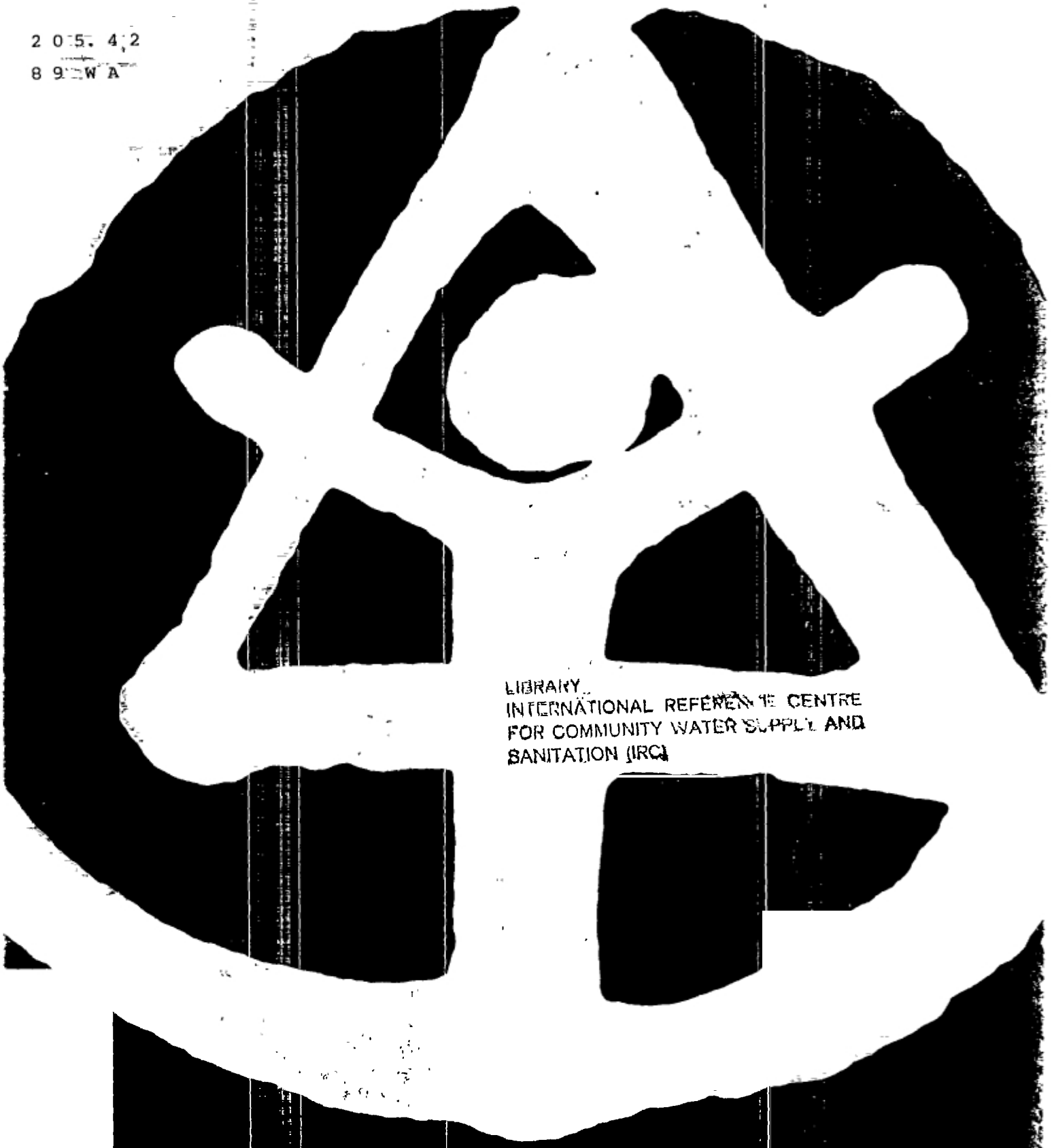

WATER SUPPLY IN LOW-INCOME HOUSING PROJECTS: THE SCOPE FOR COMMUNITY PARTICIPATION

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Training Module

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GUIDELINES FOR THE INSTRUCTOR

This module has been developed as one of a set of modules of the training programme for community participation in improving human settlements. It discusses how and to what extent a community can participate in the development or in the implementation of a water-supply system in an urban low-income area. It outlines the various topics related to the two major areas of special attention (community participation and urban water supply) contained in the module.

The topics are divided into three parts:

- Defining the problem in urban water supply and management
- Availing tools; community participation, training, financing, technology
- Developing the project; planning, implementation, maintenance and evaluation.

Target group: Project staff, community workers, local leaders and residents involved in the execution of squatter-settlement upgrading and slum-improvement projects.

Number of participants: 10 - 15 persons

Duration: Three or four days

Location: Preferably the training should be as much as possible executed on, or close to, the spot where there is a need for improvement or upgrading of a water supply. Classroom teaching should be kept to a minimum, so as to enable the trainees to gain practical experience rather than just increase their knowledge of the subject matter.

Preparation: In order to link the training to the situation in which the trainees are or will be working, the instructor has to prepare background papers before the start of the training. For that reason, a small reference list of useful books is presented at the end of these guidelines.

First paper The trainer should identify beforehand a water-supply problem area as sensed by him/her in the community and prepare a background paper, defining the problem and possible solutions. The general water supply problem should be clearly recognizable for every community or project staff member.

Second paper In the second paper the identification of water-supply problems is entirely left to the trainees. Based on the instructions taught in the first session/paper the trainees will try to tackle the water-supply problem on their own.

Third paper In the third paper a small-scale, potential water-supply project in the neighbourhood, and basic instructions for its execution, are described. This project will be the basis for on-the-job instruction in the second session.

The background papers and other relevant material are to be distributed three days ahead of the training session to the trainees so that they have the opportunity to read them through.

First session In the first training session the trainer and trainees read together the background paper to make sure all understand the water-supply problem posed in the paper. Based on this problem, discussion will be held on the constraints,

(health) risks, burdens, and their causes and possible solutions. Through this discussion the limits and opportunities of community participation in the water-supply improvement or construction will be known. A visit will then be paid to the water-supply problem area as mentioned in the paper and discussed in the classroom. The trainees will check if their assumptions are right.

Second session In the second session the trainees will be on assignment in the field to identify a major water-supply problem in this fieldwork. The trainees are divided into groups of three to five persons. Each group is assigned the task of preparing answers to issues raised in the course paper, using local water-supply projects as their reference. Depending on the number of participants, groups can be formed around such topics as:

Characteristics of the target group

Where and how do the target groups of the low-cost water-supply project live? Are they able and willing to maintain the system?

Community organization

Are there any community organizations among the target groups which served as channels for community participation? Were the target groups involved in the planning of the project? How were the users organized at neighbourhood level? Was maintenance organized by the community?

Communication with users

When and how have the users been briefed about the project? What did the users have to know in each phase of project execution? What documents were prepared for the users? What tools were used to explain the design of the water supply system to the users?

Procedures for community participation

What procedures existed for the involvement of the users in project implementation? Were these procedures suitable for the involvement of low-income groups? If not, what kind of procedures would be useful?

Third session In the third session the trainees work out the construction of, for example, a standpost,[1] estimate the quantity of materials, calculate the costs, arrange for active participation etc.

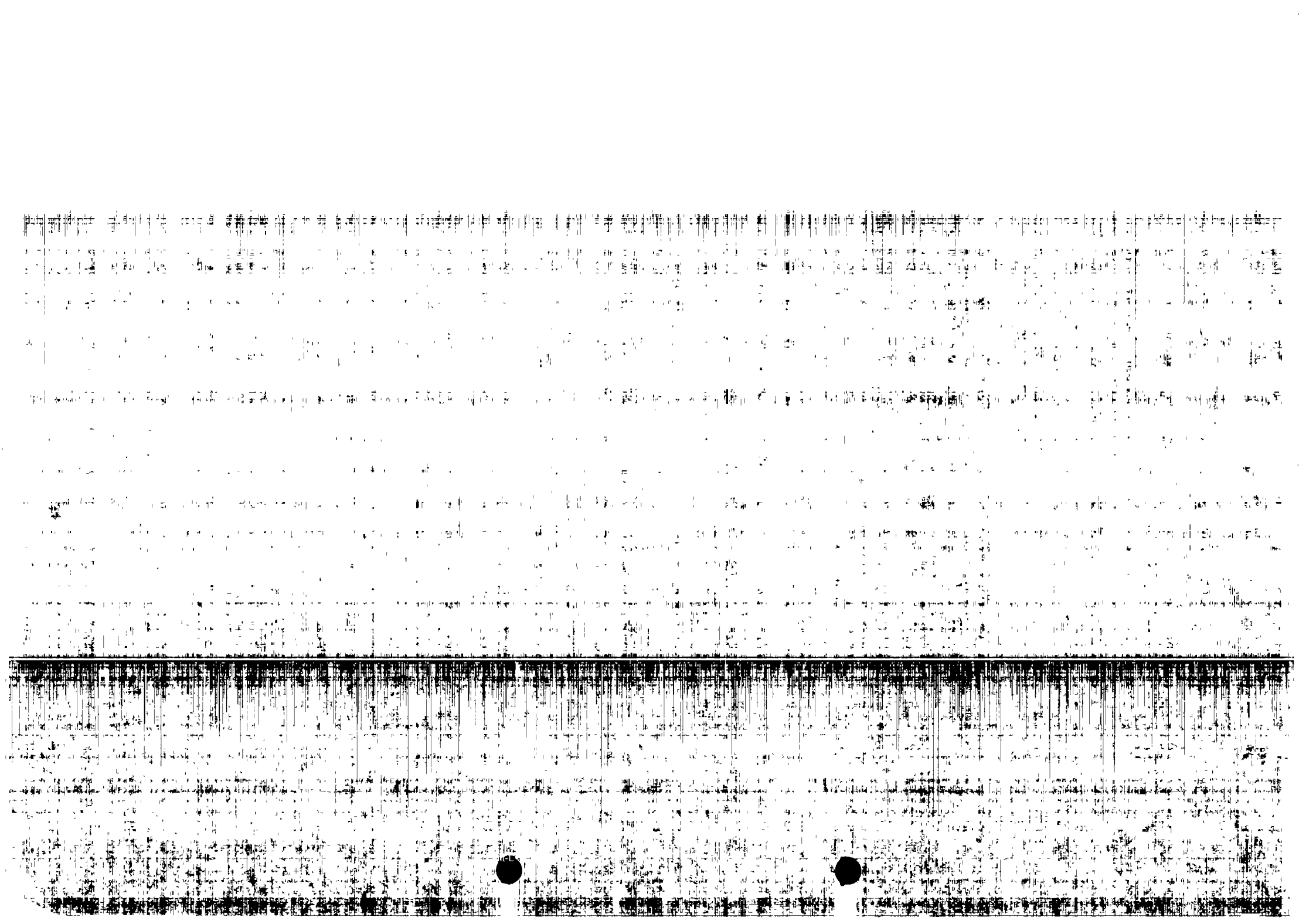
Furthermore, they will design - based on their former fieldwork and experience - ways of involving the community concerned in the planning of the standpost project.

After one month an extra plenary session is held. During this plenary session, the former trainees and the users of the new standpost evaluate its operation, costs and the approach which was followed in the planning of the construction and the involvement of the parties concerned.

Background reading Relevant material for background information, exercises and assignments:

Financing - *How people can afford shelter* (Nairobi, United Nations Centre for Human Settlements (Habitat), 1989).

Community participation	- *Guidelines for planning community participation in water supply and sanitation projects* (Geneva, World Health Organization, 1983).
	- *Community participation in squatter settlement upgrading* (Nairobi, United Nations Centre for Human Settlements (Habitat), 1985).
	- *The role of women in the execution of low-income housing projects* (Nairobi, United Nations Centre for Human Settlements (Habitat), 1986).
Water sources and health	- *Community water supply* (Geneva, United Nations Development Programme and International Labour Office, 1987).
Standposts	- *Public standpost water supplies* Technical Paper 13 (The Hague, World Health Organization Information Reference Centre on Community Water Supplies, 1979).
General water	- S. Cairncross and R. Feachem, *Small water supplies* (London, The Ross Institute of Tropical Hygiene, 1978).
	- T.D. Jordan, Jr., *Handbook of gravity flow water systems* (Kathmandu, United Nations Children's Fund,1982).
Project management	- F. Davidson and G. Payne, *Urban projects manual* (Liverpool, Liverpool University Press, 1983).
Evaluation	- *Water Supply and Waste Disposal Management: Impact Evaluation Guidelines* (Nairobi, United Nations Centre for Human Settlements (Habitat), 1987).



CONTENTS

I. INTRODUCTION

Urban water supply

Most expanding cities in developing countries are faced with the problem of water shortages. Gross irregularities in urban water systems are common. There are communities where only a few public standposts serve more than a thousand inhabitants. In a number of slum areas, residents have organized illegal tappings from the water mains because the water authorities have not provided adequate services. Low-income communities, and in particular squatter areas, are usually given the lowest priority in water provision, as compared with other urban communities and areas.

In many poor urban communities, irregular water supply or extremely low pressure cause long queues at public standposts. As a result, people are forced to fetch water of poor quality and with health risks from streams or ponds. Alternatively, they have to depend on mobile water vendors who sell water in small quantities and at prices which are usually higher than the costs of water supply through home connection in the middle- and high-income areas.

Participation

Previously, when water-supply projects were implemented, the recipient communities were regarded as passive beneficiaries. The facilities were planned and supplied by the government, without involving the communities. This approach has led to a large number of unsuccessful projects. Problems occurred, especially in the upkeep and maintenance of the water facilities, leading to malfunctioning or discarded water installations.

In recent years, community participation has gained importance in community water supply projects. Planners have come to realise that community participation is an essential ingredient for projects to be successful. When community water-supply projects are implemented, the people who are the beneficiaries should be involved in all stages of the project.

There is a tendency in low-cost water-supply and sanitation projects to restrict the contribution of the community to unskilled labour, such as digging and backfilling of trenches, carrying of materials and clearing the sites. This contribution is, of course useful, but community participation involves more than the provision of labour alone. The community needs to be involved in the other phases of the project as well. The community can contribute to the design, planning, financing, construction, maintenance and evaluation of a water-supply project.

The urban community

In projects involving the community, it is most useful to acquire adequate knowledge about the specific community or communities one wants to work with, particularly as regards its social structure, demographic composition, economic activities or leadership pattern.

Homogeneous communities hardly exist. In any community, there are great differences between people. These differences can be based on income, education, religion, origin, or economic control. There are, for example, conflicting interests between urban house-owners and slum dwellers, between the dominant political groups and minorities. Also men and women may have opposed interests in economic or social developments.

