Ministry of Water project. Here 24 women community water leaders have been trained to maintain and repair handpumps, and they and others participate enthusiastically in community water committees. UNDP/PROWWESS programmes in Egypt and Lesotho focus on rural sanitation, while in Bangladesh and Zimbabwe we are collaborating in training and follow-up support for women health volunteers selected by

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their communities, who then return to their communities to promote improved health practices. A somewhat different approach is being used in India, where PROWWESS is contracting local research organizations in four different regions to carry out feasibility studies of women's participation for the national Rural Sanitation Programme. This broad Government initiative, which covers 13 states, is also receiving technical support from UNDP/IPF, IBRD, and UNICEF.

Although in each case the local agencies have been selected because of their solid base of experience, most of them have requested UNDP/PROWWESS support in strengthening their own capabilities, particularly for training of trainers and extension workers. In providing this support we have started off with a focus on methodology, rather than content, using participatory techniques to lay the base for effective adult learning and creative problem-solving. This has been done through field-based Workshops, which have been held so far in Nepal, Indonesia, Kenya, Lesotho and Zimbabwe, and have proven to be one of the most productive activities of the PROWWESS project. Trainers and extension workers from the collaborating institutions are brought together with extension workers from other local agencies to experiment with and design themselves a number of non-traditional learning materials and exercises. This experience helps them to discover, express, and create innovative ways of working with communities in order to become effective change agents. They then have an opportunity to test these out in an actual village environment, and to come back and evaluate their experience in the group.

The Pocket Chart is an example of the kind of innovative learning aid which is being used to permit non-literate trainees or community members to conduct self-surveys, for example on what water sources they use and for what purposes. "Pockets" are made out of paper or cardboard and are attached by transparent tape or glue to a large, poster-size piece of paper and arranged in a matrix. Drawings act as captions for vertical columns which, in this case, would picture various water sources. Participants record information on their own practices by placing tokens in the appropriate pocket along horizontal rows, indicating how often and for what purpose each source is used. They can then count the number of tokens, tabulate and analyze the results themselves.

The main purpose of these techniques is to help villagers become aware that they themselves have the knowledge and capability to solve many of their own problems and increase their self-confidence and release their initiative to take action with the means at their disposal. This human development dimension is particularly important for reaching rural women, to overcome the social and psychological barriers which may have to be overcome before they can confidently articulate their ideas and take on community roles. In such circumstances, a change of attitude is fundamental to the process of self-sustaining development. This can be illustrated by an example from a village in Nepal where a woman development officer, trained in a PROWWESS Workshop, was assigned. Stimulated by some of the participatory techniques, a group of village

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women were discussing ways of solving the problem of handpumps broken by children playing with them. Drawing an analogy from a situation where her pig had run free and caused damage to a neighbour's house, one woman recalled she had been obliged to pay the neighbour for the repair. She proposed that, similarly, parents of children responsible for damage to handpumps be required to pay a fine. This solution was finally accepted by all the members of the group and put into practice.

At the end of another of the workshops, this one held in Kenya, a participant commented that:

> "Surveys show what outsiders need to find out about what insiders of a community already know ... If we people were really involved in planning (water supply activities) in our own community, you would find we already have many of the facts you outsiders go to such pains to get ... and often get wrong because we have learned to keep the most important things to ourselves."

People guard this information for themselves because they feel it is a way of keeping control over their own lives. They fear dealing with an outside world they don't understand or control. The objective of UNDP/PROWWESS is to help them demystify this world and change their attitudes. The possibilities are evidenced by the comment of another village woman from Nepal: "At first we were afraid of the project ... we were afraid that we could not do it. Now we feel we can do anything!" It is this immense reservoir of human potential which UNDP/PROWWESS is trying to tap.