Women

Traditionally, women are the main users of water for the household: cooking, washing, vegetable gardening, animal husbandry, brewing, or plastering walls and floors. These activities have consequences for the level of nutrition, income

and hygiene of the whole family. In general, women collect the water, and this may occupy a lot of time. Therefore, an improved water supply will benefit women directly.

Children It is important to understand the specific role of children in health education. Children should be well trained in safe hygienic practices. This sets a pattern of behaviour for their future. They can be reached via the schools where activities can be started such as information campaigns for safe water and sanitation. The children can bring new information home and help to motivate their parents to participate. Safe water and sanitation practices will benefit especially very young children, who are vulnerable to water-related health hazards. Their health situation will improve.

Men Having recognized the importance of women and children in the development of water projects, men should also participate. They may have little daily involvement with such tasks as fetching water and its various uses in the household, but their co-operation is essential since they often are the decision-makers in the household and usually control the household finances.

It is clear from the above that all members of the community have their role in improving a community water supply system.

Water authorities

Many different authorities may be involved in water projects and it is essential to assess at the start of a project which institutions are likely to participate and to plan at what stage of the projects communications are necessary with each of these. In general, one can assume that the larger the project is the greater the involvement of government institutions will be.

Local leaders

Local leaders may have formal positions in the local institutions or be informal key persons. They play an important role in opinion development. The blessing of local leaders and their co-operation to start a project are essential.

Local organizations

Neighbourhood organizations may be equipped to handle activities related to programme design and maintenance effectively. A study of their capacity will show the feasibility of such alternatives.

Non-governmental organizations (NGOs)

Where bureaucrats may find it difficult to experiment, NGOs may have more flexibility. They can gain a fuller understanding of the community and are able to guide the people towards more effective participation.

Experts

Water experts will also be necessary to study water quality and water-related health conditions. The social distance between outside experts and members of the community may however limit their effectiveness in developing local programmes directly with the members of the community.

Subcontractors

Sometimes, water-supply systems are leased to individuals, for example kiosks or licensed retailers. Such solutions are likely to create an easy distribution and

rate- collection system, facilitate the operation and maintenance, and control damage and pollution. Special attention will be necessary, however, to avoid the situation in which the poorest people spend a substantial part of their income on drinking water.

Community participation

A community water-supply project consists of several phases, from the initiative to the design, through the planning, financing and construction to the operation and maintenance. In all these stages the involvement of the community is a key element to ensure a successful project. When the communities are fully informed about all stages of the project and also have contributed to the project through a wide range of proposals and activities, then the project will attain a high degree of commitment from the beneficiary communities.

Adopting a community-participation approach in a water-supply project may require quite some changes in the existing system for water provision. At the level of the community, organizational and technical skills have to be developed. At the level of the water departments, personnel will need to be trained in participatory activities, and at the national level organizations may need restructuring to incorporate a community- participation strategy. At all these levels the commitment to involve the communities genuinely in development projects must exist.

Training and education at all levels is required to ensure a successful implementation of participatory community water-supply projects. Various types of participatory training can be distinguished: technical training, community organization training, administrative training, user education and health education. This training module outlines how to assess the need for training, what type of training can be offered and how to organize the training programmes.

II. WHAT THE COMMUNITY NEEDS

Although there may be a need to install new or changed water-supply facilities from the point of health conditions or for technical reasons, it is of great importance to find out what the people themselves feel their needs to be.

Sometimes the need for a change, especially in the field of health, is obvious for the outside expert such as a community-health worker or a development worker, but it may not be clear to the people. People have developed their own practices in water supply and have their own rules and beliefs to explain, for example, diseases. Some of those practices and rules fit very well in a health programme, others need to be changed since the reasons behind them are wrong.

Understanding the needs

People cannot see "disease-carrying organisms" which may effect their health, so they may not realise the health risks of the existing water and sanitation practices and therefore see no need for a change in practices or for improved facilities. They do see and feel however the burdens of various practices. A local leader may see different problems and see problems differently from his community; a woman having a key role in water practices and domestic hygiene will certainly see other burdens than most of the men. So special attention should be paid to gender-specific needs asking the women what they want and being responsive to their needs in the improvement.

At the community level, where initial enthusiasm for water and sanitation improvements is found lacking, the community- participation approach can include an educational component to increase awareness of the benefits of a project. Thus, whatever the outcome of the initial contact with a community, there are follow-up steps to be made.

A careful needs assessment will greatly assist in establishing overall goals and objectives. Without an explicit agreement on the goals and objectives there is the risk of providing inappropriate technology on conducting a training workshop which is neither consistent with programme goals, nor supported by key managers.

Philippines *In the Philippines, residents in the Tondo Foreshore upgrading area are involved in deciding how the project will be implemented. The project authority presented three options for the realignment of houses and the layout of roads, footpaths and water-pipes. The final choice among the three options was up to each neighbourhood. When an evaluation team asked a sample of residents how they felt about re-blocking, 87% per cent expressed satisfaction with the process. One of their reasons for satisfaction was that the project authority had been receptive to their suggestions.*

Community-based survey

Designing low-cost water-supply and sanitation projects in developing countries requires information on several aspects of community life. In addition, the design of a communication-support programme to promote the project and bring about behavioural change will need to take into account such matters as:

- Local beliefs and attitudes regarding water, sanitation and health
- Traditional water-use or defecation habits and excreta-handling practices

- Current levels of knowledge in the community about disease transmission.

Since all knowledge, values, beliefs and practices vary according to social class, ethnic group, educational attainment, and family tradition, and since communities are rarely homogeneous, it is useful to be aware of the facts and register them as the first part of the project. Some knowledge of the social and political structure of the community power groups, political factions and lines of authority is, therefore, necessary.

A possible range of useful socio-cultural data for low-cost water projects is:

1. DEMOGRAPHY

- Population size, growth rate, mobility;
- Household size and composition (special features such as women heads of household, sharing, individual or family renters).

2. HEALTH

- Major health problems in the community and the relative importance of water and sanitation-related diseases;
- Seasonal variations.

3. OCCUPATION

- Major occupations and approximate distribution;
- Seasonality of employment.

4. ORGANIZATION AND PARTICIPATION

- Major local organizations and types of membership;
- Community and family-level leadership in decision-making;
- Major local political or social factions which might affect participation;
- Extent of previous interest and participation in water, sanitation or other development activities;
- Important characteristics that would determine the acceptability and influence of outsiders working on projects in the area.

5. LEVEL OF INTEREST

- Evidence of popular interest in improving water supply or latrines, compared with other potential improvements in the community;
- Evidence of leadership commitment to improvements.

6. PHYSICAL STRUCTURES

- Types of dwellings, their physical condition and layout;
- Types of building materials used;
- Existing water-supply and sanitation facilities;

- Space availability inside and outside dwellings.

7. WILLINGNESS AND ABILITY TO PAY

- Ownership of land and houses;
- Income distribution;
- Expenditure patterns;
- Borrowing and savings customs.

8. WATER-USE PATTERNS AND PRACTICES

- Preferred source of water (by purpose);
- Quantity and uses;
- Water-source-related activities (e.g. laundry, animal watering);
- Possibilities for contamination of drinking water.

9.DEFECATION HABITS AND ASSOCIATED PRACTICES, UNDERLYING BELIEFS, ATTITUDES

- Existing practices (noting important differences between: castes; religions; men, women and children; different age groups);
- Cleansing and ablution materials and practices (e.g. anal cleansing materials; prevalence of bathing in latrines);
- Underlying causes of above;
- Important taboos, beliefs, related to locations, sharing, etc.;
- Latrine emptying and sludge reuse practices;
- General household cleanliness.

10.LOCAL TECHNOLOGY AND RESOURCE AVAILABILITY

- Local availability of building materials;
- Availability of skilled and unskilled labour (noting seasonal variations);
- Availability of technology-related inputs (such as water for pour-flush latrines).

11. EDUCATION ACTIVITIES AND POTENTIAL

- Literacy level;
- Mass media access in area;
- Coverage by field workers, volunteers;
- Ongoing formal or non-formal health education activities.

Data-gathering methods

A. Participant-observation

The researcher establishes residence in the community to be studied and remains there weeks or months, observing and recording the activities and events of daily life and participating in it.

B. Key-informant interviewing

Key-informants are people in the area itself who are particularly knowledgeable about certain matters. This method has been used mostly to help reconstruct past ways of life. A limitation is that one or two key-informants may provide only a distorted view of the society under study. Where it is important to have exact quantitative information, surveys are more reliable than key-informants.

C. Open-ended questionnaires

The interviewer bases the questions on the answer to the previous question. As a result, the questions are respondent- generated rather than investigator-generated, and so are likely to be more comprehensive. Written down in steps first, the investigator must list the topics about which they need knowledge. Next, the questionnaire must be pre-tested so problems can be identified regarding question interpretation. This type of questionnaire should be administered to a minimum of 30 people. The wider the variety of people interviewed, the greater the range of answers that will be provided. The last step is to analyse the results. Responses to questions can be categorized, counted, compared and listed in tables.

D. Surveys

Surveys are most useful for collecting demographic data, for systematically quantifying the occurrence of observable objects or characteristics and for estimating the prevalence of particular attitudes, beliefs and values.

Surveys have several drawbacks: they usually require much time and money; and they use pre-structured answers which tend to limit exploration into cultural beliefs and values and sometimes into personal practices. Surveys may either be complete (100 per cent coverage) or based on samples drawn from the population, depending on the size of the project area.

TASK 1: Split up in groups of about three and design a questionnaire for a given project area to gather socio-cultural data for a water-supply project.

III. WHICH PROBLEMS CAN OCCUR

Experience from other (community) water- supply projects shows the following categories of problems occurring in project implementation:

- Water and health problems
- Social impacts
- Economical and technical constraints
- Negative impacts on women
- Environmental constraints

Water and health problems

At several places people collect water for their daily use: drinking, washing clothes, bathing, cleaning utensils, general cleaning and watering animals or vegetable gardens. After collection the water is taken home and either stored or used directly. Water as such and by the way it is handled may cause a risk to the health of people. Generally speaking, there are three ways by which water can cause various diseases; drinking contaminated water, being in contact with contaminated water and lacking water for proper hygiene.

Drinking water

1.Drinking contaminated water (also during bathing/swimming).

It is difficult to find out if water is contaminated. Water from "open" sources, rivers, lakes, ponds and pools, and from unprotected springs and wells can be considered contaminated and unsafe for drinking.

Water is only safe for drinking:

- When it is boiled for at least 15 minutes
- When it is fetched from a protected well of spring
- When rainwater is collected fresh from the air (if the air is not polluted).

In all these cases one rule needs to be applied: the container in which the water is collected should be clean; likewise the cup or glass from which the water is drunk. All other water needs treatment.

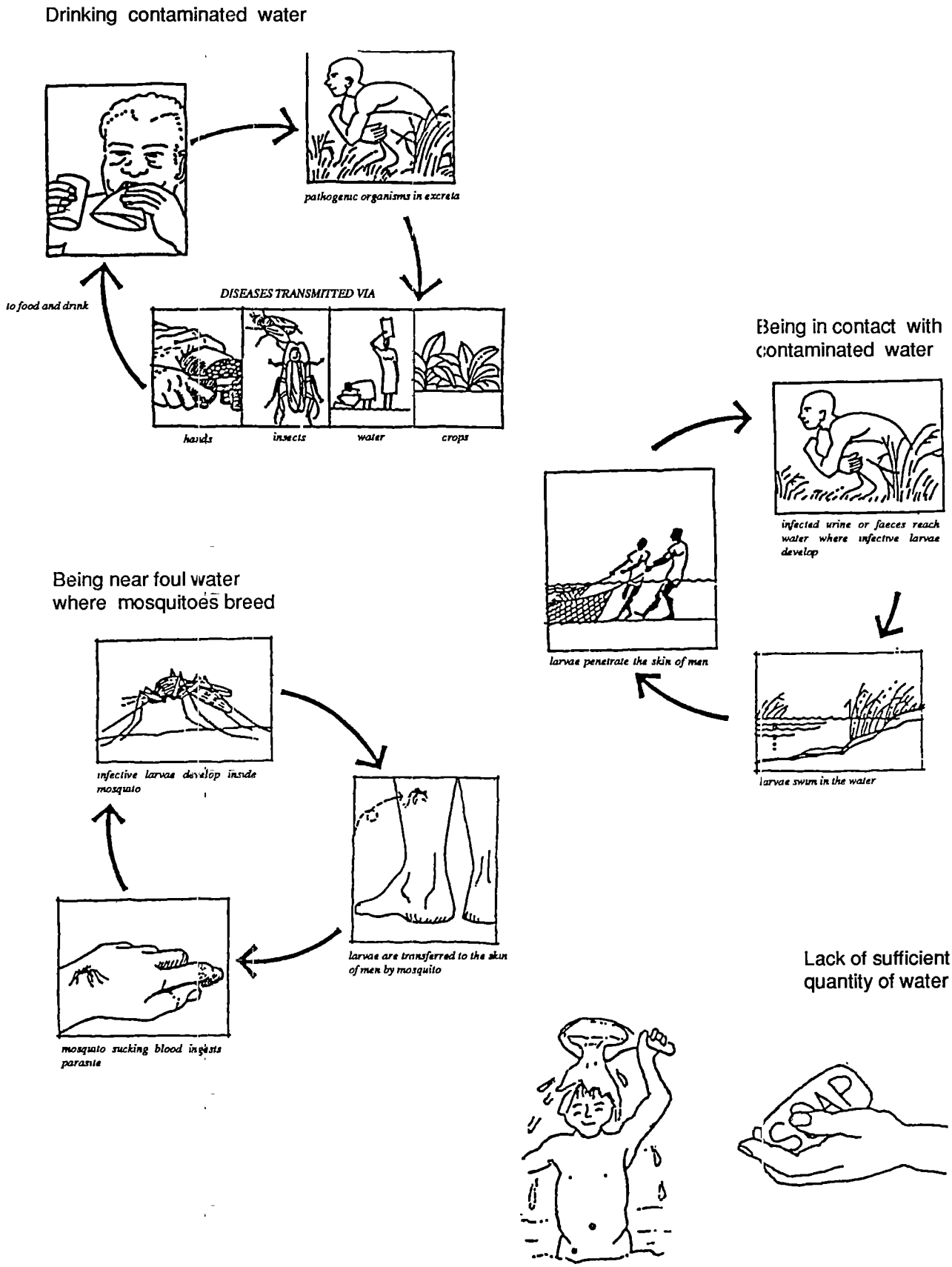
Contact water

2. Being in contact with contaminated water (bathing, swimming, washing clothes) and being near contaminated water (close to ponds, pools, lakes, dams, irrigated plots).

Even when the contaminated water is not drunk, a disease can still be contracted by being in contact with contaminated water, while washing clothes at the banks of the river, lake or pool or while bathing in such water. In the water there may be little creatures like worms which enter the blood vessels via the skin.

Being close to open water may be dangerous too. Open, stagnant water, such as pools, ponds and puddles, are good breeding places for insects like mosquitos, which carry diseases like malaria.

Figure 1. Water and health problems



3. Having too little water available for proper hygiene (cleaning of clothes, body, bedding, utensils, house etc.).

The human body and clothes need regular cleaning and washing. This prevents skin diseases and louse-borne fever. Also eye and stomach diseases can be prevented by regular cleaning, which needs enough water to wash hands, eyes and utensils before preparing food to remove dust and fly footprints. For each person in the family about 25 litres (almost three buckets) of water are needed per day for proper hygiene.

Asia *Three health implications around a water pump.*

A big stagnant pool of water surrounds a hand pump. One man tried to tell people to keep the area clean, not to bathe there or do their washing. He gave up as nobody listened to him: "Who are you to tell us what to do? This is Government property, not yours!"

Three streets in a city have been paved by their residents. They were community projects, whereby people did the work and the Government provided the stones. The people also dug a drain to the pond, but nobody could keep the drain clean: the sweeper did not want to do it, and the other residents, being of higher castes, could not do this kind of work. Yet they know that this stagnant water is dangerous to health.

There is a primary school for girls. The school has no money to buy a storage pot for water for the children, so the children take water from the well, which is nearer to the school than any of the hand pumps.

TASK 2: Split up into three groups. Each group discusses possible improvements of one of the three cases chosen; discuss the outcome of the three groups in a plenary session.

Social impacts

Problems may occur regarding the power structure in a project area. The power of dominant groups may be increased in the form of selection of a water-supply operator on a salary. The community organization of the programme, in collaboration with a powerful external agency, will be a political resource in terms of prestige.

Central slum areas are often served by communal bath-houses and clothes-washing places. In some cultures, these facilities have important social and religious significance which is all too easily ignored when Western standards are applied to improvement proposals. In Indian cities and some East African countries there are separate neighbourhoods occupied by communities that earn their living washing clothes. It can be argued that there are far too few communal washing places, but they may be wasteful of treated water supplies and may serve as a source for illegal unmetered connections. Many squatter settlements provide themselves with communal washing places and with baths and showers. In some cases shower cubicles are constructed to provide privacy. More often than not, the same standpipes are used for bathing, washing clothes and for drinking water, causing confusion and waste.

Economic and technical constraints

Dominant groups might get a subsidized service which the poor do not receive, e.g., an individual supply to their homes.

Removal of an employment opportunity in water-carrying, well-digging or any other activity linked to the existing system, such as the manufacture of equipment used.

Equal contributions from all inhabitants for the construction or running costs of the water supply may mean a charge which poor families cannot afford.

Qualified manpower is in short supply in most developing countries, and agencies responsible for infrastructure services have been handicapped by inadequate staffing. Frequently, costly developed-country technology has been applied indiscriminately.

Water standards

Design criteria and standards used in the provision of infrastructure for low-income settlements have not been appropriate. Legislative instruments such as codes, regulations and standards, suggest the use of unnecessarily high standards and technologies. These instruments have, as a result, prevented the use of cheap and relevant technologies.

Many water agencies fail to budget for system maintenance, with the result that systems fail and fall into disuse. The quality of the service suffers as a consequence, and the facilities need to be replaced prematurely.

Some slums are served by a treated water supply, but overcrowding creates a shortage which is compounded by the fact that this water must be used for all purposes. Leakage in the distribution system is also one of the causes of shortage resulting in greater water loss, intermittent supplies and risk of contamination.

Negative impacts on women

Benefits could have been increased and negative impacts could have been avoided with more involvement of women. These issues are summarized in the checklist presented below:

Reduced benefits to and negative impacts on women in domestic water supply projects

1. Certain categories of women are excluded from access:

- Poor women
- Minority groups
- Women heads of households

2. Greater benefits and development opportunities went to women from wealthier households, thus widening the gap between rich and poor.

3. Workload of women is increased by:

- Voluntary labour for construction
- Loss of assistance in water collection

4. Poor women and/or their husbands have lost employment or resources in water distribution.

5. Women have no control over the income from increased availability of water for economic purposes:

- Agriculture
- Horticulture
- Dairy cattle

6. Special needs of women are not met:

- Laundry and bathing facilities
- Service operating hours
- Privacy

7. The involvement of women has been confined to:

- Health education
- Special projects

8. Improved facilities have led to reduction of:

- Traditional spheres of influence
- Organizational skills
- Social status

Although women's involvement is gaining recognition, there are still many cases where they are not given opportunities to take part in all aspects of project work.

Asia *In an Asian urban slum development project, women initially made up 45 per cent of the paid project staff. In 1981, their involvement was reduced to 23 per cent, most being replaced by paid men. At the same time, women were essential to the project, because almost three quarters of the households were of one particular religion. This resulted in an increase in the number of voluntary workers, 93 per cent of which were women.*

QUESTION: What is wrong about this change? Consider payment and voluntary work and the role of men and women in this project.

In urban projects in Latin America, local women have been involved as intermediaries in programmes for sanitation, preventive health, basic education, and nutrition and have been employed increasingly by the departments concerned.

Environmental constraints

Water sources Water sources which demonstrate large fluctuations in supply may not be able to meet demands without the provision of storage facilities. The distance from the source to points of demand will also influence the relative costs of development.

Few squatter settlements have proper roads and pathways. This limits the accessibility needed to construct water-collection points or for water tankers to enter these settlements. Limited public awareness of the hazards of contaminated or limited water supply promotes the spread of diseases and unhygienic conditions.

Ground-water is usually suitable for human consumption without treatment, but care must be taken to ensure that contamination is not introduced since aquifers have very little potential for self-purification. Faecal contamination (water-borne diseases) and chemical contamination (industrial sources) can also have a serious detrimental effect on public health.

Although the volume of industrial waste- waters is relatively small in developing countries, the local hazards to environmental public health are often high, since the disposal of industrial waste is usually not well-controlled and residences are allowed to develop in the immediate vicinity of industry.

QUESTION: What could be the danger of industrial waste- water to a nearby residential community?

Approaches to anticipated problems

Health Users tend only to focus on the convenience aspects of infrastructure. It is difficult to convince people to rebuild their toilet because of groundwater pollution or that the public standpipe in the courtyard does not help unless the stored water is protected from contamination. Acceptance of improved facilities should include improved environmental health behaviour. Regular evaluations and continued health education will contribute to this.

When an improved water-supply system is successfully adopted , but no attempts are made to improve other environmental sanitation conditions and behaviour, other routes of infection will remain. Such improvements include disposal of excreta and other wastes, food hygiene, drainage, etc. A package approach to environmental health is therefore advisable including at least water- supply, waste disposal and health education.

Change of behaviour Development is a process of change and some changes are welcomed without much persuasion, while others require much effort. When a new habit presents itself as a new option, as an alternative to existing ways of doing things, then there often is a resistance that has to be overcome. People can change their behaviour if they have a motivation for it. The motivation can be rational and emotional. The understanding that the new habit is better may give a clear rational motivation, but even if this is the case there may be irrational factors that counteract it. Consequently motivational factors are essential to understand the process of change that is desired in development planning.

For example, the primitive hygienic practices of low-income families, many of whom may have recently arrived from rural areas, have often been used as excuses for not providing residential services in their communities. Residents need information and assistance in the transformation of these practices which must be an integral part of neighbourhood infrastructure provision.

The change of behaviour can be stimulated by:

- Building up knowledge of the ways in which customary behaviour needs to be changed and bringing together the knowledge within the community with the knowledge outside the community;
- Spreading the built-up knowledge, and improving understanding of disease transmission and ways it could be reduced;
- Increasing motivation to reduce disease transmission (respected community members (or organizations) can play an important role here);
- Facilitating changes in any way feasible.

Use of water Many of the problems associated with urban water supply may be traced to a failure to distinguish between the quality requirements of water for different uses. In addition, it is necessary to have wide knowledge of the hazards involved in using untreated water and a better sense of the wasteful use of pure water.

FIG 2 - Sample Checklist of Uses for Water and Relevant Requirements

Use of water (not exhaustive)	Requirements for health	Requirements for convenience
1. Drinking by babies, sick people	Assured purity (boiling may be specified)	Practical/customary constraints: is water boiled or only heated?
2. Drinking by healthy children and adults	Purity	Taste: will boiled or deep well water be rejected?
3. Rinsing mouth, cleaning teeth	Purity (perhaps less stringent)	Is there a custom of using surface water which is suspect?
4. Food preparation - uncooked food	As above	Is there a custom of using surface water which is suspect?
5. Dishwashing	As above	Preference for running water?
6. Cooking	Taste; colour and clarity	
7. Personal hygiene (washing body without immersion)	Abundance. Use with soap or heated	
8. Bathing, swimming (immersion)	No bilharzia	Privacy?
9. Washing clothes	As above	Softness (economy of soap)? Preference for running water?
10. Watering of domestic animals		Requirements of each type of animal: dispersion of sources to avoid overgrazing?
11. Vegetable gardens	Sullage acceptable but sewage only after some treatment	Space near houses? Damage by pigs or other animals
12. Irrigation of food crops	Care to avoid bilharzia; sewage only after treatment	Equitable sharing of water as major source
13. Other irrigation or fish culture (incl. irrigation of pastures, tree crops, non-food crops)	Care if sewage is used (e.g., to cook fish or meat well); protection against parasites while working in water	

This checklist is only a sample it will need to be modified in local circumstances. In the third column, many more concerns will certainly be apparent in each community The suggested requirements for health are not to be taken as authoritative but only as a sample list of concerns.

The demand for potable water will increase in urban areas as they continue to grow. The exploitation of new sources of water is customarily believed to be the only alternative for meeting this demand. However, the unit costs of additional water supplies will tend to increase because of higher capital and operation costs, longer distances and/or elevation differences. One alternative to high cost is the reduction of current water use. Through the use of various conservation measures there is considerable scope for the reduction of such high water use.

Educational campaigns in schools, newspapers, and through television can increase the consciousness of the people to use less water and to prevent waste by, for example, quickly repairing faucets.

Measures for reducing system losses consist of improved maintenance, renovation and replacement of critical elements of the distribution system (electro-mechanical equipment such as pumps, motors etc.) and the establishment of special emergency squads.

TASK 3: Prepare a list of "regulations" which should be observed by the community to keep their area hygienic.

IV. CHOICE OF TECHNOLOGY

In general, technologies offering higher service levels place correspondingly higher resource demands on the benefiting community. The most obvious is the need for more capital investment, but equally important are operation and maintenance costs and the demands for technical skills and materials (fuels, chemicals etc.).

Appropriate technology

A technology that provides a socially and environmentally sound level of service and the full anticipated benefits, including economic cost, may be considered appropriate.

Obstacles in the implementation of water- supply projects have been the strict application of public health regulations, service codes and standards which are based on, or are sometimes even complete copies of, a building code of a former colonizing power which set standards applicable only in highly industrialized, high-income countries.

This inconsistency between standards and needs has restrained progress in the delivery of infrastructure services to low-income communities. Arguments stressing the inability of low-income communities to pay for these unnecessarily high standards are often used as reasons for not serving them. So there is an imperative, in most developing countries, to produce up-to-date codes, regulations and standards for infrastructural services that are suited to the requirements of the majority of the (low-income) population.

Water quality

There are water-quality standards set by the World Health Organization (WHO). Often it turns out that the level of these standards is difficult to achieve and to maintain. To treat all consumable water to the required standards is unaffordable. A dual water system, consisting of a small water-supply /distribution system for drinking water only and a separate system for other domestic and industrial services, may reduce the costs of a (scaled-down) treatment plant but increase costs of a double distribution network.

Water quantity

WHO has set a minimum level required: 25 litre per capita per day (lpcd). The actual consumption depends on many more variables physical and socio-cultural condition and the type of service provided. Average levels in low-income settlements range between 20 and 40 lpcd for communal taps with maximum walking distances of 200 m and from 40 to 60 lpcd for household connections. The demand for multiple household taps is likely to be slightly higher.

Factors in technology selection

The type of technology to be applied in providing a community water supply depends on various factors:

1. Available funds from government, the community or donors;
2. Physical conditions, quantity of water and energy, soil conditions;
3. Organizational capacity (technical abilities) of the community.

Success or failure depends primarily on one factor: can the new water system be sustained?

1.Available funds

Costs Community-water-supply (CWS) projects usually have limited funds. Only if a sizable proportion of total costs can be recovered from the benefiting communities, will it be possible to construct a self-sustaining CWS.

Regardless of how the capital costs of CWS projects are financed, recurrent costs (for operation and maintenance) should be borne by the community.

These imposed payments often may fail because:

- The community may not value the improvements highly enough to contribute to their maintenance;
- The community may not appreciate the type of low-cost water-supply option proposed, but wants an alternative more costly supply for which they are willing to pay, because they value the extra convenience.

Figure 7, which includes low and high cost estimates for the different technical options, illustrates the financial resources which need to be mobilized for different types of water-supply improvements.

2. Physical conditions

Source When CWS technology options are to be compared, some physical conditions need to be assessed: the water source and the energy source.

- The water source

In choosing a water source, it is preferable to find one which supplies sufficient good- quality water and to protect it, rather than to take water from a doubtful source and treat it. Springs, protected upland streams and groundwater are thus the preferred choices. There are however some situations in which groundwater may prove unsuitable. Naturally occurring salts can make the water unpalatable or aesthetically unacceptable (e.g. high iron levels impart a bitter taste and can stain food and laundry), and in some cases may be damaging to health.

The level of the groundwater and the potential yield of the water source have to be assessed. It depends on the size of the community to be supplied with water what quantities are needed and what yield the source should meet. In a less densely populated urban fringe area there could be many sources to meet the demand (water tanker, wells, pumps and springs). In a densely populated area these sources are less likely to meet the required quantity of safe water.

- Energy source

In a densely populated urban area the demand can most likely not be met by sources like springs, wells, water tankers etc. Moreover in such areas the sources are usually contaminated being in underground contact with pit latrines. Water will then be drawn from larger sources by means of larger equipment (wind, solar, electrical or diesel driven).

In a less densely populated urban fringe area there may be communal wells or springs, where people still draw water by hand(pumps). Any CWS system which depends on something other than human energy for its operation involves an added risk of failure through power supply interruption. These reliability risks can be minimized by proper design, but often this means much higher costs and external resources beyond the control of the community.

Diesel In urban areas the difference in costs between electrical-powered or diesel-powered pumps may not be as substantial as in rural areas where transport may fail to reach an isolated pump. Problems may occur in diesel supply to low-income areas when the supply is scarce and will go to the highest bidder: the well-to-do in their easily accessible areas. Maintenance of diesel engines is however more frequent and complex.

Electricity An electric pump can be a relatively inexpensive and operationally simple means of lifting water. However, if the power is irregular, or available for only short periods each day, daily water demand may not be met and expensive elevated storage may have to be increased. When the supply is intermittent, users tend to leave taps open, to fill containers when power is restored. Distribution is then inequitable, with only those closest to the storage tank being able to obtain water, and there is high wastage.

Wind and solarWind and solar pumping schemes have substantially higher initial costs (but do not rely on external fuel supplies) and need sophisticated and costly maintenance skills and spare parts that are not readily available to the community. Some components of solar systems that have been introduced in developing countries cannot even be repaired at the country level, but have to be replaced with new equipment or shipped to the overseas manufacturer if a breakdown occurs. Renewable energy systems also involve extra costs, because of the back-up water supply needed to cope with times when the energy source is not available.

These constraints do not rule out motorized pumps, but they do mean that ways of ensuring reliable supplies must be worked out and costed, before the community takes the decision on the affordability of higher service levels.

3. Organizational strength

Organization Many CWS projects fail because the right skills, materials or organizational capacity are not available. When a community invests labour and capital in the improvement of its water supply, it needs to be able to run it financially and technically.

Since in urban areas the CWS will be of a more complex level (perhaps in a phased development) some organizational provisions need to be made.

For hand-pump schemes, the organizational structure needed involves creation of a mechanism such as a water committee to manage repair and maintenance activities and to procure spare parts.

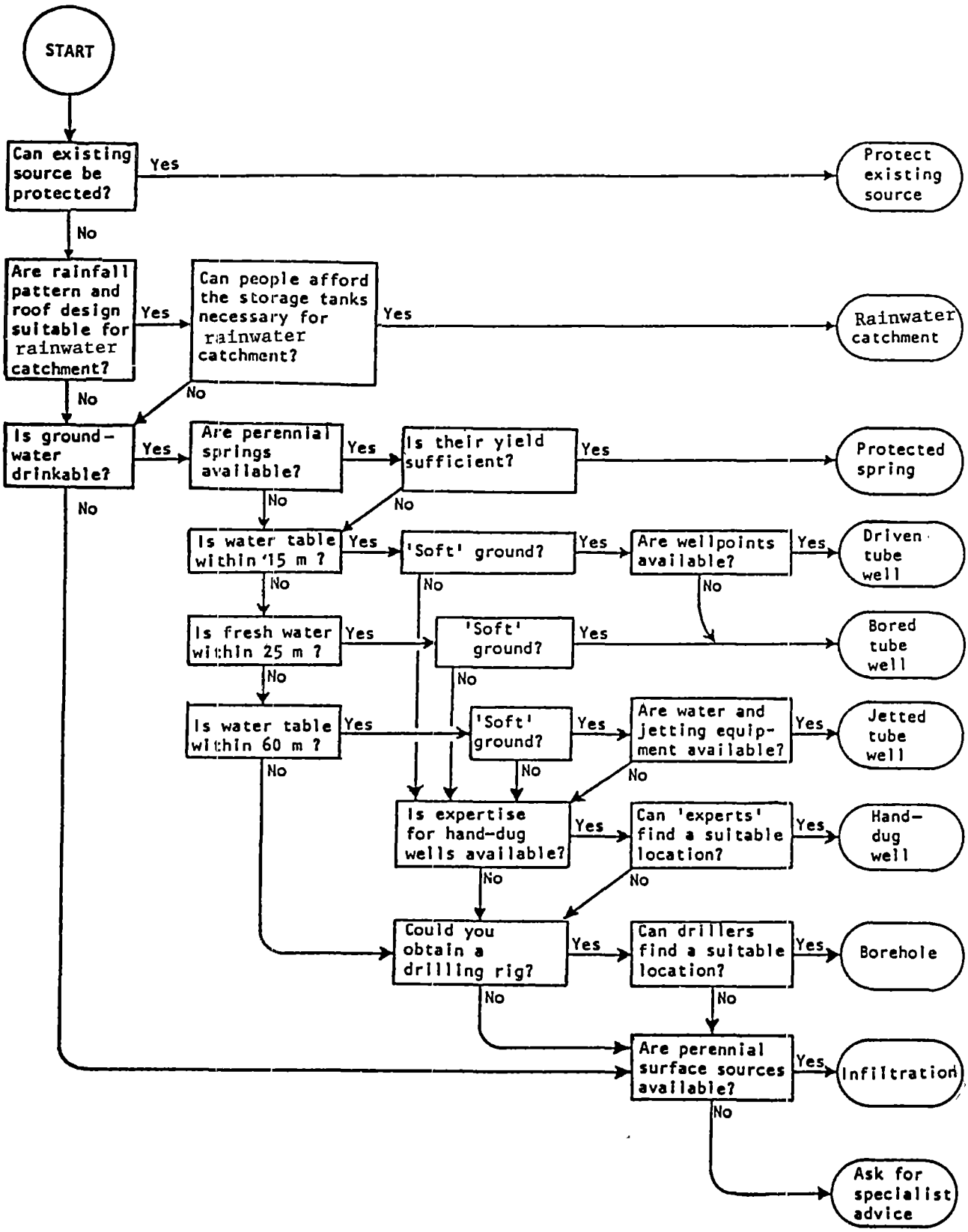
Availability of skilled manpower is a critical consideration in technology choice, as it has a direct impact on the feasibility and cost of installing and sustaining any type of system. Developing countries may have a severe shortage of trained people in the water-supply sector. In urban circumstances there are usually all sorts of mechanics available either in the formal or informal market.

Assessment of organizational resources has to be carried out at both national and community level, and a decision reached on the duties for which each will take responsibility.

Self reliance at the community level is the only workable alternative in the long run, and the community must assess whether it can provide the level of skills and equipment needed for a higher level of service, or opt for the lesser maintenance needs of a hand- pump based system.

Figure 3. Choosing a water source

Follow the arrow corresponding to your answer to the question.



Source: S. Cairncross and R. Feachem, Small Water Supplies

Water-supply sources and options

Three major sources of water exist:

1. Atmosphere; condensation, rain;
2. Groundwater; springs, wells;
3. Surface water; seas, rivers, lakes, ponds.

All these sources may be used for community water supply but each source has its specific implications such as accessibility, quantity, quality and costs to draw the water and possibly treat it.

1. Atmosphere

Rainwater

The interception of rainwater before it reaches the ground has the advantage that the water may be collected with minimum contamination. The use of roofs for water collection is widespread in developing countries with regular rainfall, and, under satisfactory climatic conditions, collection of rainwater from roofs can supplement other water sources at minimal cost.

The quantity of rainwater which can be collected is often under-estimated. From a pitched roof of a single room (3x3m) in an semi-arid area with a rainfall of 350 mm per year can be collected: 3mx3m (area) x 0.35m (rainfall per year, per square metre) x 1.2 (factor for pitched roof) = + 3.8 cubic metres which makes 3800 litres of potable water.

A major problem will be (safe) storage, since usually in tropical countries the rainy period comes only once or twice a year. Good (ferrocement) storage jars and tanks have been developed at reasonable cost. In urban areas there is, however, a risk of the rainwater itself and/or the roofs being polluted from industrial activities, bird droppings and dust. The risk is even more apparent when the rainwater is collected from inner paved courtyards. Rainwater collection on a large scale is also of importance. By the creation of contour ridges and catchment areas the rainwater can be prevented from running off into rivers and stream unused in the open sea, and can instead, be used to replenish the groundwater source.

2. Groundwater

Groundwater as a source has a number of advantages over surface water (safe water, storage buffer, relatively simple installation to supply water directly).

Surface waters are prone to serious contamination and therefore treatment is necessary.

Springs

Springs with a regular flow of water constitute one of the most economical sources of water for domestic use. Since most springs produce uncontaminated groundwater, there is no need for disinfection or any other treatment. Civil works consist basically of concrete or masonry structures to intercept the water at the point it surfaces, and the same structure is designed to protect the water from external contamination, avoid clogging of the spring "eye" and intercept silt or other material which might otherwise pass into the water-distribution system. Spring catchment units require little maintenance that cannot be done by unskilled personnel. However the yield from springs is normally small, and their use for the supply of water to large settlements is not feasible in most cases.

Wells Large-diameter excavated wells are adopted:

- Where it is not possible to obtain, maintain or pay for drilling small- diameter wells;
- Where it is desired to use a type of water-raising system requiring more space than is available in a small diameter well;
- Where there are cheap labour and local skills and the aquifer is not very deep;
- Where it is necessary to store water in low-permeability aquifers.

Large-diameter wells have the disadvantages of requiring long construction periods, posing safety hazards during construction and operation, being easy to contaminate and giving generally low production rates.

Wells, whatever the type, have to be located and protected to minimize the risk of pollution through direct access of contaminated surface water, seepage of contaminated water from the surface, infiltration of polluted groundwater, access of refuse to the well shaft or insanitary water-drawing systems. Only rarely will groundwater require treatment, and, if it does, this will mainly take the form of disinfection. A well in an urban low-income area will be frequented by many people.

Pumps The risk of an open well being contaminated is high. From this point of view, a (hand) pump on top of the well is a necessity. Diesel Pumps or electric pumps can be fitted to the well connected with a storage and piped distribution system. In an urban situation, skilled labour is not the obstacle, but the financing of that labour and the replacement of expensive parts are.

3. Surface waters (rivers, lakes)

Surface water constitutes the main source of water for domestic and industrial consumption. Surface water for domestic consumption almost always requires some form of treatment. Techniques for surface water catchment are not necessarily complicated but they normally involve civil works, and thus technical supervision is often required. One way of reducing the pollutant load when abstracting surface water is to construct an infiltration gallery under the bed of or alongside the body of the surface water.

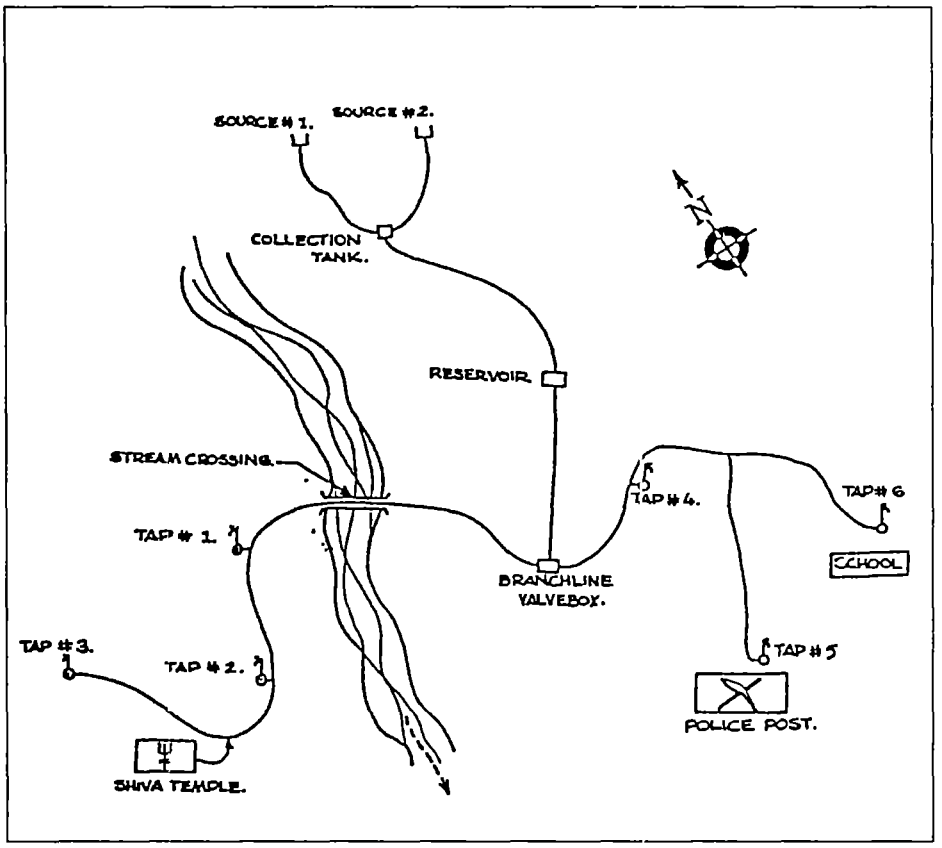
Besides the high capital costs a temporary failure of the treatment system can result in an outbreak of waterborne diseases. Reliable operators, spare parts and uninterrupted supplies of fuel and chemicals are therefore prerequisite to systems based on surface water sources. Obviously this will increase the capital as well as the recurrent costs considerably.

Distribution system

When water is not supplied to the consumer directly from the source, it is necessary to construct a water-distribution system that will bring water close to every household. Since the distribution network is one of the most expensive items in a water-supply system, the standards for design and service level should be carefully studied and chosen for every situation.

Special attention should be given to existing water-distribution facilities when upgrading low-income settlements. It is well known that water wastage in the distribution system sometimes amounts to a substantial proportion of the produced water. Investment in the repair of leaks and control equipment can often increase the amount of water available to consumers at a minimal cost.

Figure 4. Distribution system



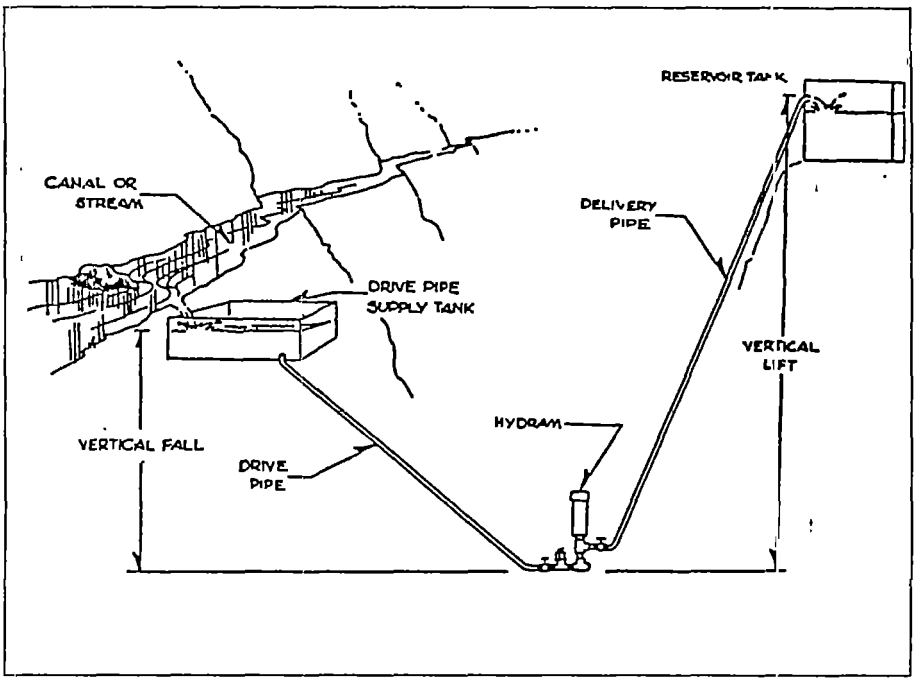
Bangkok

Autonomous collective solutions for water supply were documented in Dhaka and Bangkok. A group of squatters located on a marginal strip behind a low-cost housing project built their own distribution network with a number of standpipes serving each two houses and asked permission to connect it to the main which supplied water to the housing estate. They share the consumption charge and scrupulously maintain their investment. The Soi Sukan community in Bangkok is one of the many examples of slum neighbourhoods where house groups arrange for an autonomously managed distribution network from the few metered connections.

Gravity flow

The action of gravity is used to move the water downhill from a source to the neighbourhood. A suitable source is located at an elevation higher than the area to be served. An intake structure is built to collect the water, which is then piped down to the village through a buried pipeline of high-density polyethylene (HDP) pipe. If needed, a reservoir tank is built above the level of the area. From there, the water is distributed to several public tap-stands that are scattered throughout the area, via the mainline, branch lines, and tap lines.

Figure 5. Hydram Installation



Where multiple sources are used, a collection tank may be built and due to the topography of the land, at certain points break-pressure tanks may be required to prevent excessive pressures from bursting the HDP pipe. If the source water is carrying a lot of suspended particles, a sedimentation tank may be required to clean these out.

Water treatment

A large population as well as industries produce lots of waste (water), contaminating various water sources. This combination of factors often makes treatment of water in urban areas almost inevitable.

The first decision to be taken by the designer of a water supply is whether to treat the water or not, taking into account the fact that water treatment tends to complicate the operation of a water system and to increase costs. For these reasons, treatment processes should be included only when strictly necessary to bring the water to realistic, affordable and potable levels of quality.

Local adaption of the design

The acceptance of new facilities is not a simple matter:

- The users will compare them with the existing provisions to see in what respect the alternative is better.
- The innovation may also have some flaws in its cultural compatibility.
- The design of the facility may also not be in accordance with the local motor muscular patterns.

Appropriate technology

In India for example, a protective parapet changed the women's posture, thus making water collection more exhaustive in their view and causing long waiting times. In the United Republic of Tanzania a foot pedal for water pumps had to be adapted to operation by children. Adaption of the design can be necessary. Such adoptions can, first of all, be the result of the community study.

Figure 6. Options for community water supply

Step	Type of service	Water source	Quality protection	Water use (lcpd)	Energy source	Operation and maintenance needs	Costs	General remarks
5	House connections	Groundwater Surface water Spring	Good, no treatment May need treatment Good, no treatment	100-150	Gravity Electricity Diesel	Well-trained operator;reliable fuel and chemical supplies; many spare parts;waste-water disposal	High capital and operation and mainten-ance costs, except for gravity schemes	Most desirable service level, but high resource needs
4	Yardtaps	Groundwater Surface water Spring	Good, no treatment May need treatment Good, no treatment	50-100	Gravity Electricity Diesel	Well trained operator; reliable fuel and chemical supplies; many spare parts	High capital and operation and maintenance costs, except for gravity schemes	Very good access to safe water, fuel and institutional support critical
3	Standpipes	Groundwater Surface water Spring	Good, no treatment May need treatment Good, no treatment	10-40	Gravity Electric Diesel Wind Solar	Well trained operator; reliable fuel and chemical supplies; many spare parts	Moderate capital and operation and maintenance costs, except gravity schemes; collection time	Good access to safe water, cost competitive with handpumps at high pumping lifts
2	Handpumps	Groundwater	Good, no treatment	10-40	Manual	Trained repairer; few spare parts	Low capital and operation and maintenance costs; collection time	Good access to safe water; sustainable by villagers
1	Improved traditional sources (partially protected)	Groundwater Surface water Spring Rainwater	Variable Poor Variable Good, if protected	10-40	Manual	General upkeep	Very low capital and operation and maintenance costs; collection time	Improvement if traditional source was badly contaminated
0	Traditional (unprotected)	Surface water Groundwater Spring Rainwater	Poor Poor Variable Variable	10-40	Manual	General upkeep	Low operation and maintenance costs (buckets, etc); collection	Starting point supply improvements

The first draft design will be based on:

- The local physical conditions;
- The available funds;
- Purely technical data;
- Users' experience.

This draft plan should be discussed with the community, so as to include:

- The expected benefits;
- The necessary socio-economic modifications;
- The status of the new device;
- The experiences of other nearby communities, local discontent and preferences with existing designs.

In selecting the first step, CWS planners must work closely with the community to be served, to evaluate the resource demands of each technology option, and compare them with available resources.

The community should also be involved in the testing of designs. Care should be taken that all user categories are involved in such tests. Women, as the major users, must be involved. They can test for practicality, such as the ease

of operation of pumps. They may perceive other consequences of the facilities than do males, such as risks to children.

Other possibilities are visits to nearby (pilot) projects. the installation of demonstration models in the community and the use of models and audio-visual materials.

The complexity of the design will usually correspond to the complexity of organizational arrangements. With a simple design, one caretaker may suffice for the regular maintenance and simple repairs and to ensure proper user practices. More complex designs will demand increasingly complex arrangements for operation, maintenance and administration. The training of more voluntary or paid community members will be required.

TASK 4: Calculate the difference in litres of water used for a community of 400 people, when they have handpumps or house connections.

V. PLANNING A COMMUNITY WATER SUPPLY

Experience from many countries indicates that infrastructure systems are best maintained, least abused and most financially successful where the communities to be served were selected because they expressed a real interest in having a new or improved system. The best evidence of such interest is willingness to contribute to construction costs and to pay an adequate fee for use. However, meaningful community involvement is more than the supply of free labour and local material or, even, cash contributions. It is involvement of the community at all stages of project development, from initial conception and planning to construction, operation and maintenance. Where public awareness of the need for a given service is low, special promoters can prove useful in mobilizing community support. The process of consultation with the users requires time and the recruitment of additional personnel, but the returns, in terms of reduced resource wastage often outweigh the implied increase in planning costs.

Participation in project phases

Project phases

The community can participate in various phases of the CWS project:

1. Initiative;
2. Locating the facilities;
3. Planning and design;
4. Construction;
5. Operation and maintenance.

1. Initiative

The initiative to install a water supply or to improve the existing one may be taken by various actors:

- The government

As part of a national plan to extend water supply to all citizens of the low-income area in order to improve, for example, the health conditions of the community. Usually the water-supply system is working perfectly in the city centre (offices) and high-income areas, but not in the remaining, low-income areas. This would mean the extension to a large and densely populated area, thus requiring lots of resources.

- Agencies whether local or foreign

Agencies, such as the United Nations and the World Bank among others, have allocated funds for the improvement (and installation) of proper water-supply systems. In 1980 for example a "water supply and sanitation decade" started to provide all people with access to safe drinking water and sanitation. Through such campaigns more attention (and possibly funds) is given to this problem. Sometimes church organizations take the initiative to supply their community with proper drinking water facilities (partly) financed through their own world-wide resource network.

- A politician

The politician truly active for the community he/she represents, or seeking votes close to election time, may initiate rallies and fund drives to get a community water supply off the ground.

- The community itself

Members of the community or their leaders, aware through daily experience of the lack of safe and/or nearby water supply, through local meetings start a move amongst the population to get better water facilities. They appeal to local politicians for support. Depending on the outcome of these early contacts, people begin to undertake more organized activities: letters to officials concerned and copies furnished to other influential people. Petitions, meetings, rallies and newspaper stories underline their requests.

2. Participation in locating the facilities

In the preparatory phase the number of water points needed in a particular urban low- income area will have to be estimated. Based on the available funds, the density of the population, the quantity of water to be drawn and the type of water supply wanted by the community, the number of water points will become clear.

Besides various technical and economical considerations, problems of social access may demand adaptations to ensure an equal division of benefits:

- The existence of rivalries between neighbouring villages, or neighbourhoods, may be an insurmountable barrier to the sharing of a supply.
- The location of a supply on the land of a wealthy house or land-owner.

Such difficulties may be overcome by joint discussions between the landowner, the local community leaders and the water board representatives.

The community should take part in the selection of pipeline routes. This will also alleviate fears of crop damage. When these proposed routes are known and discussed, risks of pipe breakages from agricultural activities, road construction etc. will be diminished.

The taste of water also plays a role when new water sources are used. People may reject the water from a new well, pump or water tanker for reasons of a "bad" taste and turn to their unsafe distant and scarce traditional sources. Therefore a dialogue between users and planners on all these issues is a must.

3. Participation in planning and design

The project planning stage is the period where the project is defined in detailed technical and organizational form, and where choices are made between the various options for each project element. The source of water is chosen, the equipment to be used for the drawing, treatment, transport and distribution of water, the technical facilities to be built, the timing, resources and labour needed and compliance with the public regulations are all considered and brought together in the project. In all stages of the decision-making on design and planning of the water-supply system, the community should be involved directly or via its representatives.

All information collected from the dialogue with the community, should in principle be used for planning adaptations and evaluation.

4. Participation in construction

In the construction phase of a CWS project, the community can contribute to physical construction works in different ways. This varies from the provision of unskilled voluntary labour to carrying out all construction work by community members on a paid contract basis. Depending on the situation and community organization, different levels of community participation can be attained during the construction of a water scheme.

When a community are to be involved in the construction process, they will feel responsible for maintaining the facilities afterwards. It also makes it easier to maintain and repair the facilities, since the community has been directly engaged in the construction works, which will give them a better understanding of the water system.

5. Participation in operation and maintenance

The participation of the community (or their representatives) in the operation and maintenance of a CWS system is vital for smooth functioning. Where community members are able to maintain the facilities and are made responsible for it, the necessary work will be done properly (if the persons are well-trained), because they are the actual users of the facilities.

Community participation at this stage of the water project requires well organized financing and communication with the authorities, for instance for the regular supply of spare parts by the water authorities tc prevent breakdown.

Preparation of project implementation

The following stages in project preparation can be distinguished:

1. Formulating programme objectives;
2. Collecting social, economic and physical data;
3. Design of the water system;
4. Making a project planning;
5. Establishing a project structure.

1. Formulating programme objectives

It is important to have communal understanding of what the project is all about. Especially in urban areas where people of different tribes, belief and habits are more or less forced to live closely together.

Political In urban areas most programmes will have political objectives as well although they may not be declared. This will affect the allocation of resources and sites as well as the type of technology provided. Certain groups may try to gain (political) momentum by "assisting" the community in the development of the project.

Health An important objective of a water-supply project is the improvement of the health of the community. Such an objective is often not so obvious for the majority of the community. First, an understanding should be created of the importance of the provision of safe drinking water. Health education is therefore usually part and parcel of water supply (and sanitation) projects.

Economical There might also be an economic project objective. A safe water supply will cause less losses of working time and school-days, by improved health, and will decrease the costs of general health service. The measurement of such an impact will be difficult.

2. Data collection

Socio-economic surveying and the development of a basic settlement map are essential elements of project planning. It helps to understand the composition, conditions and needs of the community.

The method of community self-survey is especially useful in water projects, because it can be used as a two-way communication, that prepares the project staff and the community for co-operation in the development of the project. The compilation of socio- economic data and the review of these in relation to development plans can be very helpful to the community as a way to learning to see its situation as something that can be altered and improved by concerted efforts.

3. Design of the water system

It is hard for the technicians of the government or the agencies to discuss the planning elements in non-technical terms with laymen. Therefore, they are in practice often not very supportive of community participation. In most cases, a special training element has to be added to the project if the sponsors are serious about participation, but that extra effort is certainly well spent for the long-term survival of the service. All parties included should agree on the final design and layout of the water system.

Bangkok *Residents of Bangkok face the problem of intermittent supply and low pressure. Most middle-class families have built reservoirs and installed pumps to ensure a reasonable continuity of supply which in turn further reduces water availability for those who cannot afford this solution.*

Outside the central system, numerous privately operated, independent networks were developed from deep wells. The unorganized and uncontrolled private extraction of groundwater resources continues to have serious consequences for the whole city, causing large areas of Bangkok to sink at the rate of 1-2 cm every year.

4. Planning a project

The organization of materials, tools, labour, storage facilities and training has to be arranged. Technicians living among the community may form a community construction group. Such groups may need some additional training to adapt their skills towards the specific water-supply project needs. Project planners should not overrate the voluntary labour from a community. People want a direct relation between the efforts they put in and the benefits they will derive from the project. Projects should also not last too long. The labourers will then lose interest.

Town life is harsh, competitive and expensive for low-income people. Voluntary labour may not so easily be available as in rural settings. The jobless are constantly busy queueing for jobs at building sites or factories, while those (informally) employed have hardly any time left to make themselves available. Some incentives may be necessary: a little cash or a prospect of more durable employment during various community water- supply systems.

5. Establishing a project structure

Approaches to and technologies for the provision of services to low-income communities differ vastly from those traditionally adopted for conventional

development. Special units within existing institutions are required to plan and manage appropriate infrastructure systems for low- income groups.

In a conventional situation all services are planned, designed, financed and constructed by various governmental or municipal departments. In the case of constructing a community water supply including community participation in planning, decision-making, construction, operation and maintenance and applying specific technologies, an effective community organization needs to be set up. Responsibilities and tasks have to be defined clearly.

Organization of water-supply project teams

It is wise to list the tasks to be undertaken by the different groups involved and define who will deal with what task and to what extent.

General tasks in a community water-supply project:

General tasks

1. Planning, i.e. defining populations to be served; identifying particular needs in the local community; determining what is an appropriate solution; and phasing construction;

2. Establishing a legal framework for the community water supply, especially regarding ownership, and regarding the rights and responsibilities of all organizations involved;

3. Design and construction of the technical water-supply system;

4. Source works: construction or modification of source works, treatment works, pipelines etc., to supply water to the water-collection points;

5. Finance: raising grants or loans to pay for construction; fixing water charges to repay loans or to pay operating costs;

6. Training of technicians and management staff, and any members of the local community who undertake responsibilities for maintenance or supervision;

7. Community involvement and participation: consulting local people about planned development, providing public information, and health education;

8. Operational management: supervision of water-collection points, maintenance and revenue collection.

In community water-supply projects two organizations can be set up, one for the project staff and one for the community. They are separate, although they must work closely together.

Neighbourhood water committee

If the authority seeks active community participation in the construction phase only, a fairly small community organization will be necessary. If, however, the community is being asked to play a continuing role in the implementation and operation of the community water supply, much bigger demands are made.

This objective can be met by the formation of a special "neighbourhood water committee", and it will therefore be one of the first tasks of the community

workers representing the water authority to assist in the formation of such a group.

Neighbourhood water committee's tasks:

Neighbourhood water committee

1. Facilitating communication between the water authority and water users;
2. Organizing self-help, voluntary labour for construction;
3. Drawing up the rules to be observed by users of the supply, and enforcing these rules to prevent misuse;
4. Selecting local people for training as standpost caretakers, community health workers etc.;
5. Collecting financial contributions from users;
6. Reimbursing caretakers for any expenses (e.g., purchase of spare parts) and other costs;
7. Making suggestions and assist with health education.

This list of responsibilities represents the burden which falls on local people when a water authority devolves considerable responsibility on local people. Only communities with a strong formal organization and with members with a degree of managerial skill are likely to be able to undertake all these tasks successfully.

Project team

During the period the community water supply is being planned, designed, constructed and made operational a project team exists, consisting of a project engineer and some other specialists. Such a project team is made responsible to the neighbourhood water committee as well as to the water authority.

The water committee may appoint its own technician, selected engineer or health worker in the project team to participate fully in the daily running and to represent their views. A clear division of duties, responsibilities and finances should be drafted before the project starts.

Responsibilities of the project team are:

Project team

1. The technical design: it should be technically sound and appropriate to the situation (finances, maintenance requirements);
2. Project planning: determine time requirements, work organization and financial obligations;
3. Project promotion campaign:arrangements;
4. Provision of materials: procurement and delivery of construction materials and equipment;
5. Arrange for skilled labour inputs (builders, plant operators and pipe layers e.g.).
6. On-site supervision and management of all labour activities;

Depending on factors such as local circumstances, the nature of traditional or political authority and the nature of the programme itself the community should be involved in an increasing degree.

Sri Lanka *In the Colombo municipal area in Sri Lanka in 1986 a community contract was signed. The contract is between a government agency and the community for the community to carry out and be paid for the construction of public facilities in their area. From the time of this first project, 60 community contracts were made up to June 1988. They included footpaths, drains, toilets, water-collection points and community centres. Eighty per cent of the contracts were completed on time, only five took longer than the scheduled time and just one exceeded the projected costs. This represents a marked improvement compared with experience with conventional contracts, which were plagued by time and cost overruns. These community contracts offer casual jobs for the community residents and develop administrative and technical skills.*

TASK 5: Split up in three groups and prepare detailed lists of responsibilities of the neighbourhood water committee. Consider the phases before, during and after the construction of a community water-supply system. Each group works out a different phase. After 15 minutes, compare the lists and discuss the differences and similarities.

VI. HOW TO FINANCE A COMMUNITY WATER SUPPLY

Costing of a community water-supply system is an essential part of the preparation of the project since a whole community or a neighbourhood is involved in financing part of the capital and/or the running costs. Besides that, low-income communities have limited financial resources, which need to be spent carefully on an appropriate sustainable technology. An accurate cost calculation is, therefore, necessary to give the community as well as the municipality and/or water authority a proper estimate of the financial consequences of a CWS in a specific neighbourhood.

Costs of water-supply

Capital costs

Every water-supply system is an individual case, depending on specific physical, technical and socio-economic conditions. For a conventional urban water-supply system, consisting of a river intake, raw-water main, conventional treatment units, storage reservoirs and distribution mains, the cost of the intake, transmission and treatment works will account for approximately 50 per cent of the total capital costs.

In a well and hand-pump supply, the financial cost will relate mainly to the abstraction component, since the costs of storage and distribution are zero. A spring-water supply system with house connections will have minimal abstraction and treatment costs, but high distribution costs. Some cost analysis for water-supply projects in various countries is shown in figure 7.

Operation and maintenance costs

System operation and maintenance financing is particularly critical. If the quality and level of service are to be maintained to the users' satisfaction, the cost of operation and maintenance should be recovered through user-service charges. In this respect, infrastructure projects should aim at minimizing reliance on scarce public funds. The solution to this problem is to recover as much of the cost as possible from beneficiaries through direct charges and/or cross-subsidies from the relatively better- off to the less well-off beneficiaries of project investments.

Sources of funding

Four potential sources of funds exist for water-supply programmes:

1. Government/municipal budgets;
2. Foreign loans;
3. Institutional funding within the country;
4. Beneficiary communities themselves.

Municipal budget

Municipal taxes, assessed on the size or value of the property being served, are the usual source of funds for water, drainage and solid-waste-disposal investments. Low-income communities, especially urban squatter communities, because of their illegitimate status, pay no municipal taxes, and this has often been used as the principal argument against providing these communities with municipal services. It follows, therefore, that issuing land title deeds or, at least, a declared intention to provide titles, is necessary before municipal revenues may be derived from these communities.

Figure 7. Community water supply technology costs (for a community of 400 people)

Technology	Low			High		
	Handpumps	Standpipes	Yardtaps	Handpumps	Standpipes	Yardtaps
Capital cost ($US)						
Wells[a]	4000	2000	2500	10000	5000	6000
Pumps (hand/motor)	1300	4000	4500	2500	8000	9000
Distributionb)	-	4500	16000	-	10000	30000
Subtotal	5300	10500	23000	12500	23000	45000
Cost per capita	13.3	26.3	57.5	31.2	57 5	112 5
Annual cost ($US/year)						
Annualized capitalc)	700	1500	3200	1400	3000	6000
Maintenance	200	600	1000	400	1200	2000
Operation (fuel)	-	150	450	-	300	300
Subtotal (cash)	900	2250	4650	1800	4500	8300
Haul costs (labour)[d])	1400	1100	-	3000	2200	-
Total	2300	3350	4650	4800	6700	8300
Total annualized cost per capita						
Cash only	2 3	5.6	11.6	4.5	11 8	22.3
Cash + labour	5 8	8.4	11.6	12.0	17.3	22.3

a) Pumping water level assumed to be 20 metres. Two wells assumed for handpump system (200 persons per handpump)

b) Distribution system includes storage, piping and taps with soakaway pits

c) Capital costs with replacement of mechanical equipment after 10 years annualized at a discount rate of ' 0 per cent over 20 years

d) Labour costs for walking to the water point, queuing, filling the container and carrying the water back to the house.

Note Time valued at $US0 125/hour

Beneficiary community

Participation of the beneficiaries in the financing of community water-supply projects is far-reaching, since it may commit low- income families for many years. Financial arrangements between the beneficiaries ard the project should, therefore, be kept as simple and as flexible as possible, so that they can easily be adapted to the wishes, needs and resources of the people for whom they are intended.

Although the development costs of a community water supply should by definition, be kept to a minimum, the beneficiaries are generally not in a position to pay all the costs from their own resources.

Beneficiaries are only willing to pay if they receive what they want: in other words, the project should meet the most urgent needs and priorities of the beneficiaries. It is, therefore, necessary that the beneficiaries be involved in the planning of the project, and the selection of technology.

Water tariffs

It is most common to charge a monthly tariff to cover servicing and operating and maintenance expenses. There is little point in setting tariff levels which are beyond the means of the beneficiaries to pay: on average, 3 to 5 per cent of household income for either water supply or sanitation or a combined service

charge not exceeding 7 per cent of the household income is considered affordable.

There are two types of tariffs related to the use of a water-supply system:

1. Fixed tariffs;

2. Variable tariffs.

1.Fixed tariffs (flat-rate pricing):

Based on the recovery of service costs by applying uniform rates to each household. These rates are not based on measurement of the level of utilization of the service by individual households, and the system has certain disadvantages:

- First, those users making minimal use of the service, normally low-income groups, will indirectly be subsidizing those with a high demand for the services, normally high-income groups;
- Secondly, a flat rate encourages wastage and irresponsible use of the services.

The advantage of the system is its simplicity in administration, especially when dealing with services the utilization of which is difficult to monitor.

2.Variable pricing:

There are four types of variable pricing for water supplies. The first three methods require water meters.

- Incremental block pricing, as the rate of water use increases, so does the price rate per unit of use.
- Declining block pricing, where, as the rate of use increases, the rate charged for each additional block decreases;
- Constant rate pricing where the rate charged for each unit of use of consumption is constant;
- Property assessment tax pricing which is an alternative to metering where the service rates are established as an additional tax and collected together with the property taxes;

Peru *The large squatter area of Villa El Salvador, south of the centre of Lima, does not have its own water source and has to be provided with mains water. The water provided is of good quality and is made available to residents through public reservoirs, each of which supplies about 400 households. A truck provides water to those parts of the settlement which are not reached due to low water pressure in the reservoirs. This service is provided at a relatively high cost to the consumer. Household connections will not come into operation until the drainage system for the settlement is completed. The two stages of water supply, public reservoirs and then individual connections, are being financed by the residents of Villa El Salvador as part of an important programme. Residents pay a varying monthly rate over periods ranging from 1 to 15 years.*

Problems in financial management

Problems may arise in four areas:

1. Community development;

2. Leadership;

3. Internal administration;

4. Outside relations.

1. Community development

The problems of the participants could be their low level of education and training and their lack of insight into the functioning of the authorities. The lack of social cohesion can lead to a disorganized group, if cultural factors are not integrated with the concept of the group formation.

2. Leadership

It is difficult to find leaders among the group members who are able to unite the group and, who at the same time, are capable of keeping proper accounts. Favouritism and nepotism on the part of leaders are threats to community spirit and can only be avoided through precise rules for the distribution of benefits.

3. Internal administration

Organization, administration and financial management are often problems, because of the lack of proper procedures and rules for day- to-day work. The administrators are sometimes not sufficiently qualified for their jobs.

4.External relations

Community organizations, that are often small and weak, have to deal with powerful bureaucratic machines, such as governmental agencies, private or public enterprises, or even international organizations. Because of lack of information and control mechanisms, problems arise, mainly concerning the mis- management of group funds. It is obvious that information and training needs should be identified. A transparent financial system that can be understood by all the members is very important. Providing receipts to the members and showing copies of the list of transferred amounts makes control easy. Also a stable and trusted leadership contributes to the successful operation of a community (water) organization.

Organizing the collection of payments

Payment

Payments from the community to the water authorities include:

- Repayment of (part of) the construction costs in cash in case no labour in-kind was supplied to the project;
- Payment of the charges for the quantity of water used;
- Payment for operation, maintenance and improvements.

There are problems in revenue collection, such as the definition of responsibility for payment. In the case where many people use, for example, one standpipe, it is difficult to find out who the beneficiaries of the service are and who is responsible for payment. However, when one (presumed) beneficiary fails to pay, the supply to everyone may be cut-off.

Penalties

Identifying effective sanctions or penalties for non-payment of communal services is difficult and particularly so in upgrading areas. Despite the difficulty of enforcing penalties for non-payment, only enforcement guarantees the success of collections.

Inadequate administrative procedures

Many local authorities are incapable of keeping pace with outstanding payments, owing to old-fashioned accounting methods and inadequate manpower resources. Add to these the numerous small payments which have to be collected and one has a situation which is likely to overwhelm the available human and financial resources of most local authorities.

Revenue collection

Collection of repayments and charges can be done on;

- An individual basis (i.e., each individual family pays directly to the municipal authorities);
- On a collective basis (i.e. the municipal authorities collect the payments per neighbourhood).

Collection on an individual basis requires considerable ability and effort on the part of authorities, and the cost of a debt collector often exceeds the amount of repayments he or she recovers. If the authorities transfer the responsibility of debt collection to the community, the social pressure to make the payments may be strong, but the arrangement may also create tensions and conflict in the neighbourhood.

Community-based financing

In the planning stage of the community water- supply project the project team discusses with the community its priorities, the available options, and also the amount the community can afford to spend on the community water supply.

This is important to establishing a method of presenting the planning team's proposals so that they are understandable for the community. All aspects of financing the community water-supply construction, operation, maintenance and a possible phased extension or improvement must be included in the presentation.

Community Involvement

One approach is the full of the involvementcommunity in the collection and enforcement of payments. The importance of stressing the cost-recovery consequences of the project from the very first dialogue with the residents and throughout the duration of the project has already been emphasized.

In some cases it becomes clear from discussion between the project team and community representatives that it is impossible to enforce penalties and collective payment for, for example, standpost water. In that case, an alternative water-supply option can be proposed which makes collection feasible such as water selling-points: individual households pay for whatever quantity of water they need.

Possible methods of involving the community include:

1. The revolving fund

The initial investment in services in an area can be treated as a revolving fund. Members of the community pay a regular amount into the fund, which is used

to repay the cost of services or even for further development of the area. This should ensure that community pressure is put on non-payers who would be considered selfish individuals not interested in contributing to the community's development.

2. The water contract system

In this approach, the community approaches the local authority with a proposal for the introduction of services for which it agrees to pay. A contract between the community and the local authority is drawn up to this effect and the community makes a down-payment to establish the principle of cost recovery before services are installed. In this way, the community becomes the paying client with contractual obligations and is responsible for the collection of payments from individual families. This system will work only if both parties meet their obligations under the contract.

3. Community-based organizations as intermediaries

Existing community-based organizations or new ones formed for the purpose can be used as local agents for the collection of payments. Such organizations are more directly in touch with residents than the local authority and, therefore, more able to put effective pressure on defaulters. Such an approach takes away much of the burden for collection from the local authority. As yet, this has only been attempted on a small scale.

Mobilization of resources

Organizations of poor people, once formed, are able to mobilize needed resources for the achievement of their goals. The resources can be identified at three levels:

1. Resources of the members

Savings, in the form of cash or a savings account, are usually unknown to the members of a low-income group. The organization has, therefore, to start collecting small contributions on a regular basis, to create a small fund out of which necessary expenses can be met. Raising of contributions for very specific purposes, sometimes through neighbourhood festivals, can be very successful.

More readily available than cash may be the labour of members or their families, which can be used not only for direct construction work but also for collections of materials (stones, sand, timber) where an accessible source is available. The utilization of that resource needs organization and, probably, some outside assistance.

2. Access to credit facilities

The formation of an organization of water users is important for the mobilization of credit for the members. The loans can take two forms - individual loans to members, with successive loans for other group-members depending on the proper utilization and regular repayments, or a group loan, where the lending institution deals with a community with the advantage that administrative costs are reduced. The reason for lending institutions to accept group loans is the security provided by the group, particularly when groups collect and transfer the monthly repayments.

3. Non-material resources

The fact that group-members act as a unit provides them with the ability to voice their problems, define their priorities and, most important, be heard. It enables the organization to start negotiations with the local administration, water authorities, etc. Thus, an association of dwellers may achieve some essential goals. Also, the combination of individual connections and informal networks

of the group members may provide access to technical advice and practical assistance in solving specific problems.

TASK 6: Discuss the possibilities of setting up a community based finance organization to finance a community water supply system.

VII. COMMUNITY TRAINING AND EDUCATION

Water-supply agencies may not have the staff and funds adequately to control and maintain the water supply. A solution would be to employ cadres already working at the community level: nurses assigned to health posts, health assistants, health promoters, social affairs agents, development workers.

For the most part, they lack technical skills in water supply to assist the community in overcoming such problems. They tend to have broad-based responsibilities in either health or community development.

For these categories of people to become involved in community water-supply programmes they will need special training courses to optimize their functioning in such programmes. This is especially the case when the programmes are organized on a larger scale, and training cannot be given informally at the neighbourhood level.

There are two specific areas where there is need for training: first, the maintenance of infrastructure components, mainly water and sewerage; and, secondly, the organizational and managerial capabilities needed for a community to take an active part in the upgrading process.

Types of training

Various types of training can be distinguished in a CWS programme:

1. Technical training

Since it concerns the construction of a CWS in a low-income area, low-cost techniques may be introduced with which even the water technicians of the municipal water board are not familiar at all. Additional training is useful for them to show the "new", appropriate technology and to motivate them to apply the techniques associated with it successfully.

Local caretakers and operators need training to be able to recognize serious trouble at an early stage. For the latter, this also involves the undertaking of simple repairs and technical maintenance. The need for vigilance over the supply, prevention of damage by children, animals and clumsy or ignorant users, as well as wastage and pollution at the source should also be included.

Added to this, some basic knowledge of sanitation and sanitation education is required. The amount of instruction in the latter will depend on the actual task the operator or caretaker will have in the educational process.

2. Community-organization training

When promoters are used in a campaign to motivate and organize the community they will need training in this field. In an integrated approach such promoters may co-operate with other trainers, such as health workers, who will then specifically deal with health education. Training can be on-the-job or through special periodic courses. Manuals and promotion guidelines are available from various (successful) projects.

3. Administrative training

In a CWS there will be a need for administration to deal with revenue collection and maintenance and/or repairs records. In a case where the community itself take care of the administration instead of municipal officers, a few people should be trained through short courses on this matter.

4. User education

Local provision for operation and maintenance are an important contribution to achieving regular functioning of the system and is a condition for user acceptance. The education of the users themselves, can greatly contribute to the prevention of breakdowns.

In the education programme for the users topics may be included such as:

- How to operate the CWS device;
- Problems encountered by users;
- Finding solutions to the problems by exchanging experience;
- What the new CWS technology is all about;
- How users can keep the costs of operation and maintenance low;
- Early detection of leakage through the attentiveness of the users.

This user education is not a one-time exercise, but should be repeated at regular intervals, since in urban areas there is continuous coming and going of people. Newcomers to the area should be made aware of such education and the responsible feeling of the community for its CWS.

5. Health education

The health situation as well, as the provision of health services, in low-income areas is often appalling. The poor condition of the water supply and sanitation is one of the major causes of the poor health of low- income communities. An improved water supply and better sanitation facilities accompanied by a permanent health education programme geared towards preventive care in water and sanitation practices will change the health conditions drastically in a positive sense.

Hygiene and sanitation practices

With the help of the community health worker, a health education programme can establish understanding of water use, hygiene, sanitation practices and health.

Training courses for field workers and community members should be based on the conditions in which they have to work and the type of educational approach that will be expected from them at community level. Staged training may be necessary to train the large numbers of people involved in participatory programmes. Whatever training is given, it should be practical and on-the-job. Participants should easily understand the links and be aware of the benefits.

It must be remembered that if participants have received any formal education it will be along the traditional lines of a teacher- student relationship, one-way communication, reproduction of facts, and little flexibility. It will therefore be difficult for these trainees to accept a different approach, to which they may attach less prestige or authority. Yet it is essential to adapt the training to the participatory approach and to the cultural background of the communities from which the trainees come and where they will work:

Planning an on the job training

Guidelines

The following steps may offer a useful guideline when planning on-the-job-training for a CWS:

Step 1: Assess the needs of the community

The need assessment should focus on determining what specific knowledge and skills the participants should have to reach the community. The needs of the community determine the programme of the training course.

Step 2: Select participants

Through discussion with all parties involved in the CWS-project it is determined which people are to receive training. Some considerations to be made are:

- Are the participants in the right job to make use of the skills and knowledge they will acquire at the workshop?
- Will the participants have such varied educational backgrounds and experience that it will be impossible to satisfy everyone?

Avoid considering the group of training participants as representative of all actors in the CWS.

Step 3: Select trainers

Trainers who have experience in community- oriented practical technical teaching are preferred. In addition to them, some local craftspeople, artisans, contractors or health supervisors may contribute to certain topics. It is recommended that for each 10 trainees there should be one trainer to keep the training manageable.

Step 4: Schedule the training

Find out when the participants and trainers have time available to follow and to conduct the training. Take into account public and religious holidays, weather seasons (rain, up-country harvesting, etc.).

Step 5: Provide training materials

A lot of training material on CWS has been developed. Local community organizations, ministries, representative offices of United Nations agencies or non-governmental organizations may be contacted to obtain useful material. The material should be surveyed not only for accuracy and appropriateness of the technical content, but also whether it fits in with the training process.

Step 6: Prepare the staff

One of the most critical conditions for a successful workshop is staff preparation:

- Discuss the trainers' roles, ways of working together, their expectations, and the division of responsibilities;
- Make a list of the tasks that need to be completed prior to and during the workshop;
- Review the workshop design for any last minute changes;
- Contact local officials for protocol purposes.

Technical training programme

Optional topics

Suggested technical areas in which non- technical personnel can be trained include:

1. Maintenance and repair of water supply devices (e.g. hand-pumps and taps):

- Fundamental steps for maintaining the types being used in the area, including the ability to train local caretakers in the same skills;
- Recognition of breakdowns, simple repairs and knowledge of where to refer problems to more technically qualified personnel;

2. Development of water sources: Springs, shallow wells and cisterns for rain catchment:

- Design-option skills;
- Steps to assess a spring for possible use;
- Steps in spring development;
- Steps in digging a shallow well, including an assessment of when to ask for assistance from a technical agency;
- How to construct a cistern of the right size for the number of users;
- How to assemble a roof-catching system;

3. Protection of wells/springs:

- Parapet construction;
- Well lining;
- Apron and drain construction;
- Animal watering through construction;
- Protection of well surroundings from domestic animals;
- Hand-drilling of well;

4. Installation of a hand-pump:

- Renewal of piston washers and crank;
- Regular maintenance;
- Construction of a filtration well/ pump on a river bank;

5. Construction of a public standpost:

- Diverting water pipes;
- Making connections;
- Fitting taps; replacing washers;
- Concrete construction;

6. Protection of water during transport and storage:

- Protection of vessels;
- Disinfection/household device;

7. Sullage:

- Drainage construction;
- Use of sullage for gardens.

Health education programme

Systematic and successful health education can enable the community health workers to make good progress in the improvement of the health of the people in the area.

As a first step, the people of the neighbourhood or the water committee could be involved in a discussion on the health problems of the area. It is a great advantage for co-operation in carrying out a larger community health programme if the members of such manageable groups understand the problem and the way to act. There is a tendency to treat health as a separate, classroom subject. However, health education can be incorporated in all sorts of discussions which take place in planning and implementing a community water supply. Practical explanations near a health hazard spot (contaminated well, mosquitoes in a pool, faeces near a water-collection point or dirty water containers) are perhaps as good as classroom teaching.

TASK 7: Prepare a list of topics which should be covered in a health-education training programme for a community in a squatter settlement.

VIII. IMPLEMENTING A COMMUNITY WATER-SUPPLY PROJECT

The implementation of the CWS project can be divided into four phases:

1. Initial phase or pilot project phase;
2. Expansion phase;
3. Operation and maintenance phase;
4. Evaluation phase (see chapter IX).

1. Pilot project

A pilot project is a project of a technically, but also economically and socially, limited scale. Only a few people in a small block of houses or a group of users of a communal well, pump or spring may be involved. The costs of the project need to be low and the organizational complexity still comprehensible.

Objectives The principal objectives of a pilot project are:

- To establish confidence among the participants; in a short time they can see the results of their communal efforts and get the benefits of them;
- To establish the confidence of the government and potential donors to satisfy them that a larger project can be successful;
- To stimulate demand from a larger group of the community: when people can see the results of a pilot project and can talk to the beneficiaries, they will be more impressed than they could be by other explanations;
- To test practical aspects of a possible larger project to follow: the pilot project may show shortcomings in technical, organizational or financial sense, and at this stage it is easy to rectify them;
- To provide experience and training for field staff (a technician, an official from the water board, a representative of an intermediating agency).

Features The features of a successful pilot project are:

1. Project size

Bearing in mind that the numerical strength and experience of field staff is likely to be limited, it is important that the project is kept as small as possible in order to give maximum supervision.

2. Suitability of the chosen community

The community selected should be willing to co-operate and be as representative as possible, have strong leadership and have a real need for the services.

3. Identification of principal social and cultural features of the community

It will be necessary to determine relevant customs, as an indication to what technical design and what community structure is likely to be most successful.

4. Project promotion campaign

The promotion campaign for an initial project will need to be especially intensive. This is particularly important for the beginning of a water-supply (and sanitation) programme.

5. Technical simplicity

Ideally, the people should be able to see the results of their labour within a relatively short time. More difficult projects can be undertaken once the pilot project has been successfully completed.

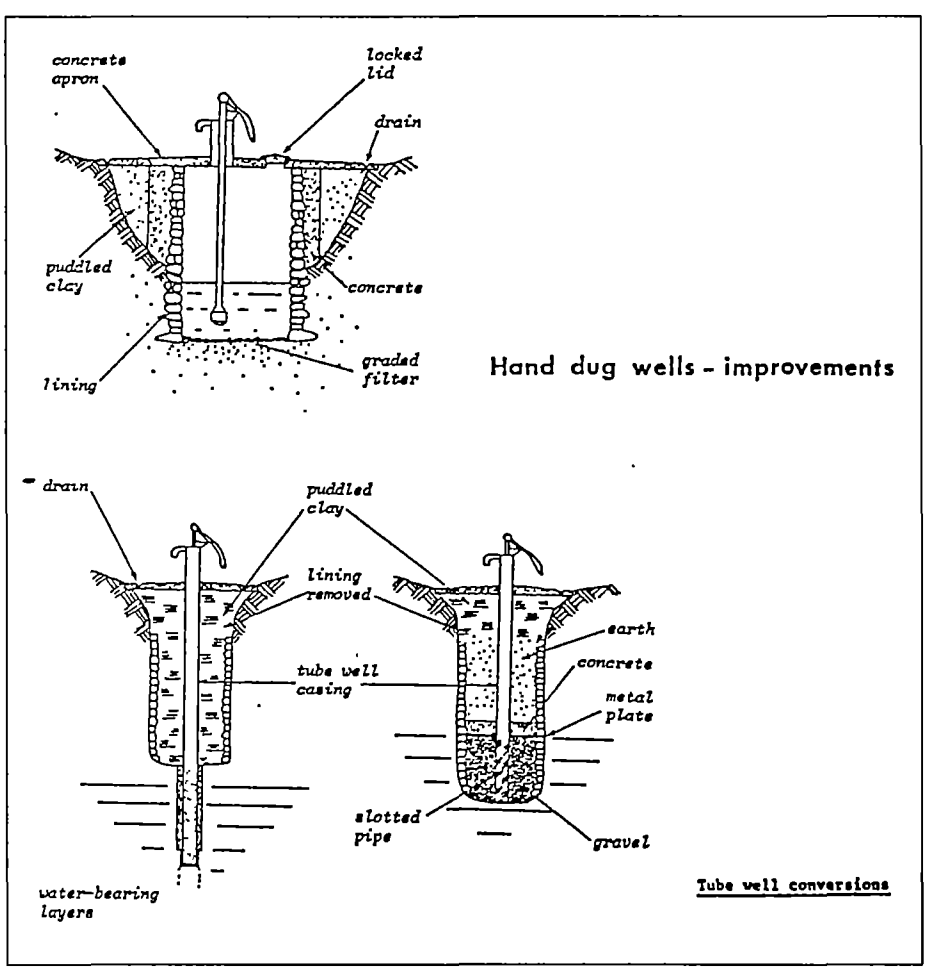
6. The quality and experience of field staff

The field staff should be experienced enough to foresee and avoid difficulties, particularly of a community nature, and be persevering enough to guide the project through the problems that arise.

7. Accessibility of project area

The pilot project should be situated in an accessible area, so communications will be easy and supplies will be regular. The project should receive adequate supervision and support.

Figure 8. Options for well design



2. Expansion phase

A pilot project is a fairly local activity. Before starting the expansion phase, the results of the pilot project should be thoroughly discussed with the community.

After the evaluation, the programme may be expanded by selecting specific areas of high growth potential and starting with demonstration projects to stimulate local demand in these areas. Once these projects are successful, a number of new projects can be initiated in adjacent areas, each with the appropriate level of field staff and supported by supervision, management, supplies, transport, administration, etc., at the area level. In this way the growth of the programme can be controlled within the managerial and trained manpower resources available.

3. Maintenance phase

As the programme develops, an increasing proportion of resources will need to be devoted to operation and maintenance. The policy for this phase will develop out of the experiences of the earlier phases.

Maintenance often turns out to become the repair of broken equipment. Therefore the difference between maintenance and repair should be stressed:

Maintenance is a continuous preventive activity to keep a water-supply system in good condition.

Repair means bringing the water-supply system back into operation after a breakdown.

In practice, however, preventive maintenance is often neglected and maintenance organizations become merely repair organizations, sending out repair teams only when standposts are broken, communal containers leak badly or tapcocks are too tight to operate.

Management of maintenance

In urban areas, centralized organization is more likely to occur. Under this system, day-to-day cleaning and inspection of the water-collection points (WCPs) is the responsibility of paid supervisors who may in turn employ labourers for the cleaning work. The supervisor is a paid employee of the water authority and will work in direct liaison with the maintenance staff of the authority. This arrangement makes every maintenance activity a direct responsibility of the water authority.

Maintenance of urban WCPs can easily be decentralized and the community can be involved. Two major options are possible:

- A person could be licensed to run a WCP and sell water at a fixed and controlled price. Depending on the arrangements (financial benefits, skill) this person is obliged to carry out repairs to an agreed level;
- Members of a water committee appointed by the community, or a health worker of a nearby health post, act as guard and operator, or carry out certain repairs and maintenance duties based on their feeling of responsibility for their WCP. It is ad visable to train more than one operator so that prolonged absence does not lead to complications.

Maintenance obstacles and recommendations

Organizational deficiencies

The organization constructing the system is usually not the organization responsible for maintaining the system. In most cases it is assumed that the community will maintain the wells, springs, standposts and pumps.

- The operation and management of these systems should be carried out by a competent agency until the communities are trained to take over and manage themselves.
- A standard set of financial, administrative and technical procedures appropriate to the system should be laid down for efficient management. Preventive maintenance, in addition to repair, is strongly emphasized.

Involvement of the community

The less the involvement of the community, the less the degree of responsibility felt by the community. However, this responsibility must be supported in practical terms by a realistic organization.

Community Involvement

- Contributions from the community by way of labour, local material, involvement in construction, and operation and maintenance are emphasized. These are means to generate a sense of ownership of the system in the community which ultimately leads to the financial viability of the system.
- The level of community participation in operation and maintenance planning depends on the complexity, type and size of the system.

Financial constraints

Owing to shortage of funds to sustain centralized maintenance organization, the central sector agency is quick to pass this responsibility to the beneficiaries, without providing the means for implementation (funds, manpower).

Financial

- Minor spares may be covered by the price of contribution, the water sold, or by the money collected from the community. Larger repairs and expensive spares, however, cannot be financed from a water price affordable by low-income communities.
- Additional funds from outside the community are therefore a necessity. It may be a governmental task to supply, administer and store the expensive spare parts. This is a permanent contribution but with the advantage of reduced costs, since some tasks have partly been taken up by the community (construction, maintenance, operation etc.).

Complex technology

Complex technology, involving pumps and treatment plants, usually requires a more sophisticated level of technical maintenance than is realistic for the community concerned.

Choice of technology

- The type of system designed should be carefully selected with a view to easy operation and simple maintenance within the management capability of the local community.
- The evaluation of the performance of the different pieces of equipment used should be made from time to time to improve the performance or to drop the use of inefficient equipment and to reduce the need of keeping in stock large numbers and a wide variety of spares.

Transport

Lack of transport is mostly cited as the bottle-neck in implementing a proper preventive maintenance programme.

Transport

- The movement of large equipment from the store to the WCP should be the task of government since it usually has a fleet of vehicles. In the agreement between the community concerned and the government, made up before the community water-supply project started, these matters of transport, supply of expensive spares, additional funds, and final supervision should be clearly dealt with.
- The absence of logistical control often delays the repairs and the recommissioning of the systems. The standardization of units and equipment is strongly emphasized in order to reduce the number of types of equipment, thereby facilitating a more efficient system of procurement of spare parts, their storage and ease of repair by the operating staff.

Administration

Administration and revenue collection are an important part of the management of maintenance.

- Maintenance and repairs should be recorded by those responsible: the operator, kiosk- holder, caretaker or supervisor. It is also necessary to keep a record for spares used and ordered and where they were fitted.
- Administration of the sales of water needs to be regularly checked by the water committee or other appointed representatives of the community and a revenue supervisor from the municipality.

Maintenance tasks

Below is an example of the duties to be carried out by a caretaker looking after a pump. As can be seen the duties are many. This job needs, therefore, to be carried out by a responsible person on whom the community can rely.

For various other functions task-descriptions of the same kind can be made.

Possible caretaker tasks are:

- Lubricate wear surfaces on pump periodically;
- Clean pump periodically;
- Replace bushings and pins;
- Replace shallow well cups;
- Repair shallow well foot valve;
- Repair shallow well plunger assembly;
- Replace broken handle, fulcrum or other above-ground part;
- Repair deep well foot valve;
- Replace deep well cups;
- Repair deep well plunger assembly;
- Fix leaks in drop pipe or suction pipe;
- Order spare parts;
- Request assistance from water supply agency;
- Collect user fees;
- Keep animals away from pump surroundings;
- Discourage villagers from spilling water off the apron;

- Drain water away from well site;
- Teach villagers how to operate pump correctly;
- Keep children from playing with pump;
- Prevent vandalism of pump;
- Tighten nuts, bolts and connections periodically;
- Keep record of pump repairs;
- Keep record of fees collected and costs of maintenance and repair;
- Disinfect the well;
- Teach villagers how to keep water clean while storing it;
- Lock and unlock the pump at hours agreed by the villagers;
- Clean the apron periodically;
- Record any comments from users about irregularities in pump operation;
- Paint all exposed parts to prevent development of rust;
- Repair any cracked concrete in apron of drain;
- Periodically test pump for foot valve leaks and worn leather cups;
- Inspect pins and bushings wear.

TASK 8: Visit a nearby low-income settlement and study the existing situation of the water-supply system. Answer the following questions:

- What type of system is used?
- What is its physical condition?
- Is regular maintenance taking place?
- What type of maintenance is taking place?
- Who carries out the maintenance?
- How do people report failures?
- How long does it take on the average before breakdowns are repaired?
- Can the community undertake repairs?
- How is the payment for water service organized?
- Is the water supply regular?

Discuss the outcome of your findings with all group members and suggest improvements for the maintenance of the neighbourhood water- supply system.

IX. PROJECT EVALUATION

Evaluation is an essential part of water- supply programmes. It is introduced to study the effectiveness of construction, cost and service, including the social, economic and health impacts. In general, the evaluation supports the call for improvement of community participation and education.

Programmes were (and still are) often considered successful when they have been completed in time and according to plan, when the costs have not surpassed the allocated budget and when the construction is up to standard. Where individual facilities are provided, such as rain catchment tanks, the major concern is to serve the maximum number of people within the planned time and budget. Sometimes there is not even a check whether the facilities have indeed been installed and are properly functioning.

In the last decade studies have also been carried out to evaluate the effective use and continued operation of CWS services. Frequently problems appear from these studies concerning the adequacy of the service, its continued operation, financial viability and appropriate use, and the realization of health and socio-economical benefits.

Stages in project evaluation

Evaluation of water improvements can be viewed in three stages;

Stage 1 - Project operation

In this stage the functional or engineering aspects of the project are assessed and the system itself is the object of evaluation by the potential users as to its appropriateness to their needs and their ability to operate and maintain it.

Stage 2 - Project performance

This stage concerns an evaluation of the use of facilities in which individuals and communities as users form the object for evaluation. It is important to study the actual use of the water supply by the community, who are the users, how they use the facilities and what are the problems.

Stage 3 - Project impacts

This final or end-stage evaluation encompasses measurements of the health, social, organizational, economic and administrative effects of the facilities on individuals, households and communities. At this point outside evaluators and techniques are important, but participatory evaluation by the community is a meaningful addition to the quantitative data.

United Republic of Tanzania *When an evaluation of a piped water-supply system was made in the United Republic of Tanzania, it was found that the maintenance service had difficulties with continuity and worked inadequately. Operators were regularly absent. Breakdowns appeared frequently and operators had to wait for a mobile team, which sometimes took several months. The evaluation made clear that although a communication system was lacking, such a system was absolutely essential for the success of the water-supply system.*

Mali *In areas where protected wells were constructed, evaluation showed that people still continued to use unprotected sources as well. Problems with distance, physical and social access, taste and adequacy were the major reasons for non-use that appeared from the evaluation. Community participa-*

tion in other drinking-water projects has resulted in considerable savings by preventing bad location and bad taste and by stimulating use.

Participation in evaluation

When the community is involved in the design and implementation of the programme, it is natural to involve it in evaluation. Discussions of problems can reveal specific reasons why the contribution of the community does not come up to expectation. Similarly, the agency owes the community an explanation when the process stagnates for outside reasons.

For some parts of the programme, it is likely that objectives have been set jointly by the agency and the community. The realization of such objectives will then also be jointly evaluated.

MonitoringThe monitoring of a water-supply project is often carried out by local agency personnel without any direct community participation. The only way in which the community can participate in this monitoring is to report problems. Formal feedback channels do not always exist or function satisfactorily. In cultures with a strong patron-client relationship an upward flow of communication will not come as a matter of course. This was the case in Ghana, where there was a reluctance to report breakdowns in improved water supplies for fear of being considered disrespectful.

Data collectionIt is possible to involve the community in the collection of evaluation data, or to stimulate regular self-surveys. One way to do this would be through integrating this activity into the school health education programme. For this purpose, the preparation of simple models and guidelines for studies by students could be developed by the departments of health and education. Another way is to train health committees for this purpose. This is done in Cameroon, where a programme for self-help action was evaluated by outside evaluators who visited the communities. Data collection was done by these committees.

Process evaluation

To realize the objectives of a participatory water-supply programme it is also important to check the process by which its outcomes are reached. Monitoring of inputs will be necessary in order to know if the programmes are carried out as planned. The collection of input and output data during the process will also facilitate final evaluations, for example, on cost-effectiveness. Process evaluation goes further than the registration of what happens. It also means checking if the developments are in the right or wrong direction and identifying explanatory factors.

Water committee

Community participation in the monitoring of performance also occurs. In many Latin American countries it is a part of the responsibilities of a local water committee. The committees have to send regular reports to the agency and receive a periodic visit of a supervisor, or monthly visits to inspect their records.

Evaluation meetings

Statutory meetings with the members of the user committees and regular elections of its members provide the users with a means to express their satisfaction with the functioning of the system. It could, however, be useful to add some informal measurement of user satisfaction during inspection visits.

Overall evaluations

Overall evaluations are carried out once or at long intervals. Some of these evaluations do not involve local people at all, but rely on survey data to measure project success. Methods used in such studies are observations at the water sources, water measurements (for example, on flow, quality), inspection of agency records and study of health statistics. Usually, however, sociological surveys are also carried out, to collect information on acceptance, patterns of use, reported incidence of disease etc.

It is not only important to know that one kind of participatory programme has the intended result or that this programme is better than a non-participatory one, it is also important to investigate what kind of participation and education procedures are most successful in a participatory setting.

Implications Externally administered evaluation of water projects has the obvious advantages of expert design, use of valid measures, and access to facilities for data management. Achieving interpretable results, however, in the case of water-supply projects involves sharing a part of the responsibility for carrying out the design, execution, and interpretation of the evaluation with the users themselves.

Women

Valid explanations for the results of water- supply projects demand that women be entrusted with the responsibility of identifying criteria for each stage of the evaluation, for the collection and recording of data, and for a share in the interpretation of results. Only so will reliable collection of evaluation data be achieved. With a stake in the outcome of the evaluation, women will be more likely to see that the necessary care is taken to select feasible data items and to collect them reliably. At the same time, they will feel responsible for suggesting modifications or changes in the facilities themselves based on interpretation of the data gathered.

Honduras *In Honduras, women not only collected the survey data but organized a workshop to analyse it and prepared a final evaluation document.*

Guidelines Both continuous and periodic evaluations of water-supply programmes should deliberately examine both the role women have played in the programme and the benefits that have accrued to women as a result of the programme. For example, questions should be asked about water transport, storage, and use in the home that reflect an understanding of the role of women.

Experience with participation in project evaluation is still limited. This has also consequences for the judgement of the importance of participatory evaluations for ultimate project success. Such involvement can yield important benefits, for example, for the identification of the real effects of water supplies and the underlying reasons for these owing to the lack of cases no hypothesis-testing research has yet been carried out on this aspect of participation. With more attempts to integrate evaluation into water-supply programmes and to involve the community in project evaluation, future evaluation could also show if and in what form local involvement in project evaluation is important for project success.

TASK 9: Evaluate this training course. Each participant prepares a list of the following items:

- The most important thing I have learned;
- How could I use what I have learned;
- What I liked most about the course;
- What I liked least about the course;

Discuss the answers in the total group.

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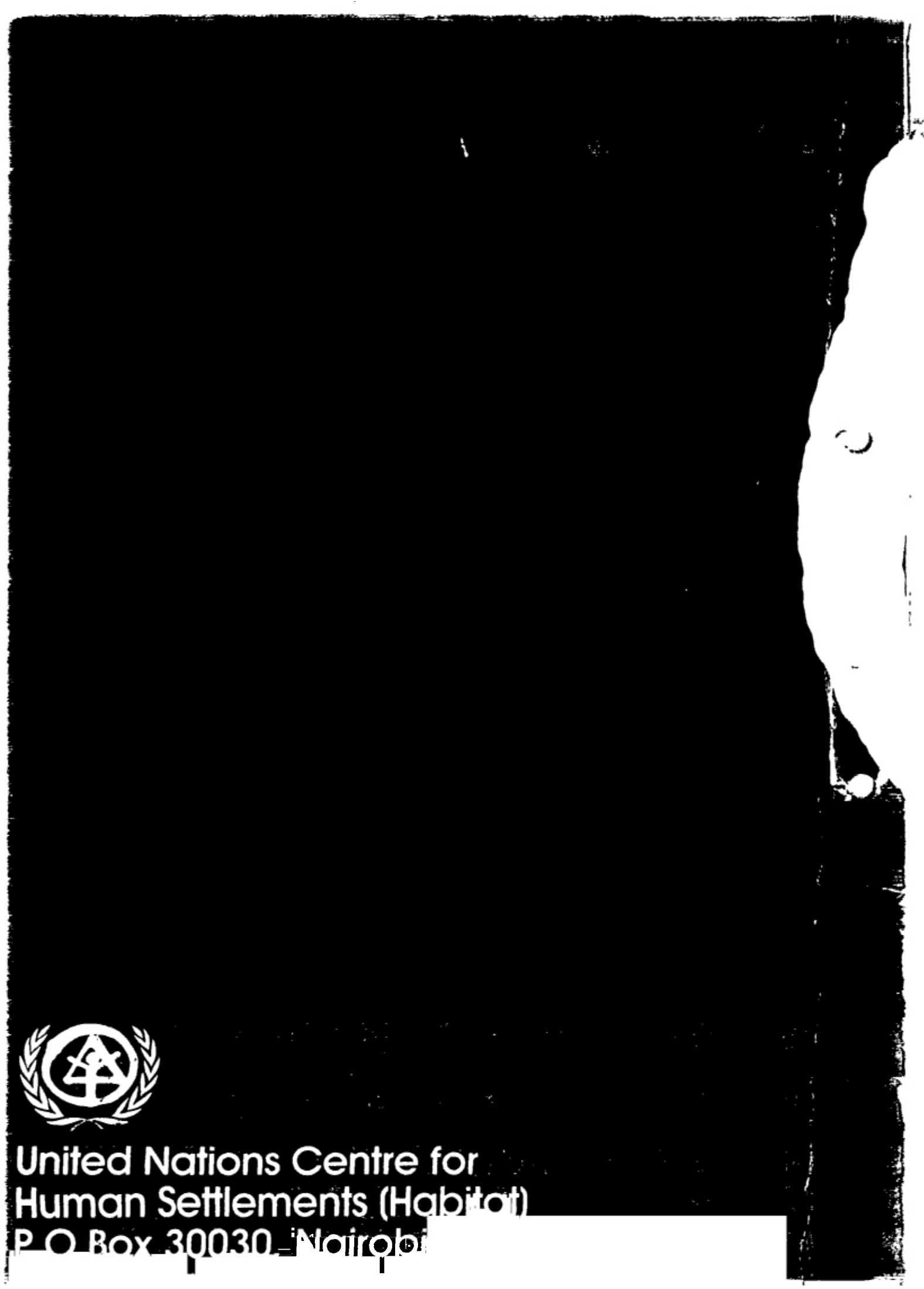

United Nations Centre for
Human Settlements (Habitat)
P.O. Box 30030, Nairobi